U.S. Department of
Homeland Security
United States
Coast Guard

U. S. COAST GUARD ADDENDUM

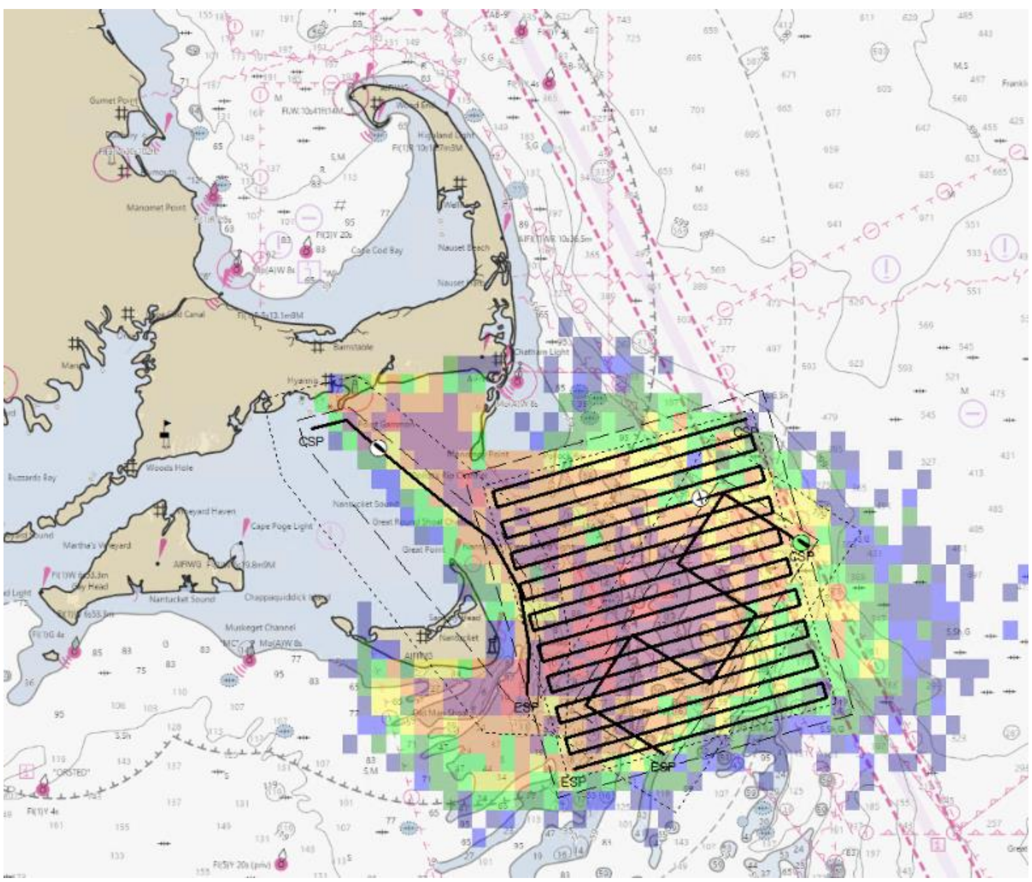
TO THE

UNITED STATES

NATIONAL SEARCH AND RESCUE SUPPLEMENT (NSS)

To The

International Aeronautical and Maritime Search and Rescue Manual (IAMSAR)



COMDTINST 16130.2G

October 2022

U.S. Department of
Homeland Security

**United States
Coast Guard**

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COMDTINST 16130.2G
OCT 28, 2022

COMMANDANT INSTRUCTION 16130.2G

Subj: THE U.S. COAST GUARD ADDENDUM TO THE UNITED STATES NATIONAL SEARCH AND RESCUE SUPPLEMENT (NSS) TO THE INTERNATIONAL AERONAUTICAL AND MARITIME SEARCH AND RESCUE MANUAL (IAMSAR)

1. PURPOSE. This Instruction is an update to the Coast Guard Addendum (CGADD) to the United States National Search and Rescue Supplement (NSS), which is a supplement to the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR). The CGADD establishes policy, guidelines, procedures and general information for Coast Guard use in search and rescue (SAR) operations.

2. ACTION. All Coast Guard unit Commanders, Commanding Officers, Officers-in-Charge, Deputy/Assistant Commandants, and Chiefs of headquarters directorates must comply with the policies contained.

3. AUTHORIZED RELEASE. Internet release is authorized.

4. DIRECTIVES AFFECTED. The U.S. Coast Guard Addendum to the United States Search and Rescue Supplement (NSS) to the International Aeronautical and Maritime Search and Rescue Manual, COMDTINST 16130.2F is cancelled.

5. DISCUSSION.

   a. The CGADD is a Coast Guard publication complementing the NSS and IAMSAR guidance for Coast Guard SAR operations.

   b. The CGADD, NSS and IAMSAR are reference documents for SAR, which are published and revised to incorporate the latest policy guidance for techniques and recommendations for SAR.

   c. The CGADD includes procedures and information that may be useful to rescue agencies outside of the Coast Guard. Although the CGADD is a Coast Guard policy publication, commands may share the information with other rescue organizations. In the event of apparent conflict between the provisions of the CGADD and other Coast Guard directives, the latest provision shall be applied and Commandant (CG-SAR-1) shall be notified of the apparent conflict.

   d. The policies and procedures in this Instruction apply to Coast Guard facilities within the U.S., territories, and possessions, and to Coast Guard SAR operations worldwide. This directive promulgates internal Coast Guard planning guidance solely intended to promote efficiency and consistency in public service, above and beyond the requirements of law and regulation. Any obligations discussed, flow only to the Coast Guard, and Coast Guard personnel are expected to exercise broad discretion in performing the functions discussed. The Coast Guard retains the discretion to deviate from or change this guidance without notice. This document creates no duties, standard of care, or obligations to the public and should not be relied upon as a representation by the Coast Guard as to the manner of proper performance in any particular case.

6. DISCLAIMER. This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. It is intended to provide operational guidance for Coast Guard personnel and is not intended to nor does it impose legally-binding requirements on any party outside the Coast Guard.

7. MAJOR CHANGES. No new policy has been established with this update; this document only consolidates policy changes that have already been promulgated. This updated Instruction contains 17 doctrine and policy updates that have been released since 2012 by either policy memo or ALCOAST Commandant's Notice (ACN). In addition, certain key administrative corrections were made, which do not impact the Coast Guard SAR System in a substantive manner but were necessary for clarity and consistency with other instructions. A complete list of major changes to this Instruction is included in Appendix P.

8. SCOPE AND AUTHORITIES. It is recommended the reader become familiar with the following directives and publications noted throughout this Instruction and listed here:

   a. The International Aeronautical and Maritime Search and Rescue Manual (IAMSAR)

   b. The United States National Search and Rescue Supplement (NSS)

   c. 14 U.S.C. § 102

   d. 14 U.S.C. § 521

9. ENVIRONMENTAL ASPECT AND IMPACT CONSIDERATIONS. The Office of Environmental Management, Commandant (CG-47) reviewed this Commandant Instruction and the general policies contained within, and determined that this policy falls under the Department of Homeland Security (DHS) categorical exclusion A3. This Commandant Instruction will not result in any substantial change to existing environmental conditions or violation of any applicable federal, state, or local laws relating to the protection of the environment. It is the responsibility of the action proponent to evaluate all future specific actions resulting from this policy for compliance with the National Environmental Policy Act (NEPA), other applicable environmental requirements, and the U.S. Coast Guard Environmental Planning Policy, COMDTINST 5090.1 (series).

10. DISTRIBUTION. No paper distribution will be made of this Instruction. An electronic version will be located in the Coast Guard Directives System Library internally, and if applicable on the Internet at www.dcms.uscg.mil/directives.

11. RECORDS MANAGEMENT CONSIDERATIONS. Records created as a result of this Instruction, regardless of format or media, must be managed in accordance with the records retention schedule located on the Records Resource Center site: https://uscg.sharepoint-mil.us/sites/USCGRecordsCoordinators.

12. POLICY.

a. Procedures, techniques, and terminology in the CGADD are adopted for use by the Coast Guard for SAR operations. Procedures, techniques, and terminology promulgated by the NSS and IAMSAR also apply to the Coast Guard. Where Coast Guard policies or procedures differ from NSS and IAMSAR manual, discussion and guidance will be provided within the CGADD. The CGADD is considered the primary document for Coast Guard procedures, techniques, and terminology. The NSS and IAMSAR can be used as secondary and tertiary references.

b. The provisions of this Instruction are intended as a guide for consistent and uniform execution of the Coast Guard SAR program. This Instruction does not cover occurrences best handled through experience and sound judgment. The CGADD is not intended to place undue restrictions on use of sound judgment.

13. FORMS/REPORTS. The forms referenced in this Instruction are available at: https://uscg.sharepoint-mil.us/sites/cg61/SitePages/Forms.aspx.

14. SECTION 508. This instruction was created to adhere to Accessibility guidelines and standards as promulgated by the U.S. Access Board. If changes are needed, please communicate with the Coast Guard Section 508 Program Management Office at Section.508@uscg.mil.

15. REQUEST FOR CHANGES. Units and individuals may formally recommended changes through the chain of command using the Coast Guard Memorandum. Comments and suggestions from users of this Instruction are welcomed. All such correspondence may be emailed to Commandant (CG-SAR) at: HQS-DG-lst-CG-SAR-1@uscg.mil or mailed to: Commandant (CG-SAR); U.S. Coast Guard; 2703 MARTIN LUTHER KING JR., AVE SE MAIL STOP 7516; WASHINGTON D.C. 20593-0001.

/Jo-Ann F. Burdian/
Rear Admiral, U.S. Coast Guard
Assistant Commandant for Response Policy

RECORD OF CHANGES

Change Number	Date of Change	Date Entered	Entered By:

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REFERENCES

(a) United States National Search and Rescue Supplement to the International Aeronautical and Maritime Search and Rescue Manual Version 2.0
(b) International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual
(c) U.S. Coast Guard Incident Management Handbook (IMH), COMDTPUB P3120.17 (series)
(d) U.S. Coast Guard Incident Emergency Management Manual Volume IV: Incident Management and Crisis Response, COMDTINST M3010.24 (series)
(e) Auxiliary Operations Policy Manual, COMDTINST M16798.3 (series)
(f) U.S. Coast Guard Command Center Manual (CCM), COMDTINST M3120.20 (series)
(g) U.S. Coast Guard Boat Operations and Training (BOAT) Manual Volume I, COMDTINST M16114.32 (series)
(h) Team Coordination Training, COMDTINST 1541.1 (series)
(i) Risk Management (RM), COMDTINST 3500.3 (series)
(j) Public Affairs Manual, COMDTINST M5728.2 (series)
(k) The Coast Guard Freedom of Information (FOIA) and Privacy Acts Manual, COMDTINST M5260.3 (series)
(l) Federal/State Relations – Recreational Boating Safety, COMDTINST 16750.8 (series)
(m) Memoranda of Understanding /Agreement, COMDTINST 5216.18 (series)
(n) Management and Operation of the Automated Mutual Vessel Rescue (AMVER) System, COMDTINST 16122.2 (series)
(o) U.S. Coast Guard Maritime Law Enforcement Manual (MLEM), COMDTINST M16247.1 (series)
(p) The Coast Guard Communications Manual, COMDTINST M2000.3 (series)
(q) Spectrum Management Policy and Procedures, COMDTINST M2400.1 (series)
(r) International SafetyNET Manual, IMO Publication
(s) Radiotelephone Handbook, CGTTP 06-01.1 (series)
(t) USMCC National Rescue Coordination Center and Search and Rescue Point of Contact Alert and Support Messages
(u) (Removed)
(v) Emergency Medical Services Manual, COMDTINST 16135.4 (series)
(w) Critical Incident Communications, COMDTINST 3100.8 (series)
(x) Records & Information Management Program Roles and Responsibilities, COMDTINST 5212.12 (series)
(y) Marine Safety Manual, Vol. VI, Ports and Waterways Activities, COMDTINST M16000.11 (series)
(z) Supply Policy and Procedures Manual (SPPM), COMDTINST M4400.19 (series)
(aa) Prevention of BloodBorne Pathogen Transmission, COMDTINST M6220.8 (series)
(bb) Federal Highway Safety Act of 1966
(cc) Boarding Officer Job Aid Kit (BOJAK)
(dd) United States Coast Guard Regulations 1992, COMDTINST M5000.3 (series)
(ee) 47FT Motor Lifeboat Operator’s Handbook, CGBOH 16114.47 (series)
(ff) 45FT Response Boat – Medium Operator’s Handbook, CGBOH 16114.45 (series)
(gg) Rescue and Survival Systems Manual, COMDTINST M10470.10 (series)
(hh) Coast Guard Air Operations Manual, COMDTINST M3710.1 (series)
(ii) 29FT Response Boat – Small II Boat Operator’s Handbook, CGBOH 16233.29 (series)

(jj) Coast Guard Helicopter Rescue Swimmer Manual, COMDTINST M3710.4 (series)
(kk) Cutter Surface Swimmer Program, COMDTINST 16134.2 (series)
(ll) Coast Guard Diving Policies & Procedures Manual, Volume I, COMDTINST M3150.1 (series)
(mm) NAVSEA SUBMISS/SUBSUNK Bill for Submarines and Manned Noncombatant Submersibles, NAVSEAINST 4740.1 (series)
(nn) Emergency Management Manual, Volume III – Exercises, COMDTINST M3010.13 (series)
(oo) Privacy Incident Response, Notification, and Reporting Procedures for Personally Identifiable Information (PII), COMDTINST M5260.5 (series)
(pp) Emergency Support Function #9 – Search and Rescue Annex
(qq) National Response Framework (2016)
(rr) Catastrophic Incident Search and Rescue Addendum to the United States National Search and Rescue Supplement to the International Aeronautical and Maritime Search and Rescue Manual (2012)
(ss) National Search and Rescue Plan of the United States (2016)
(tt) Saving Life and Property, 14 U.S.C. § 521
(uu) Cooperation With Other Agencies, States, Territories, and Political Subdivisions, 14 U.S.C. § 701
(vv) International Convention on Maritime Search and Rescue (1979)
(ww) Convention on International Civil Aviation, Annex 12 – Search and Rescue
(xx) Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288 (codified as amended at 42 U.S.C. § 5121 *et seq.*)
(yy) Financial Resource Management Manual (FRMM), COMDTINST M7100.3 (series)
(zz) FEMA Mission Assignment Guide, 2017

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NOTES TO READERS

NOTE 1: Policy and Doctrine

The hallmark of policy is the use of the terms "must" and "shall." These are mandatory terms. They require compliance or action. The term "prescribe" encompasses the term "restricts." Thus, other hallmarks of policy are the terms "must not" and "shall not."

By comparison, the hallmark of doctrine is the use of the terms "can" and "may." These are permissive terms. The term "should" is a mandatory term **unless justifiable reason** exists for not complying. Since there is a significant degree of judgment included within its use, the term "should" is more associated with doctrine than policy.

The term "will" is sometimes used in the place of "shall." This is incorrect in the context of both doctrine and policy. "Will" applies only to a statement of future condition and should not be used in the place of "shall."

Source: Doctrine Study Group Final Report, 01 April 2009

NOTE 2: Use of *Bold/Italic*

Items highlighted by ***bold/italic*** text are policy. This marking is based on the use of the terms "shall" and "must" (this includes, of course, "shall not" and "must not"). However, this marking is not all inclusive; some items constitute policy but do not currently use the terms "shall" or "must." Future changes will address highlighting of all policy statements.

ABBREVIATIONS AND ACRONYMS

(Note: Since some terms have more than one meaning, the reader is advised to carefully note the context in which an abbreviation or acronym is used.)

A	search area
A/C	aircraft
A/S	air station
ABC	airway, breathing, circulation
ACC	area control center
ACO	aircraft coordinator
ADCON	Administrative Control
ADF	automatic direction finding
AE	assistance entry
AFTN	aeronautical fixed telecommunications network
AICD	Automated Implanted Cardioverter Defibrillator
AIS	automatic identification system
AIS-SART	automatic identification system-search and rescue transponder
AM	amplitude modulation
AMS	aeronautical mobile service
Amver	Automated Mutual-assistance Vessel Rescue
ANB	55 foot Aids to Navigation Boat
AOI	Area of Interest
AOR	Area of Responsibility
ARTCC	air route traffic control center
ATC	air traffic control
ATN	aeronautical telecommunications network
ATON	Aids to Navigation
B	cross-over barrier pattern
BARD	Boating Accident Report Database
BC	bottom current
BOJAK	Boarding Officer Job Aid Kit
BSW	Base Sweep Widths
BUSL	49 foot Stern Loading Buoy Boat
C	coverage factor
C	creeping line pattern
C3CEN	Command, Control and Communications Engineering Center
CASP	Computer-Assisted Search Planning
CASPER	Contact Area Summary Position Report
CBT	Computer Based Training
CC	command center
CCIR	International Radio Consultative Committee
CPPM	Contingency Preparedness Planning Manual
CDO	Command Duty Officer
CES	coast earth station
CESM	Coldwater Exposure Survival Model
CG	Coast Guard
CGADD	Coast Guard Addendum
CIRM	Centro Internazionale Radio-Medico
CISAR	Catastrophic Incident Search and Rescue
CMF	Common Mapping Framework
COI	Certificate of Inspection
COMDTINST	Commandant Instruction
COMMSTA	Communications Station
COMSAR	Committee on Radiocommunications and Search and Rescue
Cospas	Cosmicheskaya Sistyema Poiska Avariynych Sudov (Russian language for "Space System for Search of Vessels in Distress")
COTHEN	Customs Over The Horizon Enforcement Network
COTP	captain of the port

CPA	closest point of approach
CPB	Coastal Patrol Boat (Marine Protector Class)
CPR	cardiopulmonary resuscitation
CPS	Contingency Preparedness System
CPX	Command Post Exercise
CS	Cutter Swimmer
CS	creeping line single-unit
CSC	creeping line single-unit coordinated
CSP	Communications Service Provider
CSP	commence search point
CST	Commence Search Time
CUC	communications unit controller
DAN	Diver's Alert Network
DF	direction finding
DINFOS	Defense Information School
DMB	datum marker buoy
DME	distance measuring equipment
DOD	Department of Defense
DOS	Department of State
DR	dead reckoning
DR	disaster response
DRe	dead reckoning error
DSC	digital selective calling
DSN	defense switched network
DTG	date-time group
DVL	Digital Voice Logger
E	total probable error of position
EDS	Environmental Data Server
EGC	enhanced group calling
ELT	emergency locator transmitter
EMS	emergency medical services
EMT	emergency medical technician
EPIRB	emergency position-indicating radio beacon
EST	End Search Time
ETA	estimated time of arrival
ETD	estimated time of departure
EXCOM	extended communication search
F	flare patterns
F/V	fishing vessel
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FLAR	forward-looking airborne radar
FLIR	forward-looking infrared
FM	flare multiunit
FM	frequency modulation
FOIA	Freedom of Information Act
FOV	field of view
FS	flare single-unit
FSP	Foreign Service Post
FTX	Field Exercise
Fv	aircraft speed correction factor
f_W	weather correction factor
GEO	Geo-stationary Satellite
GHz	gigahertz
GIS	Geographic Information System
GMDSS	Global Maritime Distress and Safety System
GPS	global positioning system
H	homing pattern
HF	high frequency
HMN	Homing Multi-Unit Non-Return
HQ	headquarters
HS	homing single-unit
HSA	Homing Single Unit Aural
HSM	Homing Single Unit Meter
IAMSAR	International Aeronautical and Maritime Search and Rescue
IC	Incident Commander
ICAO	International Civil Aviation Organization
ICS	incident command system
IHO	International Hydrographic Organization
IIP	International Ice Patrol

IMA	Incident Management Activity
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
Inmarsat	International Mobile Satellite Organization
INS	inertial navigation system
INTERCO	International Code of Signals
ISARC	Improvements to Search and Rescue Capabilities
ITU	International Telecommunication Union
JAWS / C2PC	Joint Automated Work Sheets / Command and Control Personal Computer
JRCC	joint (aeronautical and maritime) rescue coordination center
JRSC	joint rescue sub-center
kHz	kilohertz
km	kilometers
kt	knot (nautical miles per hour)
LC	lake current
LEO	Low, Near Polar Orbit
LKP	last known position
LOB	Line of Bearing
LPD	Letter of Presumed Death
LRS	Long Range Search
LUF	Lives Unaccounted For
LUT	local user terminal
LW	leeway
m	meters
M/V	merchant vessel
MARS	Maritime Mobile Access and Retrieval System
MAST	Military Assistance to Safety and Traffic
MCC	mission control center
MEDEVAC	medical evacuation
MEDICO	medical advice, usually by radio
MERTS	MISLE Enhancement Request Tracking System
MF	medium frequency
MFAG	Medical First Aid Guide
MHz	megahertz
MISLE	Marine Information for Safety and Law Enforcement
MLB	Motor Life Boat
MLB	Motor Life Boat
MLEM	Maritime Law Enforcement Manual
MMSI	maritime mobile service identity
MNPS	Minimum Navigation Performance Specification
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MRCC	Maritime Rescue Coordination Center
MRS	Medium Range Search
MSAP	Maritime SAR Assistance Policy
MSC	Maritime Safety Committee
MSI	maritime safety information
MSO	Marine Safety Office
n	number of required track spacings
NAVAREA	Navigational Area
NAVSAT	navigation satellite
NAVSEA	Naval Sea Systems Command
NAVTEX	Navigational Telex
NDRS	National Distress and Response System
NIIMS	National Interagency Incident Management System
NIMA	National Imagery and Mapping Agency
NM	nautical mile
NMCC	National Military Command Center
NOAA	National Oceanic and Atmospheric Administration
NOCR	Notification of Country of Registry

NOK	Next of Kin
NSARC	National Search and Rescue Committee
NSB	Non-Standard Boat
NSP	National Search and Rescue Plan
NSS	National Search and Rescue Supplement
NVG	night vision goggles
NWS	National Weather Service
O	contour pattern
O/B	outboard
O/O	Office of Operations
O/S	on-scene
OCMI	Officer in Charge, Marine Inspection
OFA	Oceanographic Features Analysis
OM	contour multiunit
OOD	Officer of the Deck / Day
OPC	Ocean Products Center
OPCON	Operational Control
OPFAC	Operational Facility
OS	contour single-unit
OSC	on-scene coordinator
OSC	Coast Guard Operations Systems Center
P	parallel pattern
P/C	pleasure craft
PBX	private branch exchange
Pd	drift compensated parallelogram pattern
PFD	personal flotation device
PIW	person in water
PLB	personal locator beacon
PM	parallel track multiunit
PMC	parallel multiunit circle
PMN	parallel track multiunit non-return
PMR	parallel track multiunit return
POB	persons on board
POC	probability of containment
POD	probability of detection
POS	probability of success
PQS	Personal Qualification Standard
PRECOM	preliminary communication search
PS	parallel track single-unit
PSAP	Public Service Answering Point
PSDA	Probability of Survival Decision Aid
PSS	parallel single-unit spiral
R	search radius
R&D	research and development
RAE	Right of Assistance Entry
RB-HS	Response Boat – Homeland Security
RB-M	Response Boat (Medium)
RB-S	Response Boat (Small)
RC	river current
RCC	rescue coordination center
RDF	radio direction finder
RDP	Remote Desktop Protocol
RF	radio frequency
RFF	Remote Fixed Facility
RNAV	Area Navigation (ICAO term)
RS	Rescue Swimmer
RSC	rescue sub-center
S	square pattern
S	track spacing
S/V	sailing vessel
SAP	Search Action Plan
SAR	search and rescue
SAREX	Search and Rescue Exercise
SARFAC	Search and Rescue Facilities
SARMIS	Search and Rescue Management Information System
SAROPS	Search and Rescue Optimal Planning System
SARS	Severe Acute Respiratory Syndrome
SARSAT	Search and Rescue Satellite Aided Tracking
SART	search and rescue radar transponder

SATCOM	satellite communications
SC	SAR coordinator
SC	sea current
SCC	Sector Command Centers
SES	ship earth station
SITOR	simplex telex over radio
SITREP	situation report
SLAR	side-looking airborne radar
SLDMB	Self Locating Datum Marker Buoy
SM	Searchmaster (Canadian term)
SMC	SAR mission coordinator
SNO	Statement of No Objection
SOLAS	Safety of Life at Sea
SPC (HWX)	Special Purpose Craft for Heavy Weather
SPPM	Supply Policy and Procedures Manual
SRR	Short Range Recovery
SRR	search and rescue region
SRS	search and rescue sub-region
SRU	search and rescue unit
SS	expanding square search
SSAS	Ship Security Alert System
SSB	single side band
SSTA	Sea Surface Thermal Analysis
SUC	surf current
SURPIC	surface picture
SVR	surface vessel radar
SWC	swell/wave current
T	search time available
T	true course
T	trackline pattern
TACAN	Tactical Air Navigation
TACON	Tactical Control
TAD	Temporarily Assigned Duty
TC	tidal current
TCM	Telecommunications Manual
TISCOM	Telecommunications and Information Systems Command
TLX	teletype
TMN	trackline multiunit non-return
TMR	trackline multiunit return
TMT	Training Management Tool
TQC	Training Quota Management Center
TSN	trackline single-unit non-return
TSR	trackline single-unit return
TTX	Table Top Exercise
TWC	total water current
UHF	ultra high frequency
UMIB	urgent marine information broadcast
USC	United States Code
USCG	United States Coast Guard
USDAO	U.S. Defense Attache Office
USMCC	United States Mission Control Center
USN	United States Navy
UTB	Utility Boat
UTC	coordinated universal time
v	speed of search object
V	SAR facility ground speed
V	sector pattern
VDSD	visual distress signaling device
VHF	very high frequency
VM	Sector Search Pattern Victor Mike
VMS	Vessel Monitoring System
VOR	Very High Frequency omnidirectional radio range
VS	sector single-unit
VSR	sector single-unit radar
w	search sub-area width
W	sweep width
WAGB	Icebreaker
WC	wind current
WHEC	Coast Guard High-Endurance cutter
WHO	World Health Organization
WLB	225 foot Coast Guard Buoy Tender
WLI and WLIC	65 foot and 100 foot Inland Buoy Tender (WLI) and 75 foot, 100 foot, 160 foot Inland Construction Tender (WLIC)

WLM	175 foot Coast Guard Buoy Tender
WLR	River Tender (65 foot and 75 foot)
WMEC	Coast Guard Medium-Endurance cutter
WMO	World Meteorological Organization
WPB	Coast Guard patrol boat
WTGB	140 foot Ice Breaking Tug
WYTL	65 foot Harbor Tug
WTGB	Tugs
X	initial (distressed craft) position error
XSB	barrier single unit
Y	SAR facility position error
Z	effort

PREFACE & PROGRAM OVERVIEW

1. Mission and Purpose

The mission and purpose of the Coast Guard's Search and Rescue (SAR) Program is to prevent death or injury to individuals and loss or damage to property in the marine environment. The overall success of the Coast Guard's SAR program depends on many separate efforts, including SAR program management (doctrine, policy and procedures), facility management (platforms and units), support management (equipment, systems), training (proficiency), boating safety and marine inspection (prevention), and others. Ultimately, the success of our SAR program is measured by the success of each and every SAR mission that we perform. The focus of this addendum is on the four key processes involved in performance of our SAR missions: (1) distress monitoring and communications; (2) search planning; (3) search coordination; (4) search and rescue operations. The addendum also addresses SAR records and administration, public affairs, SAR liaison and agreements, SAR exercises, and several other aspects of our SAR mission.

2. Risk Management

We do dangerous work in a perilous environment. Our heritage is based in large part on the selfless acts of courageous men and women who use their tools and their judgment under the most demanding conditions to save the lives of others. This tradition continues as we perform duties that often place us in harm's way. With a renewed commitment to careful risk management, we seek to avoid jeopardizing the success of our missions by not unnecessarily endangering the lives of our own crews and the lives of those we go out to save. Successful missions begin with thoroughly understanding the environment in which we operate. Based on that understanding, we develop operational concepts, acquire appropriate equipment, and put our people through rigorous formal training. We build on that foundation by continuous operational training and drills, by improving our personal skills, and by maintaining our equipment at the highest state of readiness. In short, successful performance requires thorough preparation.

Preparation alone, however, is not enough. Success also requires that our people and equipment be used within the limits of their abilities. No small boat or aircraft, no matter how well maintained or skillfully piloted, can be expected to survive, much less perform a rescue, when wind and sea conditions are beyond the limitations of hull, airframe or the humans that operate them. Responsible commanders evaluate the capability of crew and equipment against the conditions likely to be encountered when deciding on the proper course of action. Conscious attention to time-tested and time-honored principles of risk management is a necessity.

Today's Coast Guard standard of response remains true to its legacy. We honor our heritage daily by casting off all lines or lifting off the runway in severe weather to save others' lives, while carefully weighing the risk of losing our own. We honor our heritage as well by attending to the principle that a proper and practiced understanding of duties, a thorough evaluation of the risks involved in an operation, and the exercise of good judgment in carrying out that operation is of paramount importance for success. With this in mind, Coast Guard units will carry out SAR missions only after the operational commander has ensured the unit is properly trained, equipped, maintained and ready for the mission and has assessed crew and equipment capabilities and limitations against the operational scenario and the known and predicted challenges the crew will face. Amplified discussion of SAR risk assessment is contained in Section 1.2.3 of this Addendum.

3. **SAR Functions and Hierarchy**

a. Search. An operation normally coordinated by a rescue coordination center (RCC), rescue sub-center (RSC), or a sector command center, using available and appropriate personnel, facilities and resources to locate individuals or property in distress.

b. Rescue. An operation with the primary purpose of retrieving individuals in distress and delivering them to a place of safety. This may include providing for certain medical care or other critical needs. Rescue operations may also be performed for the purpose of preventing or mitigating property loss or damage. ***However, missions shall not normally be performed for the purpose of salvage or recovery of property when those actions are not essential to the saving of life.*** Beneficial secondary consequences of a rescue operation may be to prevent environmental damage or remove hazards to navigation, but these are not considered part of the rescue operation's objective.

c. The rescue of individuals in distress is the highest priority SAR mission. Missions solely for saving property or for other purposes such as preventing environmental damage will always give way to saving a person's life.

4. **Statutory Authority and Responsibility**

The statutory authority for the U. S. Coast Guard to conduct SAR missions is contained in Title 14, Sections 102, 521, and 701 of the U.S. Code. ***The code states that the Coast Guard shall develop, establish, maintain and operate SAR facilities and may render aid to distressed individuals and protect and save property on and under the high seas and waters subject to the jurisdiction of the United States.*** It also states that the Coast Guard **may** use its resources to assist other Federal and State entities. Thus, Coast Guard performance of SAR is essentially permissive in nature. Search and Rescue activity may be considered a mandated function, but no specific level of performance has been cited under the legislative authority. ***Nevertheless, judicial rulings have made it clear that once the Coast Guard undertakes a particular mission, we must conduct that mission with due diligence, we must not worsen a situation by our actions, and we must meet a reasonable standard of performance.*** Moreover, it is within our service's own ethos to carry out each mission to the best of our ability.

In accordance with the National Search and Rescue Plan, the Coast Guard is responsible for organizing available SAR facilities in Search and Rescue Regions (SRRs) as defined in the National SAR Supplement. These waters generally include all navigable waters subject to the jurisdiction of the United States, but also include international waters stretching far into the Atlantic and Pacific Oceans and the Gulf of Mexico.

5. **SAR Publications**

a. Description. SAR doctrine, policy and procedures for the Coast Guard are provided in three primary publications. These publications provide material that applies to each of three levels (international, national & agency) within our SAR system. Each publication both complements and supplements the others.

(1) The **National Search and Rescue Plan** is a federal executive level inter-agency document that describes how the United States will meet its international legal and humanitarian obligations to provide SAR services. It establishes over-arching federal SAR policy, assigns SAR responsibilities to various federal agencies, and adopts the International Aeronautical Search and Rescue Manual and the National SAR Supplement for use by U. S. SAR agencies.

(2) The **International Aeronautical and Maritime Search and Rescue (IAMSAR) Manua**l, in three volumes, provides doctrine applicable on an international level. Volumes I and II of the manual describe the basic structure of the SAR system and address the fundamentals of the four basic processes listed in Section 1 of this preface: SAR communications, planning, coordination and operations. Volume III is designed for use by SAR facilities and by units or individuals in need of SAR services. Not all Coast Guard commands require the full three-volume set. In general, SAR Coordinator (SC) commands will require all three volumes, commands with personnel who may be designated as SAR Mission Coordinators (SMC) should have volumes II and III, and response units may need only volume III.

(3) The **United States National Search and Rescue Supplement (NSS) to the IAMSAR Manual** provides the inter-agency doctrine applicable at the federal level. This Addendum defines the national SAR system, expands on topics covered by the IAMSAR Manual, and provides specific guidance for coordination and operations unique to the United States.

(4) The **Coast Guard Addendum (CGADD) to the NSS** provides policies, procedures, and standards applicable specifically to the U. S. Coast Guard. The CGADD serves as the standard reference for the entire Coast Guard to use in performance of our SAR missions: (1) distress monitoring and communications; (2) search planning; (3) search coordination; (4) search and rescue operations. Further, it provides a common reference for discussion among Coast Guard SAR professionals and a timely mechanism for recommending and implementing improvements to the SAR system. Just as SAR is not the only mission conducted by our Joint Rescue Coordination Centers (JRCCs), Sectors, air stations and boat stations, the SAR Program functions as part of the larger Coast Guard, and has developed our SAR doctrine as part of both the larger national and international maritime and aeronautical SAR networks. The

CGADD addresses this organizational relationship and focuses on the particulars of search planning and response.

(5) Several additional Coast Guard and other publications provide policy, procedures and guidance that apply to SAR, and serve to enhance the overall professional knowledge of SAR personnel. A list of some of these publications is found in Appendix K.

b. Precedence. Each successive level of primary SAR publications, from the National SAR Plan to the CGADD, provides greater refinement of doctrine, policy and procedure. ***If conflicts arise between guidance or information in the various publications, Coast Guard SAR personnel shall follow the CG Addendum, unless otherwise directed by Commandant (CG-SAR).***

6. **SAR Program Goals, Objectives, Standards and Requirements**:

a. SAR Program Primary Goal. The ultimate **goal** of the Coast Guard's SAR program is to prevent loss of life in every situation where our actions and performance could possibly be brought to bear. Our success in meeting this goal is the result not only of how well the SAR system responds to maritime SAR incidents, but also the efforts of other maritime safety programs, including recreational boating safety and commercial vessel safety. Success reflects how these combined efforts provide mariners with seaworthy craft, proper equipment, necessary knowledge, training, and information to operate safely in the maritime environment, and to take the correct actions when faced with a distress situation.

b. Program Objectives. Four general objectives provide direction for the SAR Program:

(1) Minimize loss of life, injury, and property loss and damage in the maritime environment;
(2) Minimize crew risk during SAR missions;
(3) Optimize use of resources in conducting SAR; and
(4) Maintain a world leadership position in maritime SAR.

c. SAR System Performance Benchmark. From a humanitarian perspective, we would like to prevent all loss of life at sea. We recognize, however, the inherent danger involved in the maritime environment makes this unattainable. The current performance **benchmark** for our maritime safety mission strives to measure the effectiveness of our collective prevention and response efforts. Simply stated it measures the number of "lives saved" versus the number of "lives in distress." "Lives in distress" as used in this measure refers to individuals in peril caused by some extraordinary event (e.g. injury, material failure of the vessel, environmental conditions, etc.). When a life is in distress there are three possible outcomes – the life is saved, the life is lost, or a person remains missing at the conclusion of search efforts. The "lives lost" portion of the measure recognizes that some of those lives will be lost before the Coast Guard is notified or has any chance to affect the outcome. Therefore "lives lost" is further divided into "lives lost before notification" and "lives lost after notification." The individuals missing are not divided into "before" and "after." All are accounted for within the purposes of the primary lives saved performance measurement: "Percent of lives saved from imminent danger in the maritime environment." This primary measure encompasses the effectiveness of the total search and rescue system, response and prevention activities. To calculate this measure we use the equation:

$$= \frac{LS}{\left(LS + \left(LLB + LLA + LUF\right)\right)}$$

Where:
LS = "lives saved"
LLB = "lives lost before notification"
LLA = "lives lost after notification" and
LUF = "lives unaccounted for" (or missing) as defined and input into MISLE.

(1) Our performance benchmark target is based on calculations of historical performance and estimations of attainable levels of success. As future improvements are made in the SAR System we expect these improvements to be reflected in our performance as shown below with planned periodic adjustments to the benchmark.

Lives Saved Performance Target	*Save people in imminent danger on the ocean and other waterways.*					
Performance Measure		FY11	FY12	FY13	FY14	FY15
Percent of people in imminent danger saved in the maritime environment.	Program Target	*77%*	*77%*	*77%*	*77%*	*77%*
	FYHSP Target	*100%*	*100%*	*100%*	*100%*	*100%*

(2) A specific benchmark has been established to measure a subset of the overall Coast Guard Maritime Safety of Lives. This sub-measure encompasses primarily the response activities of the service's maritime safety team. This indicates how well we are performing within the constraints of our current resources. After Coast Guard notification, in waters over which the Coast Guard has SAR responsibility save a targeted percentage of those people whose lives are in distress each year as detailed in the following table. As improvements are made in the SAR System, we expect these improvements to be reflected in our response performance as shown below with planned periodic adjustments to the benchmark.

Lives Saved Performance Target	*Save people in imminent danger on the ocean and other waterways.*					
Performance Measure		FY11	FY12	FY13	FY14	FY15
All mariners in distress saved after CG has been notified	Program Target	*84%*	*84%*	*84%*	*85%*	*85%*
	FYHSP Target	*100%*	*100%*	*100%*	*100%*	*100%*

To calculate this measure we use the equation:

$$= \frac{LS}{LS + LLA + LUF}$$

Where:
LS = “lives saved”
LLA = “lives lost after notification” and
LUF = “lives unaccounted for” as defined and input into MISLE.

NOTE: These benchmarks were established based on a macro analysis of expected survival times of people in the water and based on an excellent standard of response by existing rescue resources under the current SAR system. It is recognized that regional variances (cold water versus warm, resource-rich port area versus remote locations) will impact the success rate in specific regions.

(3) A specific benchmark has been established to measure a secondary measure of the SAR Systems performance in service to property in danger in the maritime environment. That benchmark is to save a targeted percentage of property in distress each year. As improvements are made in the SAR System, we expect these improvements to be reflected in our response performance with planned periodic adjustments to the benchmark. The benchmark baseline was set using fiscal years 2009 and 2010 data.

Property Saved Performance Target	*Save property in danger of loss on the ocean and other waterways.*					
Performance Measure		FY11	FY12	FY13	FY14	FY15
Percent of property "in danger of loss" saved.	Program Target	*70%*	*70%*	*71%*	*71%*	*71%*
	FYHSP Target	*70%*	*70%*	*71%*	*71%*	*71%*

To calculate this measure we use the equation:

$$= \frac{PS}{PS + PL + PUF}$$

Where:
PS = "property saved"
PL = "property lost" and
PUF = "property unaccounted for" as defined and input into MISLE.

c. Data Exclusions from SAR System Performance Benchmark Measurement. The SAR System Benchmarks are primarily in place to measure long term trends in SAR system performance. To avoid undue influence on the measures by a small number of events involving large numbers of lives, the data associated with these events is excluded from calculation of the measure(s). Although not included in measure calculations, they are footnoted in reports. The thresholds for exclusion are:

(1) **Lives** – 11 or more lives at risk (lives saved, lost and/or unaccounted for) in a single incident.
(2) **Property** – value in excess of $2M, lost in a single incident.

d. General SAR Program Standards and Requirements. Certain standards and requirements have been developed for various components of the Coast Guard's SAR system.

(1) SAR Readiness. The SAR unit response standard is geared toward quick response craft at boat and air stations. Readiness requirements for individual units are assigned by the District Commander in accordance with the general responsibilities for readiness and response for SAR incidents provided in the Coast Guard Organization Manual, COMDTINST M5400.7 (series), and United States Coast Guard Regulations, 1992, COMDTINST M5000.3 (series). ***To meet the SAR response standard for most Coast Guard unit AORs, Coast Guard units with a SAR readiness responsibility shall maintain a B-0 (have a suitable SAR resource ready to proceed within 30 minutes of notification of a distress) readiness.*** This readiness requirement may be adjusted by District Commanders, and by unit commanders when this authority is delegated, based on resource constraints, crew fatigue limits, environmental considerations or other factors. This response standard is in no way intended to negate or supercede proper risk

management. It is recognized that mechanical malfunction, unusual mission preparations or other factors may make it necessary to deviate from this standard. ***Such deviations shall be reported to the District Commander.*** In certain areas and/or at certain times of the year, the presence of unit coverage overlap may allow a lower readiness than B-0 (greater than 30 minutes).

(2) SAR Mission Response. Based on assigned SAR areas of responsibility (AOR) for Coast Guard Sectors and other Coast Guard units with specified SAR AORs, the siting, basing or staging of search and rescue units (SRU) should provide for no greater than a two-hour total response time for any one surface or air SRU within that Sector or unit's AOR to arrive at any location within the AOR. This time is calculated from time of notification of the Coast Guard until the time of arrival on scene of an SRU, based on moderate environmental conditions which allow for operation of the SRUs at their top cruise speeds, and including 30 minutes of preparation time (i.e. a total of 90 minutes from underway to on scene). This is a SAR system resource-planning standard; it does not create a requirement for SRUs to actually arrive on scene within this time in each and every case, as the particular circumstances of any given mission may make this impossible or contrary to proper risk assessment. It is recognized that this response standard may not be met in the AORs of all Coast Guard units with SAR responsibility, especially in those which include vast areas of open ocean and/or remote areas with little or no SAR demand.

NOTE: Search and Rescue Regions (SRRs) associated with Rescue Coordination Centers (RCCs) are determined by international agreement, and are not strictly based on Coast Guard readiness and response standards. RCCs are nevertheless responsible for directing and coordinating response to SAR incidents, within their SRRs, by dispatching the most suitable assets in the timeliest manner possible. Likewise, the Coast Guard's SAR program is responsible for providing suitable assets in the proper locations to provide SAR capability throughout as much of our SRRs as possible.

(3) National Distress and Response System (NDRS) Coverage. NDRS is the primary distress alerting and SAR command, control and communications (C3) system for U.S. coastal waters (Sea Area A-1, which extends from the territorial baseline out to 20 nautical miles). The standard for the VHF-FM network is a minimum 90% continuous coverage for reception of a one-watt signal of a one-meter antenna, out to 20 nautical miles from shore around the coastline of the continental U.S., the Great Lakes, main Hawaiian Islands, the Commonwealths of Guam, Puerto Rico, the U.S. Virgin Islands and portions of Alaska.

(4) Basic SAR Training. Successful completion of resident SAR planner training at the National SAR School is required for all Area & District (Joint Rescue Coordination Center), and Sector Command Center watchstanders and staff who may be designated as SMC or perform SMC functions. Area/District (drm) and other SAR staff personnel should also attend the resident course on a lower priority basis. An additional goal is to complete training in the Incident Command System (ICS) for all SAR planning personnel and SAR staffs.

(5) SAR Command and Control Responsiveness. ***SMCs shall process and evaluate information about a SAR incident, determine appropriate initial action, and initiate action within five minutes of a distress incident notification. Units other than that of the SMC receiving SAR incident information shall relay information to the SMC immediately.***

(6) Employment of Approved Search Planning Methodologies. ***Coast Guard SAR Watchstanders shall use an approved search-planning tool for all incidents that require search planning and fully document search planning efforts.*** Approved tools include the Search and Rescue Optimal Planning System (SAROPS) and the manual solution work sheets with manual plotting. (See Section 3.2)

(7) Amver System. ***SMCs shall use Amver to identify SAR facilities for all cases involving maritime and aeronautical incidents offshore when such facilities might be useful for mission accomplishment. SAR Coordinators (SC), SMCs, and others within the Coast Guard SAR System shall seek to increase ship participation in this voluntary ship reporting system for SAR and promote the use of Amver information for SAR purposes by other RCCs.***

(8) SAR Unit Training and Professionalism. ***The search and rescue unit (SRU) crew shall be able to correctly operate all equipment provided on their vessels, aircraft or land vehicles to aid a person or property in distress. Specialized and recurrent training shall be provided to personnel designated by the unit as Rescue Swimmers, Emergency Medical Technicians (EMTs), or First Responders. All personnel assigned these specialized rescue duties shall demonstrate a high level of professionalism and competency as documented by completion of appropriate PQS, practical factors, and by their performance.***

7. SAR Program Focus

The Coast Guard Headquarters Office of Search and Rescue, Commandant (CG-SAR) performs the functions of the SAR Program Manager. The SAR Program's overall purpose is to provide the resources and policy that facilitate Coast Guard field units in achieving optimal effectiveness in saving lives and property in distress or at risk of injury or damage. The program addresses known and latent deficiencies in the SAR system and strives for continuous improvement in Coast Guard SAR response capabilities through policy-making and budget actions. SAR Program efforts are focused in five key areas:

a. SAR Policy. Adoption and development of IAMSAR Manual, National SAR Plan, National SAR Supplement, CG Addendum to the National SAR Supplement.

b. SAR Professionalism. Update of SAR School curriculum (including CBT courses); renewed emphasis on SAR planning skills for JRCC, Rescue Sub-Center (RSC) and Sector

Command Center planners; development of SAR PQS, SAR Standardization (Command Center Stan Team).

c. SAR Capabilities. Development and acquisition of computer-assisted SAR planning and case management tools (SAROPS, MISLE (response module, SAR data entry, MMSI)) and other operational equipment (self-locating datum marker buoys, Personal Locator Beacons (PLBs) for SAR crews, new SAR signaling and detection devices, etc.).

d. SAR Communications. SAR related communications procedures; communications systems improvements (National Distress and Response System Modernization Project (NDRSMP)/Rescue 21, and Global Maritime Distress and Safety System (GMDSS)).

e. International SAR System. Cooperation in doctrine, standards, organization, coordination, and R&D.

8. SAR System Infrastructure

The Coast Guard's SAR System infrastructure is composed of a network of Headquarters, Area, District and field commands:

a. Headquarters. Offices with key SAR program, resource and support responsibilities include: Office of SAR Policy (Commandant (CG-SAR)), Office of Shore Forces (Commandant (CG-741)) (serves as program manager for all CG command centers), Office of Boat Forces (Commandant (CG-731)), Office of Aviation Forces (Commandant (CG-711)), Office of Auxiliary and Boating Safety (Commandant (CG-BSX)), Office of C4 and Sensor Capabilities (Commandant (CG-761)); Office of Environmental Response Policy (Commandant (CG-MER)), and Office of Communications Systems (Commandant (CG-62)).

b. Area and District staffs. Include senior officers and key staff assigned specifically to oversee operational and programmatic SAR matters (Atlantic Area (Arm), Pacific Area (Prm) and District (drm)). The functions of SAR Coordinator (SC) are carried out at this organizational level. Depending on the nature, complexity, duration, geography, and resource requirements of a particular SAR case, SMC functions are sometimes carried out at this level in the Area or District's multi-mission Command Center, which is also and serves as an internationally recognized JRCC.

c. Sectors. Are multi-mission commands that are responsible for the full range of Coast Guard missions and operate a command center for that purpose. SMC functions are typically carried out at the Sector level for most SAR cases.

d. Air Stations and Boat Stations. Are units that perform specific assigned SAR missions as well as many other Coast Guard missions (LE, MEP, ATON, RBS, etc.). Over 1900 vessels (ships & boats) and over 200 aircraft (fixed wing and rotary wing) provide ready response around the nation.

e. An extensive communications network. For distress alerting and response coordination, consisting of the National Distress and Response System (NDRS) VHF-FM sites and MF/HF sites serving SAR communications needs. The sites are operated by a combination of Sector communications centers and Coast Guard Communications Command (COMCOM) (formerly Communications Area Master Stations (CAMS)), depending on the frequency band, location and other communications infrastructure considerations.

9. Terms within the Addendum

The following terms found in the Addendum are discussed in terms of policy and doctrine in the Notes To Readers. They are provided here for easy reference. They have these intended meanings:

a. **"Shall"** and **"Must"** (also **"Shall Not"** & **"Must Not"**) are used to show an action, procedure or application that is mandatory.

b. **"Should"** is used to show an action, procedure or application that is recommended and expected as the normal course of action, and is deemed mandatory **unless justifiable reason** exist for not complying.

c. **"May"** and **"Can"** are permissive and used to show when an action, procedure or application is optional.

d. **"Will"** is used only to indicate futurity, never to indicate any degree of requirement for action, procedure or application. It should not be used in the place of **"Shall."**

10. Applicability and Obligation

The policies and procedures in this Addendum apply to U. S. Coast Guard facilities within the U.S., territories, and possessions, and to U. S. Coast Guard SAR operations worldwide. This directive promulgates internal Coast Guard planning guidance solely intended to promote efficiency and consistency in public service above and beyond the requirements of law and regulation. Any obligations discussed, flow only to the Coast Guard. Coast Guard personnel are expected to exercise broad discretion and to exercise sound judgment in performing the functions discussed. The Coast Guard retains the discretion to deviate from or change this guidance without notice. This document is intended to provide policy for Coast Guard personnel and is not intended to nor does it impose legally-binding requirements on any party outside the Coast Guard.

This addendum represents internal policy guidance to Coast Guard units and is not intended to create any right or cause of action on behalf of the public.

CHAPTER 1
SEARCH AND RESCUE SYSTEM

Section 1.1
Search and Rescue (SAR) Organization

The National SAR Plan (Appendix A of reference (a)), designates the Coast Guard as the aeronautical and maritime SAR Coordinator for the waters over which the United States has jurisdiction, such as navigable waters of the United States and land areas other than the Continental United States and Alaska (e.g. State of Hawaii). Reference (a) provides a chart showing the geographic areas of SAR responsibility and discussion on both international and domestic arrangements made to implement the United States SAR system.

1.1.1 Rescue Coordination Center

Rescue Coordination Center (RCC) is internationally recognized as the designation of a facility with the responsibility to promote efficient organization of SAR services and to coordinate the conduct of SAR operations within a search and rescue region (SRR). For the Coast Guard, this is one of the primary functions performed at the Area and District level command centers and includes all aeronautical and maritime incidents within its maritime SRR; the Coast Guard operates Joint Rescue Coordination Centers (JRCC) because of both aeronautical and maritime SAR responsibilities. Atlantic and Pacific Areas remain SAR Coordinators (SC) for the Atlantic/Pacific Ocean U.S. Aeronautical and Maritime SRRs respectively, but have no primary SRR responsibility. For internal purposes and ease of administration, the Coast Guard divides the U.S. SRRs into areas of responsibility, with each District maintaining primary responsibility in their assigned SRR.

Table 1-1 USCG SAR Coordinators, RCCs and Locations

SAR Coordinator Command / JRCCs	***Location***
Atlantic Area	Norfolk, Virginia
First District	Boston, Massachusetts
Fifth District	Norfolk, Virginia
Seventh District	Miami, Florida
Eighth District	New Orleans, Louisiana
Ninth District	Cleveland, Ohio
Pacific Area	Alameda, California
Eleventh District	Alameda, California
Thirteenth District	Seattle, Washington
Fourteenth District	Honolulu, Hawaii
Seventeenth District	Juneau, Alaska

1.1.2 Rescue Sub-Center

Rescue Sub-Center (RSC) is internationally recognized as the designation of a facility established where the RCC cannot exercise direct and effective control over SAR facilities in remote areas, or where local facilities can be directed only through local authorities. There are two RSCs in the Coast Guard; Sector San Juan within Seventh District (RSC San Juan under RCC Miami) and Sector Guam within Fourteenth District (RSC Guam under RCC Honolulu).

1.1.3 Sector Command Center

The Command Center at the Sector level is an internal Coast Guard designation. Sector Command Centers are subordinate to the RCCs. Sector Command Centers, while performing many of the SAR duties, are not designated as RCCs or RSCs. The Sector Command Center is responsible for SAR mission coordination and tactical control of search and rescue units (SRUs) in its AOR, which is within the SRR of the RCC.

1.1.4 Incident Command System and SAR

1.1.4.1 **Background.** SAR efforts primarily focus on finding and assisting persons in actual or apparent distress and are carried out within a well-defined SAR response system per references (a) and (b) and this Addendum. These references have their basis in international law and have practical benefits that are intended to maximize the effectiveness of SAR operations, particularly when working with other military services, SAR authorities of other nations, and with ships or aircraft at sea. U.S. SAR service providers are obligated to follow these laws.

When an emergency warrants responses in addition to SAR, the National Interagency Incident Management System (NIIMS) Incident Command System (ICS) organizational structure should be used to manage the overall response. Examples of other activities that are not SAR, but are often closely associated with a large SAR incident, include:

(a) search and recovery,

(b) salvage,

(c) investigation,

(d) fire fighting, and

(e) pollution response.

See reference (c) for a detailed description of the ICS organizational structure that will provide supervision and control of essential functions during a major SAR incident that includes, or will include, other non-SAR activities.

1.1.4.2 **ICS and SAR System Interface.** For large incidents that actually or potentially involve both SAR and non-SAR activities, the SAR Mission Coordinator (SMC), who is designated by the SAR response system, will initiate action and coordinate the overall SAR aspect of the response in accordance with references (a), (b), and this Addendum.

If a Coast Guard Incident Commander (IC) is designated, the SMC function will be placed under the umbrella of the ICS organizational structure, typically as the SAR Branch Director or SAR Sector Supervisor in the Operations Section. Simply put, the SAR response system "plugs into" the ICS organizational structure, where the SMC (or someone designated by the SMC to carry out this function) serves as the "plug" or link. ***In essence, SAR personnel shall continue to use standard SAR terminology and procedures regardless of the scope of the SAR incident.***

The SAR response may also include an On Scene Coordinator (OSC) and an Aircraft Coordinator (ACO). In some cases the person serving as IC or Operations Section Chief in the ICS structure may also be designated as the SMC, but the terms "Incident Commander" or "Operations Section Chief" are not interchangeable with titles associated with SAR response functions.

1.1.4.3 Closing/suspending a SAR case in an ICS structure. Only agencies designated as U.S. SAR Coordinators (i.e. the USCG for maritime regions) have the authority to suspend a SAR case. For example, the NTSB does not have the authority to suspend a maritime SAR case even though they may fill the IC role. Per reference (b), the IC may continue the SAR mission beyond the time when a SAR case would normally be suspended due to humanitarian considerations, large number of people involved, or forecast of greatly improved search conditions.

However, SRUs should not be placed at risk when potential for saving life is minimal, or when their use may preclude their availability for other missions. For the majority of incidents, the SAR response will be completed or suspended by the time the ICS structure is fully in place.

1.1.4.4 Transition from SAR to Other Missions. As the SAR mission winds down and other missions take precedence (i.e. search and recovery), the SMC may be designated to serve as a Branch Director or Section Supervisor in the Operations Section to manage on scene operations other than SAR. Likewise, Search and Rescue Units (SRUs) may also be reassigned to other sectors in the ICS structure once the SAR mission is concluded.

Coast Guard personnel with SAR responsibilities should receive required ICS training to enable them carry out their respective duties. See reference (d) for minimum Coast Guard ICS training requirements.

Section 1.2
SAR Coordination

SAR coordination is discussed in the National Search and Rescue Plan contained in reference (a). Coordinating SAR response to any distress situation will be achieved through cooperation among SAR authorities willing and able to assist. To achieve this, the Coast Guard may enter into international, domestic and local SAR agreements as discussed in Section 1.6

Any facility within a SAR organization should respond to distress situations whenever and wherever it is capable of doing so. SRRs are established to help ensure response to persons in distress will be coordinated, and should in no way be viewed as justification for an RCC not assisting persons in distress outside its own SRR. Cooperation among Coast Guard RCCs and with SAR authorities of other countries should be as close as practicable, and arrangements to request or grant a request for assistance should normally be handled at the RCC level as expeditiously as possible. The general principle that applies is that the facilities that are in the best position to respond should be tasked. On an operational level, SAR response includes: investigation, coordination, and dissemination of information.

It is crucial that all levels of the SAR organization keep each other informed, both up and down the chain of command. This Addendum discusses required documentation but the SAR planner needs to anticipate when additional awareness of an incident may be required (e.g., expansion of case complexity or public interest). Prior sharing of information in such situations will decrease the chance that superiors might be caught uninformed and that SRUs might be unable to respond.

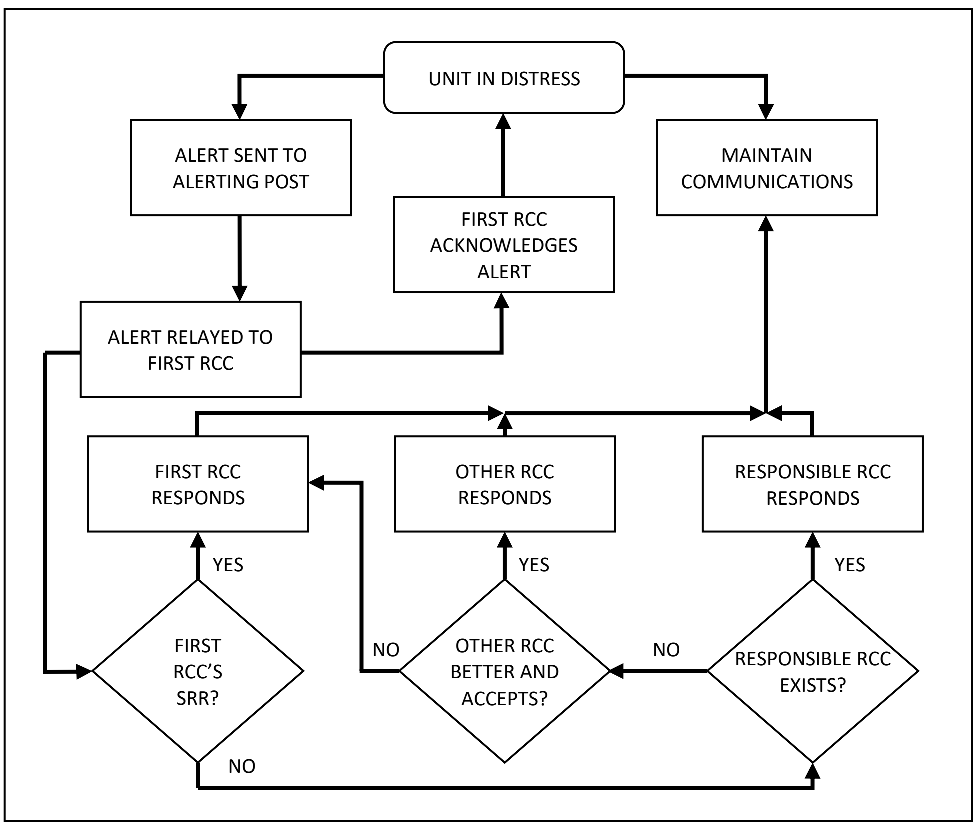


Figure 1-1 Determination of RCC to Respond

1.2.1 First RCC

Reference (a) outlines actions required by the "First RCC." The RCC affiliated with the unit which first acknowledges a distress alert is designated the First RCC and should assume responsibility for all subsequent coordination of SAR measures unless and until that responsibility is accepted by another RCC better suited to respond. Figure 1-1 summarizes the guidelines for the First RCC.

NOTE: First RCC retains responsibility until it is accepted by another RCC, and maintains communications with the unit in distress until the other RCC can do so.

1.2.2 SAR Mission Coordinator (SMC)

An SMC shall be designated for every SAR case to successfully manage each mission and to skillfully coordinate resources, in accordance with references (a) and (b).

1.2.2.1 SAR missions are normally coordinated at the lowest practicable level within an SRR for both efficiency and practicality reasons, but SMC responsibilities shall not be delegated below the Sector level.

1.2.2.2 The SMC within the Coast Guard operates within the SAR chain of command as the person assigned to carry out all aspects of planning, coordinating and managing the response to a SAR incident. The SMC must be assigned at the appropriate level within the SAR organization, so as to provide effective SAR incident oversight and supervision, as well as ensuring proper SAR mission execution. The SMC is required to have the requisite experience, knowledge, and skills to fully direct the command center in its efforts, ensure the appropriate response to each SAR incident, and evaluate the effectiveness of their actions. SMC carries out the functions with the support of the Command Center SAR watchstanders. As such, the command center is accountable for executing key elements of the initial response, providing accurate and timely products, and information that supports decision processes in SAR mission execution.

(a) At the District level, the SMC is the direct representative of the SAR Coordinator (SC). At the Sector level, the SMC is the direct representative of SC through the Sector Commander.

(b) Considerable authority is delegated to SMCs to ensure that lifesaving actions can be carried out in a timely and effective manner. The SMC should be able to employ or launch any asset assigned to the mission (tactical control) and request additional support as needed.

(c) Although the SMC is assigned on a mission-by-mission basis, commands should pre-designate a person to assume SMC at the initial report of a SAR incident, consistent with Section 1.2.2.6 and Table 1-2.

(d) ***SMC shall not be a member of the Command Center watch that is planning and executing a particular mission.*** This provides increased objective oversight and augments the technical SAR planning expertise of the command center with an additional layer of operational expertise.

(e) Some SMC tasks (i.e., SITREPs, MISLE data entries, initial response authority, etc.) may be delegated to Sector units when they carry out single unit cases that do not require search-planning efforts. In these cases, the SMC at the Sector remains responsible for ensuring those functions are properly carried out. ***Once SAR response efforts exceed the initial response, the Sector shall assume all SMC tasks.***

(f) Figures 1-2 and 1-3 depict the typical SAR chain of command for SMC at the District and Sector level respectively.

(1) The figures depict the lowest level in the command that SMC may be assigned. SMC may be assigned to an individual at any level above that point in the chain of command, provided that the requirements are met as outlined in 1.2.2.3 and 1.3.

(2) The particulars of each SAR incident and established policies determine the degree of involvement (e.g. briefings, concurrence/approval of actions, etc.) up the SAR chain of command from the SMC.

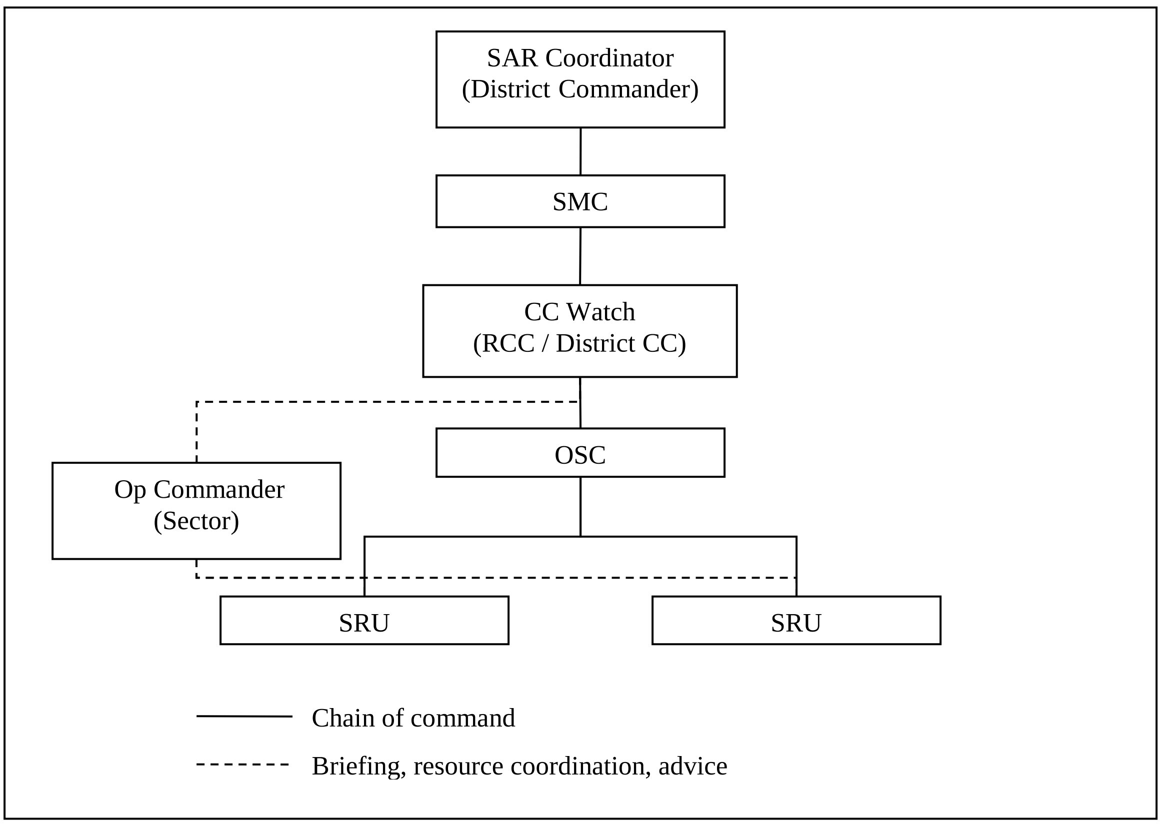


Figure 1-2 SAR Chain of Command for SMC at the District Level

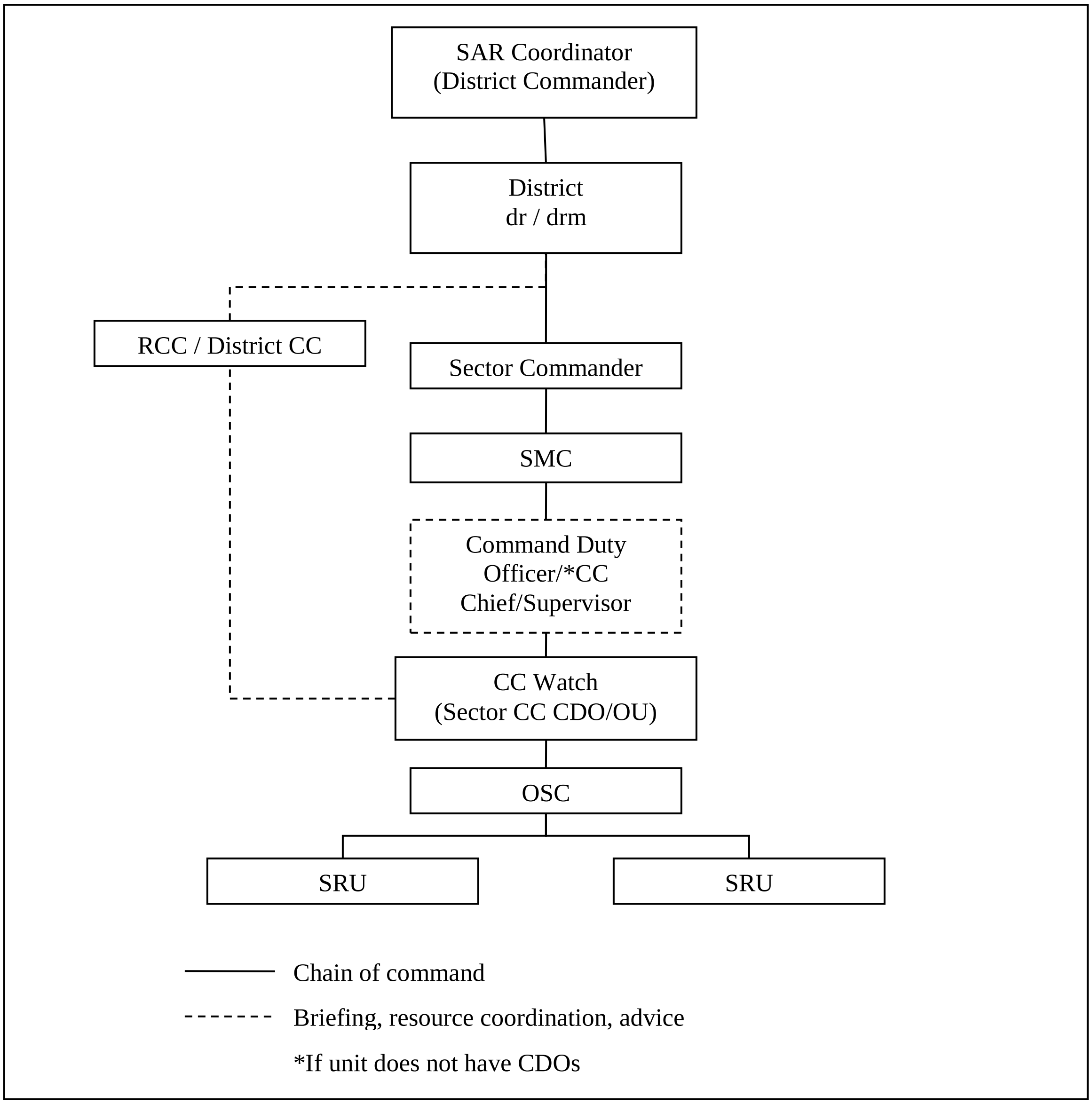


Figure 1-3 SAR Chain of Command with SMC at the Sector Level

1.2.2.3 SMC Designation

(a) Designation as an SMC is based on training and experience, rather than merely by position assigned within the chain-of-command. ***SMCs shall meet the training and knowledge requirements outlined in 1.3. Any person who has not completed the requisite training shall not be SMC.***

(b) SMC is a designation from the SC or Sector Commander to a qualified individual. ***The designation of each SMC within the District or Sector remains in effect unless specifically cancelled or superseded.***

(c) ***SMC designation shall occur in writing with a Letter of SMC Designation, and those letters shall remain on file at the District Command Center for District SMCs and the Sector Command Center for Sector SMCs.***

(d) SMC designation authority rests with the SC, who may delegate this authority to Area/District Chiefs of Response for Area/District personnel and Sector Commanders for Sector personnel.

(e) Within the District and Sector construct, the following individuals should be designated SMC, to ensure personnel with the proper training and experience are assigned at all levels within the chain-of-command.

(1) District Chief of Response;

(2) District Chief of Incident Management;

(3) Sector Commander;

(4) Deputy Sector Commander; and

(5) Sector Chief of Response.

(f) SMC designation of Area/District and Sector personnel other than those listed above is authorized to accommodate periods of absence, to manage mission fatigue, and to strengthen selected designees' SAR knowledge and experience.

(1) ***The individual's Letter of SMC Designation shall be routed thru the SC for concurrence, and shall include supporting documentation of completion of professional requirements in accordance with Table 1-3.***

(2) Allowing these individuals to serve as SMC will provide the opportunity to develop future Response and Incident Management candidates. This will also limit overall risk exposure to the organization while ensuring that the majority of the time the SMC team has the best blend of technical competence, operational experience, and sound objective judgment.

(3) In order to maintain proficiency, all personnel designated SMC should serve as SMC on a regular basis.

(g) ***SC and Sector Commanders shall consider the professional experience of the individual.*** Consideration for SMC should be given to only those individuals who have been a Command Center Command Duty Officer, Command Center Chief, Incident Management Division Chief, or served as an Air Station Commanding Officer or Executive Officer, Sector Commander or Deputy Commander, or Chief, Response Department/ Group Operations Officer.

(h) Individuals not having previously filled those positions should complete at least six months in their current assignment prior to receiving designation as SMC.

(i) This SMC designation policy does not preclude units from including individuals without a specific SMC designation in the SAR briefing process. Involvement of those individuals can promote training and professional development, and can provide additional resources to the SMC.

(j) SMC designees shall have their competency entered into Direct Access.

1.2.2.4 SMC Duties. The duties, responsibilities, and relationships (to the rest of the SAR Response System) of the SMC are described in references (a), (b) and (e). If the situation gets beyond the capability of the current level of SMC, there should be no hesitation to shift the case up to the next level. When deciding whether a specific person is appropriate to act as SMC, consider the following about both the individual and command capabilities:

(a) The nature and complexity of the case. Factors that contribute to complexity include:

(1) Number of participating SAR facilities and their parent organizations (e.g. DOD, other nation, etc.);

(2) Number and complexity of probable scenarios;

(3) Numbers and types of search objects;

(4) Number of possible persons to be assisted/saved;

(5) Level of media interest;

(6) Other coincidental missions involved (i.e. pollution, mass rescue, law enforcement, etc.); and

(7) Pre-existing plans, MOUs, and relationships.

(b) Other factors to consider include:

(1) The adequacy of the unit's command, control, and communications capability in terms of equipment, personnel, training and experience,

(2) The unit's geographic proximity to the incident. Per reference (a), if a SAR mission crosses areas of responsibility (AORs) or SRRs, the RCC within whose region the last position report was received assumes overall responsibility. If the last report received was at the boundary of two regions, or if no position report was received, the RCC of the region the craft was entering usually assumes responsibility.

(c) ***Amver accessibility shall reside at the District/Area level and will not be delegated to the Sector level.*** This does not preclude a Sector from requesting their District Command Center run an Amver SURPIC for a case where the Sector is SMC. However, Amver is most useful for offshore cases, usually outside Sector AORs. Typically, SMC for these types of cases resides at the District/Area level.

1.2.2.5 Initiating Responsibility. Responsibility for initiating a response to distress incidents and requests for assistance rests with the coordinator of the region or sector in whose area the incident occurs. ***When boundary or location ambiguities exist, the unit receiving initial notification shall assume SMC and take immediate action to provide a response. SMC of a distress incident shall be retained until the incident is terminated or until proper relief is effected.***

1.2.2.6 Coast Guard SMC Assumption. The Coast Guard should normally assume SMC according to Table 1-2, which is based on AORs. These SMC designations are the lowest levels normally assigned. SAR Coordinators may use discretion in SMC assignments where non-complex cases straddle sector (or district) boundaries and the mission may be effectively coordinated by one of the involved sectors (or involved districts).

(a) Incidents that require the SMC to be at the District RCC level or above are:

(1) Initial action for cases involving ELT and EPIRB, HF-DSC, and Inmarsat alerts; to ensure that cases are managed effectively throughout the Coast Guard. When the actual situation of the alerting vessel is determined, the SMC can be shifted down to

the sector level to coordinate the response.

(2) Cases outside the U.S. SRR where a Coast Guard RCC is carrying out the duties of "first RCC", where assistance is requested by an international RCC outside the U.S., or where U.S. citizens appear to be in distress outside U.S. SRR and involvement of a U.S. RCC is appropriate.

(b) ***Cases during which search planning by a Sector extends beyond 36 hours shall be evaluated by the District to determine the unit's ability to continue planning and coordinating the search effort.*** This required evaluation is just a review, not a signal for the District to automatically take SMC; in fact, keeping SMC at the Sector in many cases will be advantageous.

(c) The required review does not preclude shifting SMC up to the District level prior to the 36-hour mark.

(d) ***Decisions to shift or not shift the SMC in all cases shall be documented in the MISLE case file.***

(e) These guidelines do not preclude Districts from establishing their own policies for subordinate units regarding additional factors that contribute to case complexity and when SMC will be shifted to the District.

Table 1-2 Standard SAR Mission Coordinator Assignment

Incident Location	*SAR Mission Coordinator Assigned Within*
Single Sector AOR	Sector
Multi-Sector AOR's	District
Search and Rescue Sub-Region (SRS)	Sector; San Juan and Guam only
Single District Search and Rescue Region (SRR) outside Sector AOR	District
Multi-District SRR's	Area (Or as outlined in Area SAR Plan)
Other Nation SRR's	Other Nation RCC or U.S. RCC by international agreement

1.2.2.7 Delegating SMC. Districts will exercise great care in delegating SMC to subordinate Sectors whenever comprehensive SAR planning is involved or special coordination problems are anticipated, such as multi-service or multi-sector operations.

1.2.2.8 Reassuming SMC. ***Having delegated SMC, RCCs shall always be ready to assume SMC responsibility from subordinate Commands when they request relief from cases that exceed their capabilities or it becomes evident that relief would be appropriate.***

1.2.2.9 Transferring SMC. There will be occasions when it is appropriate to transfer SMC to another RCC either inside or outside the Coast Guard (national or international). A transfer may be appropriate when the other RCC is in a better position to handle the case.

1.2.3 Mission Briefings and Risk Assessment

Experience has taught us that doing everything right is no guarantee that a mission will not end in a mishap. But, we do know that not doing the right things right dramatically increases the risk of death or injury to the people we serve and to ourselves. The following pages provide an overview for Operational Risk Management (ORM). There are various models and checklists that can be used (for examples, see Appendix E), but all of them have these factors in common: defining the task, identifying the hazards, identifying options, evaluating risk versus gain, and executing the decision. ***Regardless of the model or checklist a unit uses to evaluate operational risk, documentation of the completed risk assessment shall be included in the case file.***

1.2.3.1 SMC Risk Assessments and Briefings. ***SAR Mission Coordinators (SMCs) shall ensure risk assessments are conducted, communicated and documented at all levels of the SAR response and conduct briefings prior to launching or diverting resources for a particular SAR mission. SAR personnel shall be given all relevant details of the distress and all instructions for the SAR operation. This briefing shall, at a minimum, discuss the mission objective and all foreseeable hazards that might be encountered by the responding units.***

(a) Known risks may include, but are not limited to:

(1) heavy weather;

(2) poor visibility;

(3) hazardous bar conditions;

(4) critical navigation segments of the transit;

(5) placing Coast Guard personnel on disabled vessels; and

(6) presence or possibility of communicable diseases among mariners being rescued.

(b) ***SMCs shall ensure that all assets tasked understand the mission and the known risks, and have an appropriate SAR action plan. SMCs shall continually assess the situation as the mission proceeds, and consciously and continually weigh the associated risks against the desired gain. SMCs shall be responsive to safety or capability concerns raised by cutter CO/OICs, aircraft commanders, and coxswains, and modify the SAR action plan as appropriate.***

(c) Appendix E includes various models recommended for use to assist in determining risk. Direction for conducting risk assessment within the command center for missions is provided in reference (f). ***For cases involving a large number of SAR assets, and/or when direct communication between the SMC and each unit is not feasible, the SAR Action Plan shall address foreseeable hazards and known risks associated with a particular mission.***

(d) Even when not SMC for a particular case, the operational staff at Stations and Sectors retain their inherent responsibility for oversight of the SAR units (SRUs) assigned to them. The senior operational staff members at these units play a crucial role in risk assessment and risk management. ***Any tasking of SRUs that raises a safety or capability concern on the part of the parent unit shall immediately be brought to the attention of the SMC.***

1.2.3.2 Crew Briefings. ***A mission briefing shall be conducted among the crew of all SRUs prior to launching on a particular SAR case.*** Chapter 4 of reference (g) outlines specific coxswain requirements for risk management, crew briefings and crew debriefs as part of standard boat operations. Aircraft commanders are responsible for all phases of flight, and are tasked with ensuring that all crewmembers and passengers are properly briefed on all aspects of the mission. Coast Guard Flight Manuals for rotary wing aircraft require crew briefings prior to hoisting operations, and mandate a discussion of, among other things, the assignment of crew duties, a discussion of rescue methods to be used, and specific emergency procedures to be followed.

1.2.3.3 Training Sources. Specific Team Coordination Training requirements for active duty, civilian, reserve, and auxiliary members are outlined in reference (h), Team Coordination Training. Chapter 4 of reference (g), and the course book "Team Coordination Training Student Guide" (available from the Coast Guard Institute), are two excellent sources for Coast Guard specific training on Risk Management and Team Coordination.

All units conducting SAR operations will review these two documents and incorporate them within the unit's training plan. Reference (i) and associated job aids (available from Commandant (CG-1134), Afloat Safety Division website) should also be used to integrate Operational Risk Management (ORM) into daily SAR activities and processes.

1.2.4 Adverse Weather

1.2.4.1 As adverse weather is such an important, and relatively common, risk factor to be considered by the SMC and SRUs in the execution of a SAR case, the following definitions are extracted from the Boat Crew Seamanship Manual with the purpose of enhancing proper risk assessment:

1.2.4.2 Heavy Weather is defined as seas, swell, and wind conditions combining to exceed 8 feet or winds exceeding 30 knots. If heavy weather is forecasted, it should be considered when planning a mission. Reliable and up to the minute information is critical for planning. There are many sources of information available to the coxswains, heavy weather coxswains, surfmen, and commands of Stations. Ensuring that the information is found and used is the responsibility of everyone involved in the mission.

1.2.4.3 Rough bar/surf is determined to exist when:

(a) breaking seas exceed 8 feet;

(b) in the judgment of the Commanding Officer/Officer in Charge, rough bar/surf conditions exist; and/or

(c) in the judgment of the coxswain, there is doubt as to the present conditions.

1.2.4.4 ***When rough bar/surf conditions exist, a surfman shall be assigned as coxswain and all members of the boat crew shall wear all personal protective equipment unless waived by the Commanding Officer/Officer in Charge.***

(a) <u>Rough bar</u> – A rough bar is a river entrance or inlet where heavy seas or surf conditions exist. In situations when the coxswain or the CO/OIC is unsure, a rough bar is assumed.

(b) <u>Surf</u> – Surf is defined as the waves or swell of the sea breaking on the shore or a reef.

1.2.5 Health Risks

Rescue personnel frequently encounter persons who are injured or ill in the course of rescue work. ***Personnel must be aware of high threat and/or prevalent diseases in their operating region and in the area of origin of possible victims.*** Recognition of the symptoms of such diseases, over and above possible injuries from the SAR incident, and use of proper personal safety procedures are critical. ***In addition, personnel must gain awareness of a person's medical and physical condition and how that may impact the ability of rescue personnel to effectively recover that person.***

1.2.5.1 General Health and Physical Condition. ***SMCs, OSCs and on scene rescue personnel shall seek information from potential rescue subjects on the general state of their health and physical condition prior to conducting hoisting or recovery to rescue vessels.***

(a) During MEDEVACs health and physical condition are primary focuses in the information gathering that is necessary for the response. ***SMCs and on scene personnel shall ensure this information is shared with others involved in the response as needed to aid in recovery, transport and reception ashore.***

(b) For SAR incidents other than MEDEVACs the health and physical condition of persons should also be of primary concern but may be overshadowed by the emergent events of the incident itself. In many distress situations the SAR response may become focused on performing the actions necessary to mitigate the situation on scene (e.g. sinking vessel, drifting into danger, etc.).

(1) ***When a distress incident is reported, communication with the distressed persons is possible, and time exists to gather information while rescue units are enroute, information on the health and physical condition of each individual subject to the distress shall be sought.***

(2) ***In situations where the rescue units are on scene and information could not be gathered prior to arrival due to either lack of communications or insufficient time, on scene personnel shall make every effort in the process of recovering individuals to ascertain any injuries, health concerns and physical limitations which may impact the recovery process or present a risk for additional injury.***

(c) The above does not preclude rapidly recovering individuals from immediate life threatening situations (e.g. vessel on fire, vessel going under or capsizing, multiple persons in the water without personal floatation devices or other means of flotation assistance, etc.) where delay to ascertain health/physical issues would likely result in additional injury or death.

1.2.5.2 Specific Health Risks

(a) **Blood-Borne Pathogens**. Possible exposure to blood-borne pathogens exists during any SAR case. All SAR personnel should be cognizant of the possible presence of blood-borne pathogens and use sound situational awareness when planning and/or dispatching personnel to the scene of an incident. Appropriate safeguards should be put in place to protect rescue personnel from possible infection.

(b) **Respiratory Diseases**. During SAR incidents, rescuers may encounter persons who have infectious respiratory diseases such as the Severe Acute Respiratory Syndrome (SARS) and other viruses that are of an epidemic or pandemic nature. Rescue personnel should stay informed of current disease threats and keys to recognizing symptoms that may indicate persons they are rescuing may be infected. Appropriate safeguards should be put in place to protect rescue personnel from possible infection.

(c) **Hazardous Medical Devices.** During the recovery of SAR victims, rescuers may find the victim has internal or external medical devices that may prove hazardous during recovery. One such hazard is the increasing use of Automatic Implanted Cardioverter Defibrillator (AICD), more commonly referred to as Internal Defibrillators, for heart patients in lieu of pacemakers. AICDs deliver a significant shock to the patient, strong enough to knock them or anyone in contact with them to the ground, if the subject's heart rate becomes excessively elevated (such as during a rescue case or other traumatic event). This can pose a particular hazard to rescuers as it could momentarily incapacitate them while performing a rescue. During pre-rescue questions where heart ailments are identified by rescue subjects, SAR personnel should further inquire about AICDs and ensure those effecting the rescue on scene are aware of any devices and associated cautions.

Section 1.3
Professional Requirements

Training and experience are crucial to proper SAR response. Training combined with a demonstrated ability to perform the required tasks can lead to certification by the command that the individual is ready, willing, and able to assume SAR watchstanding duties. Command leadership plays a significant role in shaping the watchstanders' attitudes towards SAR. It is expected that Sector Commanders and Station Commanding Officers/Officers in Charge will issue guidelines delineating their expectations regarding such things as notifications, specific interagency interactions and other matters specific to the command's AOR. These guidelines are not intended to replicate requirements published elsewhere, but rather to clarify the command's expectations in instances where that authority is allowed.

For purposes of this instruction, all references to the SAR watchstander are intended to address the Command Duty Officer and Operations Unit watchstanders. Likewise, SAR watchstander qualifications apply to all SAR watchstanders at the Area, District, and Sector levels.

NOTE: ***A newly assigned SAR watchstander shall attend the Maritime Search Planning Course at the earliest practical date.*** While awaiting assignment to the Maritime Search Planning Course, a prospective SAR watchstander should be closely supervised in an on-the-job training status.

1.3.1 Training

Training consists of on-the-job training, structured unit training (to include appropriate written exercises), and formal training. All RCCs, RSCs, and Sectors will implement a formal program to qualify members of the command that are part of the SAR system. Table 1-3 shows the minimum level of SAR knowledge expected for various positions. Table 1-4 shows the formal courses required for SAR watch and chain of command positions.

1.3.1.1 Training Program Elements. Elements of the program will include:

(a) A written form of performance qualification standard (PQS). At a minimum, SAR watchstanders will complete the performance elements found in reference (f), which includes completion of Appendix N of this Addendum. Appendix N addresses SAR specific requirements.

(b) A period of supervised watches; a minimum of 15 for initial qualification.

(c) A qualification board

(1) ***SAR Watchstanders shall pass a qualification board.***

(2) ***The qualification board shall consist of a minimum of three members, including the Chief of Incident Management (District level) or Chief of Response (Sector level), the Command Center Chief/Supervisor, and at least one other qualified watchstander. Of these members, at least one person shall be a designated SMC.***

(d) A certification letter signed by the District Chief of Incident Management for RCC watchstanders, or the Sector Commander for those assigned to Sectors. ***The District Chief of Incident Management / Sector Commander shall conduct a one-on-one interview with each prospective SAR watchstander prior to certification.*** This interview is to aid in affirming the readiness of the individual as well as an opportunity for command SAR philosophy to be passed directly to the new watchstander.

(e) ***The Command Center Chief shall validate that all required annual training has been completed in accordance with Table 1-4 and documented in TMT***.

(f) A recertification letter, signed by the Command Center Chief, if a SAR watchstander lapsed in currency or had certification removed due to poor performance, in accordance with 1.3.3.2.

1.3.2 Qualification/Currency

1.3.2.1 Qualification Procedures. ***Upon completion of training, the prospective SAR watchstander must undergo qualification procedures, a process of demonstrating the capability to perform assigned tasks. SAR watchstanders shall be qualified in SAR incident analysis, search planning, and mission management as described in reference (a).***

1.3.2.2 Interim Qualification. Commands may not designate SAR watchstanders with an Interim Qualification. ***Any person performing SAR watchstanding functions in the command center shall be qualified.*** Persons in training may perform SAR tasks/functions under the direct supervision of a qualified SAR watchstander. ***Commands unable to meet this standard shall seek guidance from their chain of command on how to provide for continuity of operations.***

1.3.2.3 Currency Training Program. ***To maintain currency, commands shall develop a comprehensive annual training program for all watchstanders (including Reservists and Auxiliarists).***

(a) ***The currency training program shall cover all topics in Table 1-3, with knowledge areas marked 'Proficiency' completed annually for recertification. In addition, the program shall include a review of updated policy guidance (including information from Headquarters, SAR School/Command Center Standardization Team (CCST), Areas and Districts).***

(b) ***For qualified SAR watchstanders the program shall include a practical exercise requirement for a minimum of three completed SAROPS drift scenarios per quarter. The exercises shall be briefed to a designated SMC, to include an explanation of decisions made for type of scenario, search objects, and SRUs selected; and a discussion of the resultant survival implications and search effectiveness (probability of success (POS)). The Command Center Chief or Supervisor shall also review the quarterly scenarios following briefings to the designated SMC. Two of the three exercises may be exempted through an actual SAR case that includes search planning efforts utilizing SAROPS.***

(c) ***Completion of this training shall be documented in members' training records (documented in TMT).***

Table 1-3 SAR Knowledge Requirements

Knowledge Area	Column 1 Command Cadre / **ACTSUS**	Column 2 Chief, Response Department / **SMC**	Column 3 Command Center Chief / Supervisor & **SAR Watchstanders**
Area Familiarization	K	K	P
SAROPS and other automated SAR applications [1]	A	K	P
Case claiming/documentation	A	K	P
Chain of command notification/requirements	P	P	P
Datum and search area computations	A	K	P
Firefighting and General Salvage Policies	P	P	P
Hoaxes and Uncorrelated MAYDAY response Policies	P	P	P
Interagency cooperation / protocol / procedures	P	P	P
Major/Minor SAR responses	K	P	P
Maritime SAR Assistance Policy	P	P	P
Message preparation	A	K	P
Resource characteristics (traditional and nontraditional)	K	P	P
Risk Management	P	P	P
Search pattern criteria/selection	K	K	P
Suspension process	P	P	P
Use of QRCs/Job Aids/Checklists	A	K	P

Notes for Table 1-3:

1 SAROPS and other automated SAR applications: The various SAR Tools may not be required or apply at all levels and all commands. Tools include but are not limited to Amver, SAROPS, MISLE, MMSI database, sound manipulation software, and hypothermia/survival software.

Key:

P = Proficiency in performance of functions or tasks within the knowledge area

K = Knowledge of functions or tasks within the knowledge area; able to assist or perform with aid

A = Aware of functions or tasks within the knowledge area and their importance and role in SAR

Table 1-4 SAR Course/Workshop

Course/Workshop	Column 1 Command Cadre / **ACTSUS**	Column 2 Chief, Response Department / **SMC**	Column 3 Command Center Chief / Supervisor & **SAR Watchstanders**
Maritime Search Planning Course		R/M[1]	M
SMC Course	M	M	
SAR Fundamentals (e-SAR) Course	R	R	R
Search Coordination and Execution	R	R	R

Notes for Table 1-4:
1 See 1.3.2.4.(b) for clarification of mandatory and recommended Maritime Search Planning Course attendees in Column 2

Key:
M = Mandatory
R = Recommended

1.3.2.4 Explanation of SAR Knowledge (Table 1-3) and Course Requirements (Table 1-4).

(a) **Command Cadre / ACTSUS authority.** ***Elements of column 1 of SAR Knowledge Requirements (Table 1-3) and the SMC Course shall be completed prior to receiving ACTSUS delegation from the SC.***

(1) ***At the Area/District level, SAR knowledge requirements shall apply to: Area/District Commander, Chief of Staff, Chief of Response, Incident Management Branch Chief, regardless of SAR authority delegation, and any other personnel who are delegated ACTSUS authority by SC***.

(2) ***At the Sector level, SAR knowledge requirements shall apply to the Sector Commander and the Deputy Commander.***

(3) If Command Cadre members attend the Maritime Search Planning Course within one year of assignment to the Command Cadre position, the SMC Course requirement may be waived by SC.

(b) **Sector Chief of Response / SMC.** ***Elements of column 2 of SAR Knowledge Requirements (Table 1-3) and the SMC Course shall be completed prior to receiving SMC designation from the SC / Sector Commander.***

(1) For purposes of this Section (1.3.2.4), SMC applies to any member at the Area / District / Sector levels with an SMC designation.

(2) ***Sector Chiefs of Response and other individuals desiring SMC designation shall be Maritime Search Planning Course graduates.***

(3) The Maritime Search Planning Course is recommended, but not required, for Sector Commanders and Deputy Sector Commanders to receive SMC designation. ***This course exemption shall not be available to any other individuals seeking SMC designation.***

(4) If Sector Commanders and Deputy Sector Commanders attend the Maritime Search Planning course within one year of assignment to their position, the SMC Course

requirement may be waived by SC.

(5) If a member is delegated ACTSUS authority and is designated as SMC, the higher of the knowledge requirements is required (i.e. Proficiency is a higher level than Knowledge, and Knowledge is a higher level than Awareness).

(c) **Command Center Chief / Supervisor and SAR Watchstanders.** ***Elements of column 3 of SAR Knowledge Requirements (Table 1-3) and the Maritime Search Planning Course shall be completed prior to receiving certification in positions from the SC / Sector Commander.***

(1) ***SAR watchstanders shall be required to return to the Maritime Search Planning Course or the Maritime Search Planning 2 Course if the length of time from the date on their last re-certification letter has exceeded five years.***

(2) ***SAR watchstanders who remain in active SAR billets shall return to the Maritime Search Planning Course or the Maritime Search Planning 2 Course every eight years or prior to assignment in a third consecutive SAR billet.***

(3) ***Operational Commanders shall exercise due diligence in determining which course would be most beneficial to the SAR watchstander's professional development. The SAR watchstander's time away from the unit shall not be a determining factor. Appropriate comments justifying the desired course shall be included in the Electronic Training Request (ETR).***

(d) **Course Waivers:** ***All desired waivers of course attendance for personnel seeking ACTSUS delegation or SMC designation shall be routed through Area Incident Management to Commandant (CG-SAR) for approval, prior to receiving delegation/designation.***

1.3.2.5 Watch Frequency Requirements. All qualified SAR watchstanders are required to maintain watch proficiency through the use of currency watches.

(a) ***All qualified SAR watchstanders shall stand a minimum of two watches per month for the purpose of remaining current on watch policy and procedures***. Command Duty Officers are not required to stand two additional watches per month to maintain currency at the Operations Unit watch position.

(b) ***Watchstanders failing to meet the watch frequency requirements or to maintain currency must be recertified by the command.***

1.3.2.6 Demonstrating Proficiency. ***To maintain the integrity of the SAR system, all members involved in the SAR system shall meet minimum knowledge requirements listed in Table 1-3 above. All qualified watchstanders shall demonstrate proficiency through completion of quarterly exercises, as outlined in 1.2.2.3.*** These may be locally derived or provided by their parent command. Watchstanders may fulfill this requirement either through tabletop exercises (SAROPS problems) or written tests. ***Watchstanders must demonstrate proficiency in the areas shown in Table 1-3.***

1.3.2.7 Collateral Duty Assignment. Commands should carefully consider the type and number of collateral duties assigned to SAR watchstanders and the Command Center Chief/Supervisor/Senior watchstanders. SAR watchstanders/Supervisors should not be assigned collateral duties that significantly degrade their ability to properly stand the watch, maintain currency, or inhibit the maintenance of a proper watch rotation. ***Further, Senior SAR watchstanders/Command Center Chiefs/Supervisors shall not be assigned collateral duties that would degrade their ability to exercise oversight, quality control, and leadership to a Command Center staff.***

1.3.3 Certification

After completing qualification procedures, personnel must be certified in writing by their command prior to being assigned RCC, RSC, or Sector Command Center SAR watchstanding duties. This is where the individual's maturity and judgment are taken into account. ***Recertification procedures must also be documented and signed by the command.***

1.3.3.1 Annual Recertification. ***Annual recertification shall be completed by SAR watchstanders to validate that quarterly and annual training requirements have been met within the training cycle. The Command Center Chief shall review and validate that annual certification requirements have been met at the conclusion of the training cycle with documentation in TMT.***

1.3.3.2 Recertification Process Outside of Annual Training Cycle. The requirement to recertify outside of the training cycle is normally a result of watchstanders not maintaining currency (not meeting currency training or watch frequency requirements) or having their certification removed due to poor performance. For poor performance, commands have discretion to set the level of actions required to be reinstated as a watchstander within the range of actions: the minimum for poor performance being recertification, the maximum to complete the full qualification/certification process. ***Each command shall establish a recertification process that at a minimum:***

(a) Includes a period of supervised watches until recertified. The minimum standards are listed in Table 1-5. These represent only the minimums; in some regions the complexity of operations and corresponding complexity present in the command center watch may call for a greater number of supervised watches to bring an individual back up to proficiency. The supervision of the watches should be conducted by experienced watchstanders (i.e. not by recently qualified watchstanders).

Table 1-5 Supervised Watches for Recertification

Recertification Reason	Minimum Number of Supervised Watches Required	Notes
Currency Training lapse	continuous	Until training requirements are met
Watch frequency lapse < 30 days	1	Recommended; may be waived by command
Watch frequency lapse 30 to 90 days	2	May be waived by the command if the frequency lapse was due to attendance at National SAR School or Command Center Watchstander courses.
Watch frequency lapse > 90 days	6	

(b) Includes meeting the training currency requirements in 1.3.2.4 (knowledge requirements in Table 1-3).

(c) Includes a command formal re-certification board. Number of board members and composition should be flexible and reflective of the reason for recertification (e.g. for a lapse < 30 days an interview with the command center supervisor may be adequate; for lapse > 90 days a full board similar to the initial qualification board may be appropriate).

(d) Documentation via a re-certification letter.

1.3.4 Professionalism/Standardization

1.3.4.1 Command Center Standardization Team. Because of the critical nature of Command Center decision-making, there is a need for service-wide standardization. This includes periodic independent review and evaluation. The Command Center Standardization Team (CCST) provides Area, District, and Sector Command Centers periodic assessments of search planning and rescue coordination proficiency, training and certification, watch organization, documentation, command relationships, C3 capability, and knowledge of reference materials. In order to allow for the evaluation, update, & overall improvement of search policies, procedures and program goals, the CCST will provide Commandant (CG-SAR) with copies of the assessment reports.

1.3.4.2 District Professional Liaison. ***Districts shall assign a command center watchstander as a professional liaison to each Sector within its AOR. The Liaison shall visit his or her assigned unit at least twice a year to discuss relevant SAR issues and conduct requested training.*** Additional visits may include, when the subordinate unit is conducting a SAREX and when the CCST is conducting a visit.

1.3.5 SAR School Quota Assignment Prioritization

The curriculum of the National SAR School and changes to the numbers and types of SAR courses available, necessitate guidance for the assignment of quotas to prospective students of the National SAR School.

1.3.5.1 Maritime Search Planning Course (340440). Sufficient Maritime Search Planning (MSP) quotas exist for Coast Guard personnel filling SAR watchstander and Sector Response Chief billets. Additional quotas are available to provide training to members included in unit "briefing chains," or personnel who have a responsibility to communicate the specifics of a SAR case up the chain of command or exercise oversight to the watch during the development of a SAR case. Twenty-five quotas are available each year for Department of Defense personnel. In assigning students to MSP convening's, Training Quota Management Center (TQC) should adhere to the following guidance:

(a) ***Coast Guard personnel shall be assigned quotas based on the following priority:***

(1) Commandant (CG-SAR) approved special requests – Commandant (CG-SAR) will set priority);

(2) Operations Unit watchstanders (Active duty / Civilian);

(3) Command Duty Officers & Command Center Chiefs/Supervisors;

(4) Sector Chief of Response Department;

(4) Sector Incident Management staff;

(4) Operations Unit watchstanders (Reserves / Auxiliary);

(5) All others on a space available basis with Commandant (CG-SAR) concurrence.

(b) International students. No more than five quotas per class convening of the regular MSP course; quotas to the regular MSP convening's will not exceed 40 per year without Commandant (CG-SAR) concurrence.

(c) DOD Personnel. No more than three quotas per regular class convening; quotas will not exceed 25 per year without Commandant (CG-SAR) concurrence. ***At least 30 days advance notice must be given to TQC in order for DOD to utilize these quotas for a given class convening. DOD quota requests shall be prioritized as follows:***

(1) Air Force personnel are allowed a maximum of two seats per class.

(2) Other service branches on a space available basis.

(d) ***TQC shall refer any request to re-attend the MSP course that falls within three years of the requester's previous MSP graduation date to Commandant (CG-SAR) for approval.***

1.3.5.2 Maritime Search Planning 2 Course (100165). This course is designed to teach the use of SAROPS and SAR planning considerations beyond what is taught in the MSP course. The course challenges the SAR planning skills of SAR watchstanders through lab scenarios and advanced SAROPS techniques. This course shall not be used as a substitute for the MSP course where a SAR watchstander's lack of SAR experiences and skills clearly indicate the need to take the full MSP course. Personnel shall not apply to the MSP2 course unless they have at least previously completed the MSP course and have remained qualified as a SAR watchstander for a minimum of 24 cumulative months before applying to MSP2.

1.3.5.3 SAR Mission Coordinator (SMC) Course (501271). Sufficient SAR Mission Coordinator Course quotas exist for Coast Guard personnel who will be designated SMCs. Additional quotas are available to provide training to personnel who serve in billets within the SAR chain-of-command.

(a) ***Coast Guard personnel shall be assigned quotas based on the following priority***:

(1) Area/District Chiefs of Incident Management, Sector Commanders/Deputies;

(2) Area/District Chiefs of Response, Sector Chief, Response Department;

(3) Command Center Chiefs;

(4) Air Station CO/XO/OPS;

(5) All others on a space available basis with Commandant (CG-SAR) concurrence.

1.3.5.4 Search Coordination and Execution (SC&E) Exportable Course (400385). Funding and quota management for the SC&E course is coordinated by FORCECOM and Commandant (CG-SAR). Each District is responsible to ensure the adequate training space and necessary equipment is available for the assigned course dates. Completion of this course fulfills the requirements for designation as Aircraft Commander as required by the Air Operations Manual and coxswain as required. The National SAR School will provide student rosters to TQC as soon as possible after class graduation.

1.3.5.5 SAR Fundamentals e-SAR Course (100343). e-SAR is a computer-based interactive

Training system that meets the SAR knowledge requirements for becoming an aircraft commander or boat coxswain. It combines the legacy correspondence course, SAR Fundamentals, with the Exportable Search Coordination and Execution course to give the pilots and boat crews a thorough familiarization of the Coast Guard SAR system and the on scene commander's responsibilities. The e-SAR course is available by accessing the USCG virtual classroom found on the Coast Guard learning portal at https://learning.uscg.mil.

Section 1.4
Public Affairs & Next of Kin Interactions

Public affairs for the Coast Guard is different from that for the other armed services and most other Federal agencies due to our unique missions which serve the citizens constantly and directly. Coast Guard search and rescue operations always have the potential to create considerable public interest. The image of the service is often "on-the-line" due to SAR and therefore, how a SAR incident is reported will affect the service either positively or negatively.

1.4.1 News Releases and Interviews

Reference (j) lists excellent instructions on news releases for SAR cases and is mandatory reading for all personnel at Coast Guard units that interact with the public as part of their duties. However, it is often found that Coast Guard personnel directly involved in a SAR case are interviewed with little or no advance notice. ***Boat coxswains, OODs, and crewmembers must be aware that they are all potential candidates for the camera or reporter's notepad.*** Dedicated public affairs personnel are very valuable for handling media requests and enabling search planners to remain focused on planning efforts.

1.4.1.1 Release of Names During Active SAR Cases. The release of information to the public concerning individuals being sought or having been rescued by the Coast Guard often supports the SAR mission.

(a) The release of names of individuals being sought or having been rescued by the Coast Guard may be released by the responsible PAO or SMC while a SAR case is open and active.

(b) ***Once a SAR case is closed or suspended in MISLE, any request for names of individuals rescued by the Coast Guard must be submitted by the requestor IAW reference (k).***

1.4.2 Training and Education

Unit commands are encouraged to educate their personnel on public affairs. All watchstanders should be aware of information release criteria related to the privacy act, next-of-kin notification and ongoing investigation limitations (reference (k)). When in doubt, contact the public affairs office within your chain of command. Training is available for personnel with public affairs responsibilities through the Defense Information School (DINFOS), Commandant (CG-0922) or the nearest District Public Affairs Office.

1.4.3 Next of Kin (NOK) Notification and Interaction

1.4.3.1 General Discussion. ***SAR Coordinators shall ensure the greatest possible sensitivity in interacting with family and friends of victims during the conduct of SAR cases where the Coast Guard is the lead agency. The person exercising ACTSUS authority shall personally ensure that notifications are made and interaction established with the NOK at the earliest possible time.***

1.4.3.2 Appropriate Coast Guard Point of Contact. It is recommended that the person exercising ACTSUS authority personally handle this interaction. However, in the event that is not possible, this responsibility may be delegated to a mature member of the Command who may be physically proximate to the NOK (e.g., Station CO/OIC) and who is thoroughly familiar with the case. When an Area or District assumes SMC from a subordinate command that has ongoing communication with the next-of-kin, it may be appropriate to continue contact with the next-of-kin at the lower level.

1.4.3.3 Prolonged Searches for Missing Persons. Notifications of missing persons are usually made by family members or friends. However, if it is not the NOK, then they should be contacted as soon as possible.

(a) The initial notification by the person exercising ACTSUS authority, or his/her designated representative, should include a summary of the search efforts so far, future plans and a Coast Guard point of contact for future interactions. The possibility of not finding their family members should be included in the list of possible scenarios.

> **Note:** If possible, the command should highly encourage NOK to have one person act as point of contact and spokesperson for the family. These interactions should be as humanitarian as possible and there should only be one Coast Guard point of contact for the family.

(b) In accordance with Section 1.10.7 of Volume II of reference (b), the person exercising ACTSUS authority, or his/her designated representative, should maintain daily contact with NOK providing them with the progress of ongoing search efforts and outlining future search plans. This helps reduce NOK's stress associated with waiting and not knowing what happened to their loved ones and assists them in accepting the SMC's decision to suspend the search effort even if the missing persons are not located. Additionally, this provides for orderly interaction and, in turn, less distractions for SAR response personnel.

> **Note:** The NOK should be provided information on mission progress and future actions before releasing it to the media.

(c) If requested, allow the family to visit the District Command Center or Sector Command Center, as applicable, to review details of the case. Seeing the search planning and coordination efforts may help them accept the situation. The person exercising ACTSUS authority, or designated point of contact, should accompany the family when visiting the Command Center.

(d) Keep all briefings to NOK simple and avoid SAR acronyms and terms or any tables/tools that objectively measure survivability. General descriptions such as the type and number of SRUs, hours and square miles searched and general weather conditions should be used in briefing family members, as these factors are usually easy to understand. Also, take care to avoid creating a false sense of hope or making unrealistic promises to NOK. Under extreme emotions, it is easy to misinterpret "We're doing everything we can to find your husband" with "We will find your husband."

1.4.3.4 Suspending a Search. As the search progresses with no significant developments, it is helpful to remind NOK that the search cannot go on indefinitely. For prolonged searches, in accordance with Section 8.3.4 of Volume II of Reference (b), NOK should be notified of the decision to suspend active searching if no significant developments occur <u>at least</u> one day prior to actual suspension. This prepares the family for the actual ceasing of operations while giving them at least one more day of hope.

The person exercising ACTSUS authority shall be the one to inform the family that active searching has been suspended, as the person who is responsible for making the decision. When the person exercising ACTSUS authority cannot make this call personally, the next senior officer should make the notification and pass along condolences on their behalf. Upon request, the family should be given a summary of the search effort and the opportunity to ask questions. The family should be reminded that although the active search has been suspended, Coast Guard units would continue to monitor the area for significant sightings and additional information. When the possibility exists that the case may involve a Marine Casualty Investigation, the SMC should facilitate linkage of the families with an appropriate person in the Prevention Department for continued liaison and information sharing regarding the investigation.

1.4.3.5 **SAR Cases Involving Large Numbers of Victims.** There are some SAR cases that typically involve large numbers of victims, particularly in a mass rescue operation (i.e. sinking cruise ship) or an incident that involves mass casualties.

Note: For airline crashes, airline companies are responsible for making NOK notifications.

In addition to the policy outlined above, the following procedures are extremely helpful when dealing with multiple NOKs (if the Incident Command System (ICS) is activated, then the Incident Commander (IC), not SMC, will be responsible for NOK interactions):

(a) Ensure that lodging is centrally located and/or easily accessible for those NOK who arrive in the area. This will facilitate daily briefings.

(b) Establish area where families of victims can receive daily mission briefings in private. This should be at the place where NOK are centrally lodged.

1.4.3.6 **Loss of Life.** ***In the event death occurs, the person exercising ACTSUS authority shall personally ensure that notification is made as expeditiously as possible, and with all due compassion.*** For those cases where the Coast Guard is not the lead agency or where interaction with NOK has not had the opportunity to develop, the command should endeavor whenever possible to use local, more qualified authorities for death notification. Local and state police departments are usually in the best position to make notification visits and are typically trained to perform this function. They are also networked with other agencies outside their jurisdictions and can make timely notifications in other counties or states. Sector Commanders should partner with these agencies and establish agreements on how NOK notification should be made for local and out of state residents.

(a) When local agencies are not available to make a NOK notification, the person exercising ACTSUS authority may have to do it directly. This may also be the case if the family is already aware of the situation and has established a good interaction with the command (if this is the case, person exercising ACTSUS authority can use their judgment as to whether notification should be made over the phone or through a personal visit).

(b) Regardless of how the contact is made, the following guidance is provided to assist in preparing to give notification:

(1) Obtain as much information as possible and have many of the facts committed to memory. Know the names of both the victim and NOK being notified and their relationship. Be prepared to answer questions and provide a point of contact at the

facility where the body is located.

(2) Wear an appropriate uniform and ensure you have military identification. Whenever possible, travel in a government vehicle.

(3) Ideally, you want to make the notification to the primary NOK (i.e., spouse or parent). Make every attempt to inform the NOK in private. If you are at the residence, ask if you may enter. Speak quietly to the NOK until you gain approval for entering the house and closing the door. Do not enter without permission.

(4) Once inside, everyone should be seated. Be direct and to the point when informing the NOK. Do not sugarcoat your information. Using euphemisms or vague language may delay the NOK's acceptance of what has occurred. The words "dead" and "death" have a finality that has been found to be helpful for gaining NOK acceptance.

(5) As mentioned earlier, do not use technical SAR language. If appropriate, general descriptions such as the type and number of SRUs, hours and square miles searched and general weather conditions should be used in briefing NOK.

(6) Be prepared for a wide range of responses from denial to extreme physical or emotional responses such as fainting, anger, hysteria or even a heart attack. If necessary call local emergency medical services (have contact number and the NOK address readily available). Ask the NOK if other family, friends or clergy should be notified and offer to do it.

(7) Family members are not encouraged, but are welcome to come to the Command to review details of the case. When possible the review should be conducted in a space separate from the command center. Family members may be given a tour of the command center prior to or following the case review to give them an appreciation for our operations and capabilities.

1.4.3.7 Presumption of Death. There are times when NOK of missing persons who are presumed dead approach the Coast Guard and request a Letter of Presumed Death (LPD), usually to assist in insurance and probate court proceedings.

(a) An LPD may be issued upon request any time after the SMC has suspended the search, an Incident Investigation Activity (IIA) initiated in MISLE and the marine casualty investigation has commenced. Because the missing person’s status is usually known very early in most investigations, an LPD should be issued by the Officer in Charge, Marine Inspection (OCMI) as soon as possible after receiving a request and need not wait for final completion of the investigation. Upon issuance, an electronic copy of the signed LPD shall be included in the Correspondence section of the MISLE IIA.

(b) If a marine casualty investigation is not conducted regarding a recreational death(s) or an overdue vessel, issuing an LPD is not authorized. Local or state authorities have jurisdiction over these cases and they perform these functions. If the NOK are unable to get an LPD from a local agency, they may request some form of proof from the Coast Guard. If they do, the SMC for the case, after consulting the Servicing Legal Office, may provide the facts of the case, including the search parameters, results, probability of success, and a description of the Coast Guard’s efforts. This may be provided in the form of a declaration, affidavit, or deposition. (Depositions may be authorized on a case-by-case basis with the approval of the Servicing Legal Office). The affidavit or declaration provides only facts and opinions within the Coast Guard's competence, and makes no conclusion regarding death. In these cases, the competent jurisdiction will use the Coast Guard's input to make the declaration regarding presumption of death.

1.4.3.8 Counseling Aid to Families. In cases where death occurs, or unlocated persons exist at the time of case suspension; the families may need further assistance coping with the tragedy. Coast Guard SAR units will endeavor to use local agencies and nongovernmental organizations, whenever necessary to assist the families. These agencies are typically trained to perform functions such as grief counseling, trauma management, etc. ***If agreements/understandings are not in place, Sector Commanders shall address this issue with local authorities to gain their cooperation.***

Section 1.5
Liaison and Contingency Exercises

SAR Coordinators will carry out active liaison efforts with organizations that can contribute to strengthening the readiness and capabilities of the international, national or local SAR systems. Such activities often help mitigate and control future emergency situations. Development and exercise of plans and improvement of communications are part of this work.

SAR Coordinators and RCC staff should routinely meet with counterparts in neighboring nations to work on improving working relationships, or to further implement international SAR agreements. ***However, any international SAR liaison efforts that may be sensitive, particularly significant, or otherwise non-routine must be coordinated in advance with the International Affairs Staff (Commandant (CG-DCO-I)) and SAR Program Manager (Commandant (CG-SAR)) at Headquarters.***

SAR liaison with states can be conducted under the Boating Safety Program (reference (l)). Liaison should also be carried out with local military commands, commercial SAR service providers, local SAR organizations, and any others who may contribute to improving SAR operations, or expanding available resources. Membership and involvement in the National Association of Search and Rescue is recommended.

1.5.1 Contingency Response Community

Maritime SAR Councils, usually organized by the Coast Guard, are committees of federal, state, local, or volunteer groups with SAR capabilities. These councils are governing bodies of the SAR community that are localized within the maritime SAR area. They enable SAR coordinators to coordinate efforts of local SAR organizations on a long-term basis. Such councils are usually identified with bodies of water such as lakes, bays, or sounds, or with adjacent metropolitan areas, and may include land areas within the maritime SAR area.

1.5.1.1 A SAR Council coordinates the activities of various groups, resolves SAR operational problems, develops contingency plans, and critiques exercises and major SAR incidents.

1.5.1.2 Councils should include scuba clubs, professional divers, firefighting services, emergency medical services, commercial assistance providers, similar groups with specialized SAR capabilities, and groups that normally respond to SAR incidents. In addition, the councils should be closely tied to other emergency management organizations such as the Federal Emergency Management Agency (FEMA), state and county emergency management agencies, and Coast Guard Captains of the Port.

1.5.2 SAR Facility List

All RCCs/Command Center's shall maintain a current Search and Rescue Facility (SARFAC) listing. The list shall be validated annually. At the Sector level, the SARFAC list shall include all assets available within the AOR that can assist in responding to SAR, and at the District level, all assets available to the District. Facility listings are particularly important for identifying capabilities not held by the Coast Guard.

1.5.2.1 ***Operational Commanders shall ensure they have 24-hour contact numbers for DOD, state, county, municipal, volunteer, and commercial SAR resources in their AORs, including hospitals, ambulances, and coroners.***

1.5.2.2 ***Listings of dive rescue resources must include all available agencies and organizations with dive rescue capabilities.*** Specific information regarding transportation available or needed and pickup points for dive teams should be included. ***Dive rescues generally require an immediate response; all means for contacting dive teams 24 hours a day must be included.***

1.5.2.3 When planning for a search using another agency's SRU, answers to the following questions should be known:

(a) What are the operating limitations of your resource?

(b) What is your response time?

(c) When can you be on scene?

(d) How will communications be conducted?

(e) Can your resource handle hoisting operations or MEDEVACs?

(f) How long can your resource stay on scene?

Information on another agency's SRU may be in the form of an Operational Asset SARFAC or it may be common knowledge for your watchstanders. Undoubtedly, you will not be able to maintain as much information on these resources as you have for Coast Guard boats or aircraft; however, all information is useful in planning. This knowledge may also prevent the loss of vital time.

1.5.2.4 Units will establish and validate 24-hour contact numbers for local authorities who are responsible for public safety, bridges, tunnels, pipelines, and other facilities subject to waterways incidents in the vicinity of the exercise. Key points of contact include those who operate these facilities and those who control traffic on, over, or through them.

1.5.3 Mass Rescue Operations Contingency Exercises

The Coast Guard's MRO Contingency Program is consists of many elements. However, two key elements, plans and exercises play an essential part of the mass rescue operations. Plans are required to ensure that the Coast Guard maintains a strong response capability, always ready to fulfill our commitments as a multi-mission organization which includes our myriad military and non-military roles. The MRO exercise program is designed to test our plans, policies, and procedures for responding to a wide variety of possible contingencies, including cruise ships, passenger vessels (foreign and domestic flagged), gaming vessels, casino/dinner cruise vessels, passenger ferries, private and commercial passenger aircraft, transoceanic passenger aircraft, and all man-made, natural disasters, military and non-military scenarios.

The rapid growth in industry regarding the number and passenger capacity of all vessels including passenger aircraft only increases the likelihood of SAR incidents with large numbers of persons in the water. Additionally, natural disasters, such as floods and hurricanes, cause similar concern. Such incidents can occur in intercoastal waterways, close coastal waters (harbors and along the coast), territorial waters, or in international waters (out at sea). Initial response often includes both a Sector and MSO and it may be appropriate to implement ICS. However, there are situations that are purely SAR, which may quickly evolve from a rescue to a recovery operation that is not SAR.

To maintain effective MRO capabilities response systems, notifications and response procedures should be exercised. While many procedures are employed daily in response to CG unit caseloads, many equally important procedures are employed far less frequently. These procedures, including response to hazardous substance incidents and intermodal (involving more than one mode of transportation) incidents such as commercial aircraft crashes and bridge allisions (vessels striking bridges), should be considered as possible scenarios. These scenarios are not all inclusive, but shown as examples. Contingency exercises of other MRO scenarios such as ones that could be unique to your AOR should also be considered for preparedness, readiness, and response planning

1.5.3.1 Exercise Participation. District should include whenever and wherever possible Sectors, Air Stations, other military commands as well as pertinent state, local community partners, other governmental organizations, and volunteer organizations (non-governmental)..

1.5.3.2 Resource Augmentation. ***When planning and coordinating exercises, RCCs and Command Center's shall refer to their SARFAC listing and invite appropriate organizations.***

1.5.3.3 Conducting MRO Contingency Exercises. Districts (Sectors and RCCs) are required to conduct a discussion-based (Seminar, Workshop, Table Top (TTX) or Game) exercise to establish and maintain positive working relationships with counterpart agencies; the exercise should focus on assessing plans, policies, procedures, coordination, notification procedures, provisions as per established MOUs, and rescue operations. In addition, the above exercises may be conducted as preliminary actions for operations-based exercise preparations.

1.5.3.4 Frequency of MRO Exercises. ***MRO Exercises shall be conducted in accordance with the Contingency Preparedness Planning Manual Volume I: Planning Doctrine and Policy, COMDTINST M3010.11(series) and Coast Guard Mass Rescue Operations (MRO) Program, COMDTINST 16711.2 (series).*** At a minimum, Districts should conduct and/or participate in one discussion based (e.g. seminar, workshop, game, or tabletop) and one operations based (e.g. drills, functional, full scale) MRO exercise over a five year period. Any actual major incident involving a MRO can be credited as an MRO major exercise.

1.5.3.5 Exercise Planning Guidance and Sharing Lessons Learned. Contingency Preparedness Planning Manual Volume III – Exercises, COMDTINST M3010.13 (series), provides guidance on how to plan and conduct an exercise, as well as reporting requirements for lessons learned. In addition**,** the Coast Guard Contingency Preparedness System (CPS) provides an efficient means of entering, integrating, managing, and monitoring Contingency Plans, Concept of Exercise reports, and capturing After Action Reports, Lessons Learned, and Best Practices from operations, contingency responses, and exercises. It can be found at http://llintra.comdt.uscg.mil/CPS/.

1.5.4 Information Sharing and Case Coordination

Coast Guard units will extend the maximum practicable cooperation to federal, state, local and private agencies in the prosecution of SAR missions.

1.5.4.1 ***The SAR Coordinator of any Coast Guard unit responding to a recreational boating accident (as described in 33 CFR 173.55) occurring within concurrent state jurisdiction shall notify the responsible state authorities as soon as practical to ensure inclusion of the information in the state Boating Accident Report Database (BARD) system.***

1.5.4.2 Coast Guard units receiving a request for SAR case information from a federal, state or local agency within their AOR will comply with that request unless there is a compelling reason to withhold it. Before the request is denied, concurrence will be obtained from the district commander.

1.5.4.3 ***Coast Guard commands, at all levels, shall establish sound working relationships with counterpart agencies within their AOR.*** Such relationships may take the form of formal agreements or MOUs. MOUs should be regularly reviewed for currency. ***This working relationship with other federal, state and local agencies must include timely and effective means of sharing SAR case information, as well as mission resources.*** This information is essential to these agencies to optimize their SAR case contribution, and for their investigative purposes, which ultimately benefit the Coast Guard.

1.5.5 SAR Assessments

A SAR assessment is intended to identify areas for improvement and to help assess needs of the SAR system.

1.5.5.1 The Coast Guard conducts two general types of assessment: internal and international. The internal (national) assessment is an evaluation of our national system as performed within the Coast Guard. Coast Guard personnel trained for this duty perform such assessments at a specific level (unit or RCC).

1.5.5.2 International SAR assessments are conducted by the U.S. Coast Guard at the request of a foreign government. Such requests from a foreign government may come directly to Coast Guard Headquarters SAR Program Manager (Commandant (CG-SAR)) or may come indirectly; e.g., through another U.S. agency, from IMO in accordance with an existing MOU, or to another part within the Coast Guard. An international SAR assessment is typically an evaluation of that country's overall SAR service. There are few people in the Coast Guard with experience in conducting this type of assessment.

1.5.5.3 ***All requests for an international SAR assessment shall be brought to the attention of Commandant (CG-SAR). Such assessments shall be conducted under the guidance provided in reference (b), Volume I, Chapter 5, which provides broad guidance and Appendix H, National Self-Assessment on Search and Rescue, which is a general questionnaire on arrangements to develop and provide SAR services.***

1.5.5.4 The U.S. SAR system has served as a model for many countries but should not be viewed as the exclusive way of providing SAR services. Any country requesting U.S. Coast Guard assistance in assessing its SAR system will be encouraged to complete the *National Self-Assessment on Search and Rescue* questionnaire contained in Volume I of the IAMSAR

Manual before an on-site visit is conducted. The country will also be encouraged to provide an advance copy of the completed questionnaire since this document is very useful in preparing for the visit.

1.5.6 Sharing Computer SAR Applications

The authority to distribute SAR computer tools varies by application and agency and is different for domestic and foreign agencies as well as federal, state and local. These agencies desire to use the software for SAR coordination/planning and other emergency response operations. It is consistent with the SAR Program's goal to be a leader in SAR to promote using the best tools available for all SAR agencies (domestic and foreign). ***All requests for sharing SAR software must be approved by Coast Guard headquarters.*** Commandant (CG-SAR) is the point of contact.

1.5.6.1 Use of SAROPS by Domestic and Foreign agencies. SAROPS and associated SAR planning applications require a high level of competency to be effective. More importantly, SAROPS relies on the SAR Controller to fully understand certain assumptions that are made in the processing. Without proper training an operator can easily develop incorrect search plans that can result in the loss of life. It is essential that all users of SAROPS participate in a SAR Training curriculum that provides planners the knowledge required to effectively prosecute a case using these applications.

1.5.6.2 Specific guidelines required for domestic state and local use of SAROPS: Consistent with the SAR leadership goal, the SAR Program supports the distribution of the SAROPS software to domestic agencies within the following specific guidelines.

(a) ***Domestic agencies requesting the software must have a sponsoring USCG command. Request shall be made via the sponsoring command and must receive positive endorsement via the chain of command for final approval by the Office of Search and Rescue, Commandant (CG-SAR).***

(b) The sponsoring command will provide assistance as needed to ensure the domestic agency has the necessary knowledge/skills to properly use SAROPS. Training via the National SAR School (either resident or exportable course) cannot be offered due to the overwhelming need within the USCG for these quotas. Any training would necessarily be provided locally by the sponsoring command. Sponsoring commands are limited to those that receive formal SAR School training (Sectors & Districts).

(c) Domestic agencies having problems with software should first be required to contact their sponsoring command. If the sponsoring command cannot resolve the problem then the use of the Hotline (1-757-686-2156) should be authorized. This use should be carefully monitored to ensure any costs are adequately covered.

(d) SAROPS/SAR Tools search planning software may be provided free of charge to domestic agencies. ***Domestic agencies are responsible for providing the necessary hardware, appropriate ArcGIS license and if desired must provide their own environmental data source.***

(e) Sponsoring commands should coordinate with C3CEN for delivery and loading of software. If C3CEN is required to assist in the setup of SAROPS for an agency, the agency may be required to bear any associated cost. When the software is loaded, the sponsoring command will work with C3CEN to ensure the agency information is properly documented for the C3CEN distribution list and software is receipted for by the agency.

1.5.6.3 **Specific guidelines required for other federal agencies use of SAROPS**. SAROPS/SAR Tools are Government off the Shelf (GOTS) applications. Requests for SAROPS may be made to Commandant, (CG-SAR).

1.5.6.4 **Specific guidelines required for foreign use of SAROPS**. SAROPS is available to international SAR authorities. ***International SAR authorities will be responsible for providing the necessary hardware, appropriate ArcGIS license and if desired must provide or contract for their own environmental data source. When approved, international SAR authorities must make all requests for SAROPS to Commandant (CG-DCO-I).***

1.5.6.5 **Specific guidelines for domestic and foreign use of other SAR applications:** Use of other SAR application will be on a case-by-case basis. These requests should be forwarded to the Commandant, (CG-SAR).

Section 1.6
SAR Agreements

SAR agreements shall conform to requirements stipulated in the National SAR Plan, Appendix A in reference (a), other pertinent agreements, and the guidance of superiors in the chain of command.

1.6.1 International SAR Agreements.

1.6.1.1 There are two types of international SAR agreements: formal international SAR agreements and informal non-binding international arrangements (e.g., memoranda of understanding). The United States is party to numerous international instruments (treaties, conventions, and agreements) to promote cooperation with other countries in rendering assistance to persons in distress. Some federal agencies have similar plans, agreements, and procedures for coordinating SAR efforts.

1.6.1.2 The United States, in support of Coast Guard search and rescue responsibilities, seeks to enter aeronautical and maritime SAR agreements where appropriate with other countries. International SAR Agreements can only be negotiated by Commandant (CG-SAR). While field commands are not authorized to unilaterally negotiate and conclude SAR agreements with other countries, they should identify any needed agreements and notify Commandant (CG-SAR) with the appropriate information**.**

1.6.2 Domestic and Local SAR Agreements

1.6.2.1 SAR Coordinators (District Commanders) are authorized to enter into domestic SAR agreements by the National SAR Plan. ***SAR Coordinators need no specific approval from Commandant, but shall comply with requirements prescribed by the Area SAR Coordinator (Area Commander) and references (l) and (m).***

1.6.2.2 SAR agreements should resolve local coordination problems. Local agreements should not include or repeat issues dealt with adequately in the National SAR Plan or agreements executed by senior commands. Local agreements are appropriate when certain local responsibilities need to be more clearly defined or contingency plans need elaboration. SAR agreements are not needed if SAR issues can be readily resolved by informal coordination.

1.6.2.3 Local operational commands are best able to recognize the need for SAR agreements and should contact their District Chief of Incident Management for guidance. As such, District Commanders should encourage commands to call attention to issues that may require stronger commitments than local informal coordination can provide.

1.6.2.4 When necessary and possible, SAR agreements with states should be included in the Federal/State Recreational Boating Safety Cooperative Agreements (BSCA) as authorized by 46 USC Chapter 131. More comprehensive maritime SAR agreements may be needed with territories whose land areas are also within the Coast Guard SAR Coordinator’s area of responsibility such as Puerto Rico, the Virgin Islands, and Guam. Refer to references (l) and (m) for instruction on instituting cooperative agreements.

1.6.2.5 ***One copy of all SAR agreements, except those included in the BSCA, shall be sent to Commandant (CG-SAR).*** Area and District Commanders may prescribe additional requirements for distributing agreements made by subordinate commands.

1.6.2.6 ***Agreements must include provisions for canceling and amending.*** A typical provision for cancellation is six months written notice by one party. ***Agreements shall be reviewed annually to ensure relevance.*** Unnecessary agreements should be cancelled and Commandant (CG-SAR) advised.

1.6.3 Department of Defense (DOD) SAR Agreements.

DOD facilities can be used under the National SAR Plan for civil SAR. Reference (a) provides guidance on availability of resources from each of the DOD components.

1.6.3.1 SAR Coordinators should be cognizant of all DOD resources regularly available for SAR response within their SRR. Where DOD resources are key components of the SAR System, agreements detailing response parameters and expectations should be established.

1.6.3.2 When Coast Guard resources are assisting DOD facilities with SAR for their forces, the Coast Guard may be designated as SMC to coordinate SAR operations; SMC assignment should be discussed and agreed on with the DOD component being assisted.

1.6.3.3 Coast Guard SMC case termination/suspension decisions will be independent of those of the DOD SMC (if separately assigned). A single SMC is preferred for effective use of resources and to minimize confusion.

1.6.3.4 ***Coast Guard SAR response to an incident involving DOD assets shall not be delayed to determine who is to be assigned as SMC. A Coast Guard response shall be initiated immediately (within current distress response guidelines) upon notification of a distress incident involving DOD forces; SMC discussions should take place in parallel. Coast Guard resources shall continue until positively released by the SMC, either Coast Guard or DOD.***

Section 1.7
International SAR

1.7.1 SAR in Foreign Territories.

1.7.1.1 Relations with foreign countries and the protection of U.S. citizens abroad are primarily the responsibility of the U.S. Department of State (DOS), which has no SAR facilities. When DOS requires SAR facilities, Foreign Service Posts (FSPs; e.g., embassies, consulates) depend on facilities of the resident country, the Coast Guard, and other U.S. agencies.

1.7.2 Guidance for Incidents Concerning U.S. Craft or Citizen Missing, in Distress in Foreign Territory or Territorial Seas.

1.7.2.1 ***When information is received that a U. S. air or surface craft, or a craft with U.S. citizens aboard, is in distress or missing while in or over a coastal State's territory or territorial seas, Area and District Commanders shall***:

(a) Determine via SAR communications channels (including commercial and Air Traffic Service facilities) the action taken and planned by responsible coastal State SAR authorities to respond within their territory;

(b) If Coast Guard rescue assets are conducting an AE rescue operation, notify the coastal State authorities;

(c) If the source of information is other than a U.S. FSP:

(1) Contact the appropriate U.S. FSP(s) by the most direct means;

(2) Pass to the FSP all pertinent information;

(3) Request the FSP immediately implement procedures for U.S. citizens in distress; and

(4) Recommend any appropriate additional measures, particularly in cases of overdue surface craft (Note: Area and District Commanders or their SAR Mission Coordinator (SMC), as appropriate, have authority to communicate with U.S. FSPs concerning the prosecution of SAR incidents, but must keep Commandant and DOS informed.).

(d) If the original source of information is a U.S. FSP, assist in evaluating the incident and recommend appropriate SAR action;

(e) Dispatch SAR assets when one of the following applies:

(1) A coastal State's SAR authorities request, or grant permission for U.S. SAR assistance (notify the appropriate FSP(s); no further clearance is required);

(2) The Area or District Commander or their SMC decides that U.S. assistance should be provided:

(a) If the case involves the conduct of an AE rescue operation by Coast Guard rescue units, notify the foreign government; or

(b) For SAR operations not involving the conduct of an AE rescue operation, obtain consent from the coastal State to assist in the conduct of a SAR operation (notify the FSP).

(3) A U.S. FSP requests, or the Commandant directs, the dispatch of Coast Guard units, and advises that clearance has been obtained.

(f) Retain operational control of U.S. efforts unless it is operationally advantageous to pass control to another SMC, or it is in accordance with an applicable SAR agreement or standard international practice;

(g) Throughout the incident, keep Commandant advised in case additional diplomatic efforts become necessary.

(1) Notify the Coast Guard National Command Center; and

(2) ***SITREPS shall be submitted with DOS as an information addressee (Note: Notification of the U.S. FSP is not a substitute for notification to DOS).***

(h) Ensure the original information source remains advised of the SAR operation.

1.7.3 Supplemental guidance for Coast Guard RCCs.

Generally, U.S. SAR operations within the jurisdiction of a coastal State should be in accordance with that country's requirements and applicable SAR agreements. Exceptions include the conduct of AE rescue operations. Within certain limitations, each coastal State has the sovereign right to control access to its territory, territorial seas and the airspace over these areas.

1.7.4 Amver System.

Amver is a worldwide voluntary ship reporting system for SAR sponsored by the U.S. Coast Guard. Amver's primary function is to quickly provide SAR authorities with accurate position information and characteristics of ships near a reported maritime or aviation distress that may be able to provide assistance. Vessels of all nations, on coastal or oceanic voyages, anywhere in the world, are encouraged to participate by reporting their position to Amver. Amver-participating vessels are typically merchant vessels, but can also include mega-yachts, commercial fishing vessels, or any other vessel capable of providing assistance. Vessels participate by sending movement reports (e.g., sailing plan, periodic position updates, and final report) to the Amver Center at OSC via assigned coast or international radio stations or satellite service providers. Information from these reports is entered into a database that computes dead reckoning positions for vessels anywhere in the world while they are participating in the system. Vessel characteristics valuable for determining SAR capability from other available sources of information will be accessed through Amver.

1.7.4.1 Position information and ship SAR characteristics within the area of interest are made available to recognized SAR authorities of any nation for use during a SAR case.

1.7.4.2 Because vessel movement information provided to Amver is considered proprietary commercial or financial information, it should be carefully guarded from external release and handled in accordance with the specific guidelines in reference (k) and reference (n). Predicted locations or Amver information are disclosed only for safety purposes; it should not be provided to Coast Guard personnel in other mission areas (e.g., law enforcement, maritime investigations) nor other types of agencies. Search planning policy and procedures using Amver are discussed in Chapter 3 of this Addendum.

1.7.4.3 Deciding when to request an Amver-participating vessel or other vessel divert in response to a SAR operation is the responsibility of the SMC, based on careful consideration of all available information. However, it should be remembered that commercial vessels participate voluntarily in Amver, are usually on tight logistical schedules, and diversions for SAR can be costly for shipping companies.

1.7.4.4 Amver-participating vessels should be called upon to assist whenever necessary to respond to a life threatening situation. They may be used along their track to help verify distress information and to keep a lookout.

1.7.4.5 Use of Amver-participating vessels to assist in extended searches should be weighed against use of other available resources. Divert as many vessels as are required, but release ships as soon as possible, consistent with the situation and their apparent importance to the SAR operation.

1.7.4.6 SOLAS ships may be asked to serve as the OSC or to perform other functions in accordance with *IAMSAR Manual, Volume III, Mobile Facilities*. While ships are valuable rescue facilities, they should be used sparingly for extended searches due to their relatively low speeds, small sweep widths, and high costs involved. Aircraft are preferred search facilities when available, but ships may be asked to search as warranted in the judgment of the SMC. Regulation V/33 of the SOLAS Convention, in part, states "The master of a ship at sea which is in a position to be able to provide assistance, on receiving a signal from any source that persons are in distress at sea, is bound to proceed with all speed to their assistance…" However, use of Amver allows the SMC to select the best facility(s) and allow the other vessels to proceed without diverting.

1.7.4.7 Reporting usage of the Amver system by the RCC will ensure continued Coast Guard provision of Amver services and also encourage participation by commercial vessels. ***SAR SITREPs and District/Area Operations Summaries shall be sent to Amver Maritime Relations (message PLAD "COGARD AMR NEW YORK NY" or by e-mail) whenever an Amver-participating vessel makes a rescue (including number of persons rescued) or diverts to assist (with or without positive results), or a foreign RCC requests a SURPIC.*** This information will be compiled and reported in annual statistics for Coast Guard and public use. As feasible, the Coast Guard RCC should follow-up on foreign RCC requests for Amver information and report the outcomes as appropriate. The RCC should have procedures in place to quickly recognize any Amver-participating vessel that diverts or makes a rescue. Such recognition can be in the form of a thank you letter to the company/owner or a public service award for the vessel in an actual rescue.

Section 1.8
Assistance Entry (AE)

1.8.1 Assistance Entry (AE)

1.8.1.1 For as long as sailors have plied the seas, there has been an ancient code requiring mariners to aid others in distress. Long before the establishment of territorial seas, mariners have recognized a humanitarian duty to rescue others from distress at sea. Moreover, the duty to render assistance at sea has been stated in various international instruments for over 100 years. The *United Nations Convention on the Law of the Sea* (LOS Convention) gives expression to the tradition and duty of all seafarers to render assistance to persons in distress without regard to the location of a vessel in distress. Although the United States is not a party to the LOS Convention, it complies with the provisions related to navigation and over flight, as those provisions are reflective of customary international law. Article 98 of the LOS Convention, "Every State shall require the master of a ship flying its flag... to render assistance to any person *found at sea* in danger of being lost." (emphasis added). The broad understanding of the mariner's duty to render assistance includes the conduct of rescue operations within a coastal State's territorial sea and is incorporated into the Coast Guard's AE policy.

1.8.1.2 In addition to codifying the duty to render assistance to mariners in distress regardless of location under Article 98, the LOS Convention makes the act of stopping to render assistance to mariners in distress while transiting a foreign territorial sea fully consistent with the principles of innocent passage in Article 18, thus disassociating entry or rendering assistance while in innocent passage from the notion that these acts violate a coastal State's sovereignty.

1.8.1.3 International law recognizes and provides for the duty to save lives in danger or distress, even when they are within a coastal State's territorial sea. However, internationally recognized SAR duties must be balanced with international concerns for sovereignty of a coastal State and United States interests.

1.8.1.4 The conduct of SAR operations in a coastal State's territorial sea generally involves two principles:

(a) The sovereign right of nations to control and regulate entry into their territory; and

(b) Humanitarian need to quickly and effectively assist persons in distress without regard to nationality or circumstances.

1.8.1.5 The conduct of AE rescue operations in a coastal State's territorial sea does not require seeking or receiving permission of the coastal State.

1.8.1.6 Customary practice for aircraft conducting AE rescue operations in a coastal State's territorial sea is not as fully developed as for vessels (e.g., nations may recognize the right to conduct AE rescue operations more readily for vessels than for aircraft). In addition, the conduct of AE rescue operations by nonmilitary vessels is apt to cause less coastal State concern than entry by military vessels. Therefore, safety of the rescue unit must be considered in light of the views of the coastal State whose territorial sea or overlying airspace is being entered.

1.8.1.7 Ships and aircraft of other coastal States should be afforded comparable freedom to enter U.S. territorial seas. U.S. actions that unreasonably restrict entry will inevitably jeopardize the ability of U.S. vessels and aircraft to conduct AE rescue operations in another coastal State's territorial sea.

1.8.2 Coast Guard Assistance Entry Policy

1.8.2.1 Coast Guard rescue assets are authorized to enter a coastal State's territorial sea to rescue persons in distress; such assistance is to be provided without regard to the nationality or status of such persons or the circumstances in which they are found.

1.8.2.2 When a Coast Guard rescue asset can render or arrange assistance to persons in distress within a coastal State's territorial sea, it should do so in accordance with the following policy and information**.** The Coast Guard's goal, when operational units contemplate AE rescue operations, is to balance concerns for saving lives with coastal State sovereignty and national security concerns. As such, the conduct of AE rescue operations must consider:

(a) The safety of assisting personnel;

(b) The safety of the persons in danger or distress;

(c) U. S. foreign relations with the coastal State; and

(d) Any applicable international SAR agreement.

1.8.2.3 Coast Guard personnel should refer to vessels or aircraft, including military craft, which enter into or over fly a coastal State's territorial sea to render emergency assistance to persons, ships or aircraft in distress, as "assistance entry" (AE) (Note: DOD commands use the term "right of assistance entry (RAE)" for such operations.).

1.8.2.4 **Coast Guard Rescue Surface Assets.** Coast Guard rescue surface assets may conduct an AE rescue operation in a coastal State's territorial sea, when in the judgment of the unit or operational commander:

(a) There is reasonable certainty (based on the best available information regardless of source) that a person is in distress;

(b) The distress location is reasonably well known; and

(c) The surface asset is in position to render timely and effective assistance.

Note: Coast Guard surface assets are authorized to use Coast Guard aircraft in the conduct of coordinated AE rescue operations.

1.8.2.5 **Coast Guard Rescue Aircraft**. Coast Guard rescue aircraft may conduct an AE rescue operation in a coastal State's territorial sea, when in the judgment of the aircraft commander:

(a) There is reasonable certainty (based on the best available information regardless of source) that a person is in distress;

(b) The distress location is reasonably well known; and

(c) The rescue unit is in a position to render timely and effective assistance.

1.8.2.6 ***Coast Guard rescue assets shall NOT conduct AE rescue operations under any of the***

following conditions:

(a) ***To perform a search (AE rescue operations in a coastal State's territorial sea extends only to rescue operations not searches. Coastal State permission must be obtained prior to entering into, flying over or landing in territory or territorial sea of a coastal State for search operations unless other prior arrangements have been made. This can sometimes be arranged with an RCC of that coastal State.);***

(b) ***To rescue (or salvage) property (other than in limited cases, such as for the retrieval of medical supplies, or other property that may assist in the conduct of the lifesaving operation);***

(c) ***To assist persons not in distress; or***

(d) ***Within the internal waters or over the land mass of a coastal State.***

1.8.2.7 ***For all AE rescue operations conducted by Coast Guard rescue units, the Coast Guard National Command Center shall be promptly notified.***

1.8.2.8 Normally, the Coast Guard should refrain from conducting an AE rescue operation when other rescue units, capable of rendering timely and suitable assistance are known to be on scene or en route, unless there is good reason to believe that the other rescue units cannot or will not respond in an adequate or timely manner.

1.8.2.9 ***When conducting an AE rescue operation, permission of the coastal State shall NOT be requested and the following shall apply***:

(a) ***The coastal State shall be notified of the entry of a Coast Guard rescue unit(s) into their territorial sea at the earliest opportunity, both as a matter of courtesy and so its rescue units may be activated if necessary; and***

(b) ***Operational communications shall avoid implying that permission is being requested; however, in recognizing the sovereignty of the coastal State communications shall be carefully worded to foster cooperation in the rescue effort.***

1.8.2.10 Reasonable doubt as to the immediacy or severity of a situation shall be resolved by assuming the person is in distress.

1.8.2.11 If the coastal State objects to the presence of the Coast Guard rescue asset while in the conduct of an AE rescue operation, or if its military/police units attempt to interfere with or otherwise disrupt Coast Guard rescue unit efforts, attempts should be made to arrange alternative assistance to those in distress, resolve disagreements amicably on scene, convince the coastal State and its units of the humanitarian nature of the situation, and advise them of Coast Guard intentions. If such opposition, interference or disruption:

(a) Ceases, the Coast Guard rescue asset may proceed with the AE rescue operation; or

(b) Continues, and the distress appears life-threatening, the Coast Guard rescue asset should, when possible, await direction via the operational chain of command, but may proceed to render immediate assistance.

1.8.2.12 When deciding what actions to take when a coastal State objects to the conduct of an AE rescue operation, the operational or unit commander must weigh the risk to the person(s) in distress, including potential for other assistance, the apparent seriousness of the coastal

State's communicated opposition, and its potential enforcement capability.

1.8.2.13 ***The right of self-defense applies in the conduct of an AE rescue operation and the following shall apply:***

(a) ***For Coast Guard rescue assets assisting on scene, the right of self-defense shall extend to and include persons, vessels, or aircraft being assisted and/or escorted;***

(b) ***The right of self-defense shall not include protecting the assisted persons (unless aboard the Coast Guard unit), vessels, or aircraft from legitimate law enforcement efforts conducted by a coastal State; and***

(c) ***Use of force, as detailed in reference (o) and applicable Rules of Engagement, provide more detailed information and procedures.***

1.8.2.14 During the conduct of an AE rescue operation, it may be useful for the Coast Guard rescue asset to make SECURITE broadcasts when entering into or over a coastal State's territorial sea.

1.8.2.15 ***A coastal State shall be notified of actual or potential marine pollution associated with a possible rescue operation in their respective territorial sea.***

1.8.2.16 ***Area and District Commanders shall***:

(a) ***Ensure operational commanders, RCC watchstanders, and Coast Guard rescue units understand and adhere to Coast Guard policy in the conduct of AE rescue operations into or over a coastal State's territorial sea;***

(b) ***Establish procedures for timely notification of the Coast Guard National Command Center of the conduct of an AE rescue operation;***

(c) ***Upon becoming aware of persons in distress in a coastal State's territorial sea, authorize Coast Guard rescue units to conduct an AE rescue operation, as required;***

(d) ***If available, arrange appropriate assistance, including assistance from the coastal State, consistent with the immediacy and severity of the situation.***

(e) ***Ensure during the conduct of an AE rescue operation, the Coast Guard rescue asset follows standard Coast Guard rescue practices and procedures;***

(f) ***Alert the coastal State of potential marine pollution associated with an AE rescue operation:***

(1) ***For rescue operations involving vessels carrying oil or hazardous chemicals off the coast of Canada or Mexico, ensure that notification is made to that coastal State, including alerting the coastal State's pollution incident On Scene Coordinator (OSC) under the appropriate Joint Contingency Plan; and***

(2) ***Notification should be coordinated with the cognizant U. S. pre-designated Federal on Scene Coordinator (FOSC).***

(g) ***Direct Coast Guard rescue asset in the conduct of AE rescue operation to proceed to the scene, render appropriate assistance, and depart as soon as possible;***

(h) ***Advise the coastal State of the situation and intentions, or broadcast in the blind if communications cannot be established;***

(i) ***Keep any involved RCC informed;***

(j) ***Continue to monitor the situation;***

(k) ***Document communications with any FSP; include Commandant, DOS and the American Embassy of the affected coastal State as an information addressee;***

(l) ***Develop and issue appropriate subordinate directives to ensure accurate implementation of this AE policy, including guidance on:***

(1) ***The conduct of AE rescue operations in a coastal State's territorial sea;***

(2) ***Establishing procedures to provide ships and aircraft of other nations comparable support in the conduct of reciprocal AE rescue operations in the U.S. territorial sea; and***

(3) ***Information concerning communications, including:***

a. ***Maintain communications by the most rapid means, followed by an immediate precedence action message providing information on the conduct of the AE rescue operation to the National Command Center, Joint Chiefs of Staff (JCS), other Area and District Commanders, DOS, the American Embassy in the coastal State, and the National Military Command Center (NMCC); and***

b. ***After initial interagency coordination, subsequent action SITREPs should be addressed to the appropriate operational commander, with information to Commandant (CG-DCO).***

(m) ***Notify the Coast Guard National Command Center concerning:***

(1) ***The conduct of an AE rescue operation by Coast Guard rescue units;***

(2) ***If a coastal State objects to a Coast Guard rescue asset conducting an AE rescue operation within their territorial sea, interferes with, or otherwise disrupts such entry;***

(3) ***If the coastal State ceases to object to such entry, or ceases to interfere with or otherwise disrupt the Coast Guard rescue asset's conduct of an AE rescue operation.***

(4) ***If military or police units of a coastal State attempt to interfere with or otherwise disrupt a Coast Guard rescue asset carrying out an AE rescue operation;***

(5) ***If a Coast Guard rescue asset is exercising, or is likely to exercise, the right of self-defense in or over a coastal State's territorial sea in the conduct of an AE rescue operation; and***

(6) ***If a Coast Guard rescue asset will continue in the conduct of an AE rescue operation for a person in distress in a coastal State's territorial sea after the coastal State has objected to entry.***

(n) ***Communication to the Coast Guard National Command Center shall be by the most rapid means, followed by an immediate precedence message, with JCS, other Area and District Commanders, DOS, the American Embassy in the coastal nation, and the NMCC included as information addressees***.

1.8.2.17 ***Coast Guard unit commanders, upon becoming aware a person in distress in a coastal State's territorial sea, shall:***

(a) ***When notified of a person in distress, advise their operational commander via the most expeditious means consistent with the immediacy and severity of the situation, their position, on scene endurance and intentions;***

(b) ***Determine the position, vessel description, nature of problem, person(s) on board, survival gear, on scene conditions, potential for marine pollution, etc.;***

(c) ***As circumstances dictate, conduct an AE rescue operation, or attempt to arrange assistance;***

(d) ***Establish and maintain communications with those in distress, and with the coastal State as directed by the operational chain of command; and***

(e) ***Relay the distress information to the appropriate RCC.***

CHAPTER 2
SAR COMMUNICATIONS

Section 2.1

Global Maritime Distress and Safety System (GMDSS) and Other Satellite Notification Systems

2.1.1 Introduction

The Global Maritime Distress and Safety System (GMDSS) is an internationally established distress and safety system. GMDSS was established by the International Maritime Organization (IMO) in 1988, and GMDSS equipment carriage requirements are now mandatory for vessels subject to the Safety of Life at Sea (SOLAS) Convention. GMDSS also can benefit all maritime interests. GMDSS relies upon the establishment of specific "sea areas" of communications and multiple distress alerting and communications networks and methods. This improvement in ship-to-shore distress alerting requires particular equipment on board vessels and at Coast Guard RCCs, Sectors, and Communications Command (COMMCOM) (formerly Communications Area Master Stations (CAMS)) in order to send and receive alerts. The primary purpose of GMDSS was to change from a ship-to-ship method of distress alerting to a ship-to-shore method. It provides for the automatic identification of the caller and the location of a vessel in distress. GMDSS became fully effective for the signatory nations of the SOLAS convention on 1 February 1999.

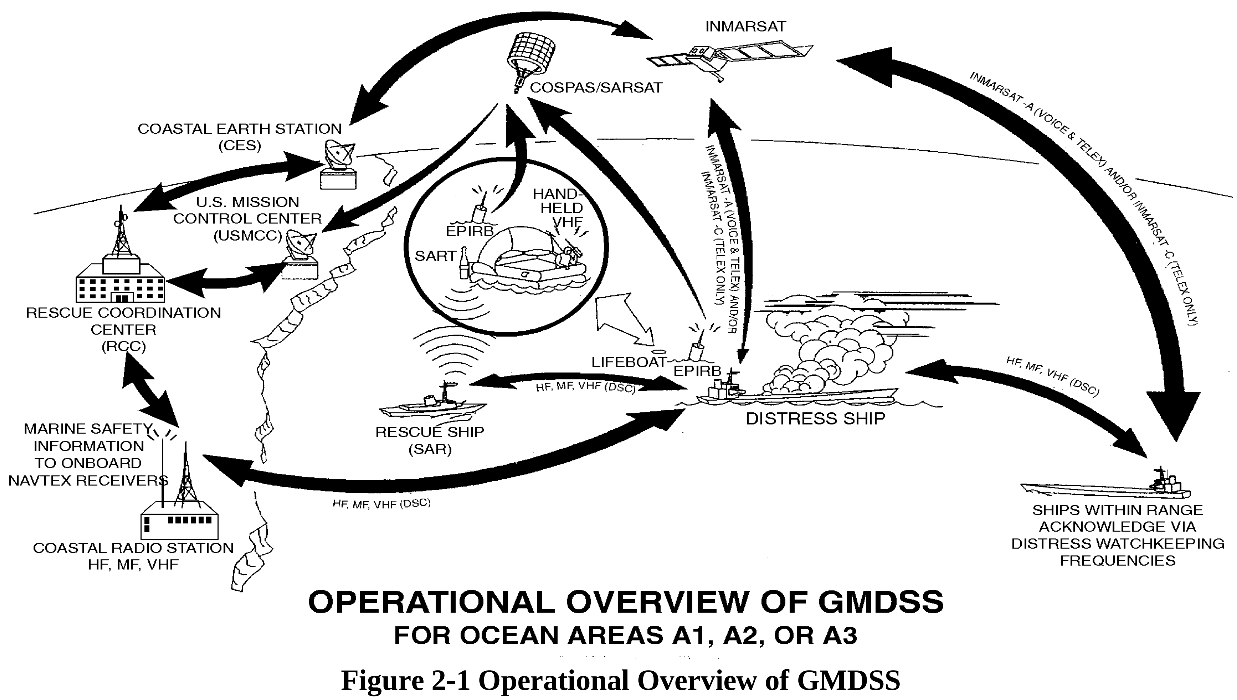


Figure 2-1 Operational Overview of GMDSS

GMDSS is the umbrella of internationally approved distress telecommunications systems. INMARSAT and 406 MHz EPIRBs are the internationally recognized methods of satellite distress alerting under GMDSS. Digital Selective Calling (DSC) is the internationally recognized method of sending a terrestrial digital distress alert. For mariners not equipped with INMARSAT, EPIRBs, or DSC, use of traditional VHF-FM distress voice channels is the preferred method of distress alerting.

2.1.2 GMDSS Functions

GMDSS has 9 specific functions which SOLAS ships must be capable of performing.

2.1.2.1 **Transmitting** ship-to-shore distress alerts by at least two independent and separate means.

2.1.2.2 **Receiving** shore-to-ship distress alerts.

2.1.2.3 **Transmitting and receiving** ship-to-ship distress alerts.

2.1.2.4 **Transmitting and receiving** search and rescue (SAR) coordination communications.

2.1.2.5 **Transmitting and receiving** on scene communications.

2.1.2.6 **Transmitting and receiving** locating signals (EPIRBS/ELTs).

2.1.2.7 **Transmitting and receiving** maritime safety information (MSI).

2.1.2.8 **Transmitting and receiving** general radio communications (ship/ship, ship/shore and shore/ship).

2.1.2.9 **Transmitting and receiving** bridge-to-bridge communications.

2.1.3 GMDSS Coverage Areas

GMDSS divides the world's oceans into four "sea areas." SOLAS ships have distinct equipment carriage requirements for each area through which they transit.

2.1.3.1 **SEA AREA A1:** (VHF-FM range) An area within the radiotelephone coverage of at least one VHF coast station in which continuous DSC alerting is available as defined by the International Maritime Organization. Sea Area A1 has been implemented

2.1.3.2 **SEA AREA A2:** (MF range) An area, excluding sea area A1, within the radiotelephone coverage of at least one MF coast station in which continuous DSC alerting is available as defined by the International Maritime Organization.

2.1.3.3 **SEA AREA A3:** (HF & Inmarsat range and Iridium) An area, excluding sea areas A1 and A2, within the coverage of an INMARSAT geostationary satellite in which continuous alerting is available.

2.1.3.4 **SEA AREA A4:** An area outside sea areas A1, A2 and A3.

2.1.4 GMDSS Sub-Systems

GMDSS consists of numerous telecommunications sub-systems, including:

2.1.4.1 **Digital Selective Calling (DSC):** for distress, urgency, safety, routine, ship's business, and test calling via HF/MF/VHF-FM.

2.1.4.2 **NAVTEX:** narrow-band direct-printing telegraphy for transmission of navigational and meteorological warnings and urgent information to ships on MF.

2.1.4.3 **SITOR:** Simplex Teletypewriter Over Radio for long-range ship-to-ship and ship-to-shore communications and transmissions of Maritime Safety Information (MSI).

2.1.4.4 Inmarsat C: for distress alerting via telex only, data communications and reception of MSI.

2.1.4.5 Radio-Telephone: for transmission via HF/MF/VHF-FM.

2.1.4.6 Satellite EPIRB: Satellite Emergency Position-Indicating Radio Beacon for distress alerting and locating survivors of distress incidents (406 MHz). May include AIS.

2.1.4.7 SART: Search and Rescue (radar) Transponder, for locating survival craft.

2.1.4.8 AIS-SART: Automatic Identification System-Search and Rescue Transmitter for locating survival craft.

2.1.5 Description of GMDSS Sub-Systems

2.1.5.1 Digital Selective Calling (DSC) - DSC is an IMO-specified technology intended to **initiate communications** over maritime radio and provide distress alert information to RCCs. DSC is similar to an electronic paging system: users of DSC may call a specific station or group of stations to establish communications. DSC calls are made using the applicable Maritime Mobile Service Identity (MMSI) number and appropriate DSC guard or calling frequencies, depending upon whether it is a distress alert or another type of call. The MMSI is the equivalent of the international radio call sign for establishing DSC communications. Federal Communication Commission (FCC) regulations require that all marine radio type accepted after 17 June 1999, have DSC capability. SOLAS convention regulated ships were required to outfit with DSC equipment as of 1 February 1999. Although DSC was intended to replace voice for initiating radio calls, the requirement for SOLAS class vessels to maintain a 24-hour continuous radio watch over VHF-FM channel 16 remains in effect. The requirement for SOLAS ships to guard 2182 KHz was abolished on 1 February 1999 and effective 01 August 2013, the Coast Guard (CG) terminated the radio guard for the international distress and safety frequency 2182 kHz.

(a) DSC distress calls may also be electronically relayed to the Coast Guard by any vessel that has a DSC compatible radio, or by other DSC equipped RCCs. ***All DSC distress calls, and DSC distress relays, shall be acted upon according to the guidance provided in this chapter***.

(b) Detailed policy guidance for Coast Guard units equipped with DSC is provided in Section 2.2.4. In general, shore units receiving DSC distress alerts should first acknowledge receipt of the call via DSC and then attempt to establish voice communications on an appropriate channel. ***Afloat units must wait five minutes to allow the shore units to respond.*** If there is no response then respond to the call and relay the alert as soon as possible to the nearest Coast Guard shore unit. RCC personnel should attempt to identify the vessel, either through database sources or by contacting the appropriate foreign RCC based on the country code (first three digits) of the caller's MMSI. There are no restrictions on RCC personnel contacting foreign RCCs for the purposes of SAR case execution.

(c) DSC calls fall into the following categories: Distress, Urgency, Safety, and Routine. The most important information to be gleaned from an incoming DSC call is the category of call, the MMSI number, and (for distress calls) the position and nature of distress.

2.1.5.2 **NAVTEX** is a service specifically designed for the promulgation of Maritime Safety Information as a part of the GMDSS. All SOLAS-regulated ships were required to carry NAVTEX receivers on 1 February 1993. NAVTEX broadcasts are made by CG COMMCOM.

(a) Coast Guard RCCs will use this broadcast method to alert ships in those coastal areas covered by NAVTEX to SAR and SAR-related information. The International Ice Patrol will use this system as a means of disseminating ice bulletins and warning messages. Districts, Sectors and the CG NAVCEN will use this system as a means of disseminating notices to mariners.

(b) NAVTEX message drafters should be aware of specific formatting required to ensure messages reach the targeted area. NAVTEX messages are prepared in accordance with the Chapter 12 of the Aids to Navigation Manual – Administration, COMDTINST M16500.7 (series). Charts of NAVTEX service areas are available on the CG NAVCEN site: http://www.navcen.uscg.gov/?pageName=NAVTEX .

2.1.5.3 **INMARSAT C distress alerts** are received via phone and email at LANTAREA and PACAREA command centers from the Santa Paula, CA coast earth station, or by relay from other RCCs. E-mails from TELENOR arrive on a standard form. "F-77 and FB-500 distress alerts may be received via phone at LANTAREA and PACAREA command centers from other coast earth stations or by relay from other RCCs. No-cost distress priority shore-to-ship calling is available for F-77 and, when implemented into the GMDSS, FB-500 as established by Inmarsat.

2.1.5.4 **INMARSAT C telex replies** to ships sending distress alert messages are sent using distress priority. Command Centers have access to a web page established and maintained by INMARSAT C provider, TELENOR. This web page allows the RCCs to send distress priority messages to the vessel, or vessels in the vicinity of the distressed vessel. ***If web or Internet access is not available, RCCs can fax the desired message TELENOR for broadcast. RCCs shall call the TELENOR operator to verify receipt of fax.*** INMARSAT C telex messages are prepared in accordance with guidance provided in Section 2.3 and Appendix C, Section 4.

2.1.5.5 **INMARSAT SafetyNET --** SafetyNET is a service of Inmarsat's Enhanced Group Call (EGC) system and was specifically designed for promulgation of Maritime Safety Information (MSI) as a part of GMDSS. The EGC system (technically a part of the INMARSAT-C system) provides an automatic, global method of broadcasting messages to all GMDSS-equipped vessels in both fixed and variable geographical areas or to predetermined groups of ships.

(a) ***Coast Guard RCCs shall disseminate and monitor search and rescue (SAR) distress related information using the INMARSAT SafetyNET system when the SAR case location is deemed to be outside the coverage of NAVTEX.*** In general, NAVTEX coverage extends to 200 NM off the coast. For specific coverage, charts of NAVTEX service areas are available on the CG NAVCEN Internet site: http://www.navcen.uscg.gov. The International Ice Patrol will disseminate ice warnings and International Ice Patrol bulletins to the appropriate NAVAREA using the SafetyNET system. Meteorological information is disseminated via SafetyNET by the National Weather Service and navigational information is disseminated by the

National Geospatial Intelligence Agency (NGA). ***Coast Guard RCCs shall not disseminate routine meteorological and navigational information via SafetyNET***. Meteorological and navigational information should be forwarded to the appropriate agency for dissemination.

(b) SafetyNET service is provided through TELENOR's web interface, and via voice operator in case of Internet failure, as described in Section 2.1.1.4(d). SafetyNET message drafters should be aware of specific formatting required to ensure messages reach the targeted area. SafetyNET Messages are prepared in accordance with guidance provided in Section 2.3 and Appendix C, Section 4. Charts of INMARSAT service areas are available on the CG NAVCEN Internet site: http://www.navcen.uscg.gov/images/marcomms/inmareas.gif

2.1.5.5.1 IRIDIUM DISTRESS ALERTS -Iridium GMDSS is a real time global coverage including Sea Areas A4 emergency response system

2.1.5.6 HF/MF/VHF-FM Radio Telephone -- HF, MF, and VHF-FM Radiotelephone are also components of GMDSS. The USCG no longer monitors HF voice only distress except for Kodiak, Alaska and Guam.

2.1.5.7 406 MHz EPIRBs/ELTs/PLBs -- A component of GMDSS, these beacons are integrated into the COSPAS- SARSAT system, which is an international satellite system designed to detect and locate distress beacons from EPIRBs, Emergency Locator Transmitters (ELTs), and Personal Locator Beacons (PLBs) all transmitting on the internationally protected 406.0-406.1 MHz distress frequency. The COSPAS-SARSAT system was established to support maritime and aeronautical safety by providing timely, accurate, and reliable distress alert information to SAR authorities worldwide. The fact that an alert has been detected, along with its position, is then relayed by way of a national Mission Control Center (MCC) to an appropriate national RCC or to another international MCC for initiation of the SAR activities. While EPIRBs are the primary equipment providing SARSAT emergency notification in the maritime environment, both ELTs used aboard aircraft and PLBs function identically within the SARSAT system. PLBs became legal for use in the United States in 2003. Due to their relatively low commercial price, it is expected that recreational boaters will increasingly use them as a method of emergency signaling. Policy for Coast Guard response to a PLB beacon is identical to that for an EPIRB or ELT. ***RCCs shall provide feedback into the USMCC Incident History Database (IHDB) System for all beacon alerts received, within five days of the case conclusion via the following website:*** https://incidenthistory.noaa.gov/ihdb/ ***Additionally, RCCs shall include a summary of the case in the Additional Comments section of the web page.*** Usernames and passwords for the IHDB can be obtained for RCC personnel by contacting the SARSAT Liaison Officer at Commandant (CG-SAR-2).

2.1.5.8 Search and Rescue Transponder (SART) -- The SAR Transponder (SART) is used for locating survival craft in the 9 GHz frequency band (9200-9500 MHz). Unique signals (swept frequency) are generated for interpretation only after being triggered by ship or aircraft radar. Range of air is 40 nautical miles; surface is 10 nautical miles. An audible alarm or light is activated on the SART when a rescue ship or aircraft is within close range. Battery capacity should be at least 96 hours. The SART signal appears as a distinctive line of 12 equally spaced blips on a radar screen extending outward from the SART position along its line of bearing.

2.1.5.9 AIS Search and Rescue Transmitter (AIS-SART). The AIS-Search and Rescue Transmitter is a portable manual-deployment survivor locating device intended for use on life rafts or survival craft and is an alternative to a radar SART. AIS SARTs are also used for personal locator beacons and man-overboard devices. The type of device used and an indication whether the transmission was active, or a test is transmitted as a safety related (text) message. As with radar SARTs, AIS SARTs are not intended as distress alerting devices, but rather as distress locating devices. The device sends updated position reports using a standard AIS class A position report. It has a built-in GNSS receiver.

AIS is a VHF-FM (line-of-sight) navigation-communication protocol for ship-to-ship-to-shore exchange of pertinent navigation safety information (e.g., vessel identity, position, course, speed, navigational status, data, etc.). Although AIS is not intended to be a means of distress communication or providing a Global Maritime Distress and Safety System (GMDSS) alert, there is nothing prohibiting AIS users from transmitting their own safety related texts to denote they are in distress or require assistance. Currently, there are three types of AIS broadcasting stations that are purposely and solely designed as (SAR) locating devices—AIS Search and Rescue Transmitters (SART), AIS Man Over-board (MOB) Devices and AIS EPIRBs. These AIS stations burst eight messages a minute, each with their unique source identity number. Seven messages provide a position; one signals whether it is active or in test mode.

Mandatory AIS carriage is expanding to smaller vessels and its voluntary use is growing. Given their lower purchase and operating costs, AIS SART devices, required under the Safety of Life at Sea Convention GMDSS regulations on ships and survival craft for locating a vessel or a person in distress, will eventually outnumber the use of radar SARTs. This proliferation of AIS will likely increase calls for assistance or distress to the U.S. Coast Guard. Determining which notifications may or may not be associated with a distress alert will require knowledge of these AIS messages and increased diligence of the SAR Mission Coordinator (SMC) and Joint Rescue Coordination Centers (JRCC).

GMDSS distress alerts and communications and AIS notifications are disparate protocols and systems. This disparity can cause confusion and pose a challenge concerning Coast Guard SAR mission coordination and execution. Distress alerts and AIS signals must be evaluated at the Rescue Coordination Center/ Command Center (RCC/CC) to determine whether or not there is a distress situation. ***The RCC/CC shall review all active distress alerts upon receipt of AIS Search and Rescue Transmitter (SART) notifications, determine the emergency phase, and take appropriate action.***

2.1.6 Satellite Emergency Notification Devices (SENDs).

Though not part of GMDSS, SENDs devices also operate over satellite systems. These alerting devices are intended for individual use and can be easily confused with 406 MHz Personal Locator Beacons (PLBs). SENDs may be dedicated satellite emergency notification devices or include additional functions and features. Additional features are increasingly being offered by SENDs, such as sending preprogrammed messages and/or tracking via Google Earth. Some newer devices even offer two-way data communication via satellite. Distress alerts are typically sent to a central commercial emergency call center for initial screening. These call centers will liaison with the appropriate SAR responder to notify them of the distress. Command Centers are reminded that the devices may offer more services than just distress alerting, such as tracking or two way text messaging. Command Centers may be able to communicate directly with the person in distress, enabling them to outfit and send the most appropriate SAR asset. SENDs alerts must be carefully evaluated and responded to in accordance with normal SAR case evaluation procedures (Uncertainty, Alert, Distress). SEND DEVICES DO NOT ALERT THE USCG.

Section 2.2
Digital Selective Calling (DSC)

2.2.1 DSC Guard Requirements

2.2.1.1 Coast Guard Shore Unit DSC Guard Requirements. Coast Guard Communications Command (COMMCOM) will guard five DSC HF frequencies: 4207.5kHz, 6312.0kHz, 8414.5kHz, 12577.0kHz, and 16804.5kHz. Coast Guard Sectors when equipped, will guard VHF DSC 156.525mHz (channel 70). USCG no longer monitors HF DSC voice only distress frequencies with the exception of 4125 kHz in Kodiak Alaska and Guam. When alerted, the USCG will activate and respond via the associated HF voice frequency. DSC guard frequencies and their associated voice frequencies are listed in Table 2.1.

Table 2-1 DSC Guard Frequencies, Associated Voice Frequencies, And SITOR Frequencies

DSC Guard Frequency	Voice Frequency	SITOR Frequency
156.525 MHz[1]	156.800 MHz	N/A
4207.5 kHz	4125 kHz*	4177.5 kHz
6312.0 kHz	6215 kHz (Not Monitored)	6268 kHz
8414.5 kHz	8291 kHz (Not Monitored)	8376.5 kHz
12577.0 kHz	12290 kHz (Not Monitored)	12520 kHz
16804.5 kHz	16420 kHz (Not Monitored)	16695 kHz

***Voice only distress frequencies are monitored in Kodiak Alaska and Guam on 4125 kHz. This is the only HF voice distress frequency monitored by the USCG**.

2.2.1.2 Coast Guard Cutter/Boat DSC Guard Requirements. ***Coast Guard vessels underway or at anchor equipped with VHF-FM DSC radios shall guard DSC frequency 156.525 MHz (channel 70).***

2.2.1.3 Canceling Alerts. The proper method for stations or ships to cancel a false distress alert they initiated is outlined below:

(a) Stop the transmission immediately (i.e. turn the transceiver “off” then “on” again);

(b) Send a “Distress Cancellation” message from the DSC radio (HF only);

(c) Switch to the associated voice frequency;

(d) Make an “all stations” broadcast on the corresponding voice frequency.

(e) The broadcast should indicate the name, call-sign, MMSI number, and that the station is canceling the false alert sent (quote distress text) with the local date and time.

Note: Other communications specific DSC policy and procedures can be found in Chapter 11 of Reference (p).

2.2.2 HF/VHF-FM DSC Distress Alert Response Policy: Coast Guard DSC Equipped Shore Units

2.2.2.1 Purpose. To provide operational shore units with policy guidance for responding to HF and VHF-FM DSC distress alerts.

2.2.2.2 Coordination. DSC is unique in that distress communications are initiated by digital data bursts that are widely distributed, but all follow-up communications after initial acknowledgement are typically handled by voice. International Telecommunications Union (ITU) regulations require each unit that receives a DSC distress alert or distress relay to send an acknowledgment, even if other units are already known to have done so. As such, it is probable that multiple sectors, along with Communications Command (COMMCOM), will receive and acknowledge the same DSC distress alert. For these reasons, it is important that Coast Guard units communicate with one another and with the default SAR Mission Coordinator (SMC) (see 2.2.2.6) to ensure role clarity during DSC case execution.

2.2.2.3 Initial Action. ***All shore-based units that receive a DSC distress call or distress relay shall complete the following actions:***

(a) ***Acknowledge the distress alert or distress relay***.

(1) Distress Alerts - Use the DSC acknowledgement function (sent to "All Ships") before taking any further action. ***Acknowledgements shall be made via DSC on the same frequency on which the distress alert was received, and shall take place after one minute to allow for units with automated HF/VHF-FM DSC to make calls on all HF/VHF-FM frequencies, and in all cases within 2.75 minutes of receipt, in accordance with ITU regulations.*** Acknowledgement does not imply assumption of SMC by the acknowledging unit. Acknowledgement simply means that a shore unit has received the DSC call and the U. S. Coast Guard is responding to it.

(2) Distress Alerts on the Rescue 21 suite – At the R21 suite an alarm will sound when a DSC alert is received. ***Watchstanders shall acknowledge all DSC alerts and follow the policy within this chapter.***

(3) Distress Relays – Shore units shall acknowledge all DSC distress relays as they are received. The first DSC Distress Relay for a given case shall be acknowledged via DSC. Subsequent Distress Relays that are received that relate to the same case may be acknowledged in one of two ways: a Distress Relay Acknowledgement sent to the "Individual" relaying vessel, or a voice acknowledgement. ***All acknowledgements shall take place within 2.75 minutes of receipt.***

(b) ***Monitor the corresponding voice frequency. After acknowledging a DSC distress alert, each receiving unit shall monitor the corresponding voice frequency for at least 10-minutes, or until follow-up communications between the distressed vessel and the Coast Guard is established***.

(c) ***Notify SMC. Each receiving unit shall notify the appropriate default SMC as outlined in Section 2.2.2.6 ("SMC Determination").*** Such notification will take place concurrent with the 10-minute monitoring period mentioned above.

2.2.2.4 Primary Voice Responder

(a) ***For all HF DSC distress calls, the primary voice responder shall be COMMCOM. For VHF DSC calls where a position is known, the primary voice responder shall be the sector within whose AOR the distressed vessel is located. These units shall have the primary responsibility to initiate a voice response if the distressed vessel does not promptly come up on the corresponding voice frequency. The primary responder shall make a single callout to the vessel in distress on the appropriate voice frequency, using any available information included in the DSC alert to identify the vessel.*** This information may include the vessel's position, nature of distress, or MMSI number. ***If communications are established, the primary voice responder shall verify that a distress situation exists, verify the vessel's position if possible, and notify the appropriate default SMC as outlined in Section 2.2.2.6.***

(b) ***If the primary voice responder is unable to establish communications with the distressed vessel after making the voice callout and monitoring the voice frequency for five minutes, the primary responder shall send a single point DSC call to the distressed vessel's MMSI number, distress priority. Because some DSC radios are only equipped with one receiver, primary voice responders shall send the single point DSC call three times over a 30-second period, in case the operator is using the receiver for voice communications.***

(c) Failure to establish communications. ***If communications with the distressed vessel cannot be established by the primary voice responder after following the steps outlined above, notification of such shall be made to the default SMC.*** Only the SMC can make the determination that a DSC distress alert is a probable false alert.

(d) VHF DSC distress calls with no position or invalid position. For VHF DSC distress calls where no position information is known, and for calls where the position of the distressed vessel falls outside the AOR of any sector with DSC capability, the 10-minute monitoring period for all receiving units remains in effect. If no communications are heard from the distressed vessel, the SMC may direct a specific unit that received the alert to assume the primary voice responder function.

2.2.2.5 SMC Determination

(a) ***Areas shall be the default level for SMC for all HF DSC distress calls. COMMCOM shall notify (by telephone, with follow-up via fax or message) the Area Command Center upon the receipt of all HF DSC distress calls.***

(b) ***Sectors shall be the default level for SMC for all VHF-FM distress calls.***

2.2.2.6 Delegation of SMC. Areas may delegate SMC for HF DSC distress cases to no lower than the District level. Delegation should normally occur in those cases where the position of the distressed vessel is known.

2.2.2.7 SMC Responsibilities. ***DSC is an internationally recognized distress alerting system, and, as such, DSC initiated distress calls shall be immediately placed in the "distress" emergency phase.*** The first priorities of the SMC are to determine if communications have been established with the distressed vessel, and to plot the distressed vessel's position, if known. ***For DSC distress cases outside of the U.S. area of SAR responsibility, the default SMC shall transfer SMC to the appropriate foreign RCC. If***

communications are established, and the distressed vessel is in the SMC's AOR, the case shall be prosecuted according to existing SAR policies and procedures. Usually, the sector in whose AOR the distressed vessel is located should be tasked to coordinate follow-up communications. If communications cannot be established, the SMC should use the vessel's MMSI to query the MMSI Database within MISLE and/or the Maritime Mobile Access and Retrieval System (MARS) database located on the ITU's website. The MMSI number can be used with either database to help determine the vessel's identity and any other possible means of contacting the vessel (such as an Inmarsat number). Where no communications are possible, but a position is provided via DSC that is inside the SMC AOR, assets should be dispatched to investigate as soon as possible.

Note: The MMSI database within MISLE is updated on a weekly basis whereas the information contained within the ITU database may be older than one month.

2.2.2.8 Case Claiming. ***Units shall claim cases for DSC initiated distress calls according to the existing guidelines for cases in this Addendum.***

2.2.2.9 Case Suspension. ***DSC alerts shall be treated as all other alerts.*** See Chapter 3, Section 3.4.9 for uncorrelated distress broadcast & alert procedures. Normal SAR case suspension procedures apply for those DSC initiated distress cases where:

(a) no communications with the distressed vessel can be established;

(b) no further information or means of contacting the vessel can be obtained from either database sources or other sources; and

(c) no position information is known.

2.2.2.10 Procedures for Non-Distress DSC Calls. Non-distress category DSC calls (Urgency, Safety, Routine, and Ship's Business) should be acknowledged if requested by the originator. "Test" DSC calls should always be acknowledged. The originator of the DSC call will normally dictate the method of acknowledgment (i.e., DSC, voice, etc.) and the working frequency in the initial DSC data transmission. ***If a specific method of response (i.e., SITOR) is not available to the called station, reply 'unable to comply'.***

2.2.2.11 Reporting Requirements. The collection of DSC statistics is an important tool as we attempt to measure both the effectiveness of DSC as a distress alerting mechanism, and the volume of calls being generated by this new system. MISLE incorporates DSC as a method of notification, and detailed MISLE entries by SMCs are crucial to this statistical gathering process.

2.2.3 VHF-FM DSC Response Policy: Coast Guard Afloat Resources

2.2.3.1 Purpose. To provide Coast Guard afloat resources equipped with VHF-FM DSC with procedures for responding to DSC initiated distress alerts.

2.2.3.2 General. All Coast Guard vessels have VHF-FM DSC radios. The United States will not be declaring Sea Area A-1 operational until the Rescue 21 system is fully operational.

These radios maintain a continuous radio guard on VHF-FM channel 70, despite the channel that may be tuned manually on the front panel. As such, vessels equipped with DSC radios could receive a distress alert on channel 70. When a DSC distress alert is received, the radio will emit a loud audio alarm. ***DSC distress alerts shall be considered***

the equivalent of a "mayday" call, and requires the same level of response.

2.2.3.3 Action. ***Coast Guard boats and cutters receiving a VHF-FM DSC distress alert shall:***

(a) ***For Coast Guard Boats:***

(1) ***As soon as possible, inform the SMC of the contents of the distress alert.***

(2) In areas where reliable VHF-FM DSC communications with one or more shore stations are feasible, coxswains should defer acknowledgement so that a shore station can acknowledge receipt of the call. Any boat receiving a call that is not acknowledged by a shore station within 5 minutes should acknowledge the call using procedures in Sub-paragraph (4) below.

(3) In areas where reliable VHF-FM DSC communications with one or more shore stations are known not to exist, boats that receive a VHF-FM DSC distress alert from a vessel should, as soon as possible, notify the appropriate Sector command center and acknowledge receipt of the distress alert when instructed.

(4) Boats acknowledging receipt of a distress alert in accordance with Subparagraphs (2) or (3) should:

a. Acknowledge receipt of the alert on the VHF-FM voice distress channel 16 and attempt to establish communications with the distressed vessel.

b. If unable to establish voice communications with the distressed vessel, boats shall acknowledge receipt of the distress alert using the DSC acknowledgment function. This action will send a DSC acknowledgement message to the distressed vessel, and terminate the DSC distress call.

c. Boats that acknowledge receipt of distress alerts are responsible for informing the applicable Sector or RCC (and OPCON/TACON, if different) by the most expedient means, of relevant information, to include but not limited to, the distressed vessel's position, nature of distress and MMSI number. This information is normally included in the DSC alert and can be retrieved via the radio display.

(b) ***For Coast Guard Cutters:***

(1) ***As soon as possible, inform the CO/OIC of the contents of the distress alert.***

(2) In areas where reliable VHF-FM DSC communications with one or more shore stations are feasible, CO/OIC's should defer acknowledgement so that a shore station can acknowledge the receipt of the call. Any cutter receiving a call that is not acknowledged by a shore station within 5 **minutes** should acknowledge the call using procedures in Subparagraph (4) below.

(3) In areas where reliable VHF-FM DSC communications with a shore station are known not to exist, cutters that receive a VHF-FM DSC distress from a ship should, as soon as possible, acknowledge receipt of the distress alert.

(4) Cutters acknowledging receipt of a distress alert in accordance with Subparagraphs (2) or (3) should:

a. Acknowledge receipt of the alert on the VHF-FM voice distress channel 16 and attempt to establish communications with the distressed vessel.

b. If unable to establish voice communications with the distress ship, cutters shall acknowledge receipt of the distress alert using the DSC acknowledgment function. This action will send a DSC acknowledgement message to the distressed vessel, and terminate the DSC distress call.

c. Cutters that acknowledge receipt of distress alerts are responsible for informing the applicable Sector or RCC (and OPCON/TACON, if different) by the most expedient means. Relevant information that could be available includes the distress vessel's MMSI number, position, and nature of distress. This information is normally included in the DSC alert and can be retrieved via the radio display.

2.2.4 VHF-FM DSC Distress Alert Response Policy: Coast Guard Shore Units

2.2.4.1 Purpose. To provide operational shore units with policy guidance for responding to VHF-FM DSC distress alerts.

2.2.4.2 Discussion. Rescue 21 will provide Coast Guard Sector operational shore commands with VHF-FM DSC capability. Until the Coast Guard is fully equipped with this capability, notification of receipt of a VHF-FM DSC distress call may be received by sectors via Coast Guard vessels and other mariners equipped with VHF-FM DSC.

2.2.4.3 System Operation. VHF-FM radios equipped with DSC maintain a continuous radio guard on VHF-FM channel 70, despite the channel the owner may tune manually on the front panel. As such, vessels equipped with these DSC radios can receive a DSC distress alert on channel 70. When a DSC distress alert is received, most of these radios will emit a loud audio alarm and automatically shift to VHF-FM Channel 16. The distressed vessel can then begin a voice transmission on this frequency. ***VHF-FM DSC distress alerts shall be considered the equivalent of a "mayday" call, and require the same level of response.***

2.2.4.4 Action. ***All VHF-FM DSC distress alerts shall be assumed to be distress incidents and will be classified in the distress emergency phase. Coast Guard shore units that receive notification of a VHF-FM DSC distress alert shall:***

(a) ***Legacy System. Obtain relevant information from the reporting source, to include the distressed vessel's position, nature of distress, voice frequency and MMSI number.*** This information is normally included in the DSC alert and can be retrieved by the reporting source via the radio display. DSC equipped radios are also capable of transmitting messages other than distress. It is prudent for units to monitor ALL SHIPS and SAFETY alerts in the event that a situation could further develop into a DISTRESS incident.

(b) Rescue 21 System. The R21 system will automatically alert the watch stander to a distress DSC call with an audible alarm and a red flashing pop-up box that contains the information provided in the data burst. The system will automatically query the MMSI database for the watchstander and provide additional vessel and vessel owner data that may be needed to carry out the case.

(c) ***Both Systems. Attempt to establish VHF-FM communications with the distressed vessel on channel 16. If unable to establish voice communications with the distressed vessel, the SMC shall issue an Urgent Marine Information Broadcast (UMIB). This is the minimum response requirement for VHF-FM DSC distress alerts. The UMIB shall include text requesting mariners and shore stations that received the VHF-FM DSC distress alert to contact the Coast Guard with their position. The UMIB shall be broadcast for at least one hour at 15-minute intervals. Radio call-outs are not sufficient--a UMIB is required.***

(d) ***Both Systems. The SMC shall launch appropriate resources when there is sufficient information to establish a reasonable search area. In the absence of such information, search planners must engage in aggressive detective work, using every available means to narrow down a search area, including queries to ascertain if other boats or shore-based radios received the digital alert.***

(e) Both Systems. It is also possible that the same distress alert may be received by multiple high-level or Remote Fixed Facility (RFF) sites. For these reasons, it is important that Coast Guard units communicate with one another to ensure role clarity (i.e. which unit is SMC) during VHF-FM DSC case prosecution. The Rescue 21 system will be able to break down the data stream to identify the RFF(s) the call was received on and indicate the quality and strength of the signal received on each RFF.

2.2.4.5 SMC Responsibilities. ***For Sector SMCs that receive notification from third party vessels within their AOR equipped with VHF-FM DSC, they shall handle the case according to established procedures for "mayday" calls.*** The reporting source should be queried for the following information specific to the DSC call:

(a) Category of call (verify distress);

(b) Nature of distress;

(c) Position (if the distressed position is unavailable, request the position of the vessel, agency or radio tower that received the DSC alert and, if R21 equipped, refer to the information provided to you in the data stream for the necessary information); and

(d) MMSI number.

(1) For DSC calls that cannot be correlated, a UMIB should be made, utilizing the distressed vessel's MMSI. If communications cannot be established, the SMC should use the vessel's MMSI to query the MMSI Database maintained by OSC Martinsburg, the MARS database located on the ITU's website, or other sources in an effort to identify the distressed caller. Where no communications are possible, but a position is provided, assets should be dispatched to investigate as soon as possible. If no communications are possible and the MMSI is not registered then treat the distress call as an uncorrelated mayday (Section 3.4.9).

(2) ***For RCCs that receive notification from Coast Guard vessels within their AOR equipped with VHF-FM DSC, they shall collect the same information as above. SMC for VHF-FM DSC calls with a position that falls within a sector AOR may be delegated to the sector.***

2.2.4.6 Case Suspension. Normal SAR case suspension procedures apply for those DSC initiated distress cases where:

(a) No communications with the distressed vessel can be established,

(b) No further information or means of contacting the vessel can be obtained from either database sources or other sources, and

(c) No position information is known.

2.2.4.7 False Alert Violation Reporting

(a) Unless a false alert is handled as a hoax case, a radio violation report should be submitted for every vessel, including foreign vessel in U.S. SAR areas of responsibility, for:

(1) Those who inadvertently transmit a false distress alert without proper cancellation, or who fail to respond to a distress alert due to misuse or negligence;

(2) Those who repeatedly transmit false alerts; or

(3) Those who deliberately transmit false alerts.

(b) Local Federal Communications Commission Field offices should be contacted to determine whether they will handle radio violations from foreign ships. If they will, violation reports should be submitted to them. If not, violation reports should be submitted to CG headquarters.

(c) Procedures for submitting violation reports are included in USCG Radio Frequency Plan, Reference (p).

2.2.4.8 False Alert Feedback Solicitations

(a) When a false alert is received a message should be sent to the offending vessel to ascertain the details associated with the alert. For recreational or other small craft that may not have record messaging capability, a mailing address should be found if possible and a letter sent in lieu of a message. The message/letter should indicate we are requesting the information to assist in sorting actual distress calls from false alerts and to help improve DSC system performance. Receipt of the message/letter by the offending vessel will help to educate the mariner on the proper use of the DSC Alert and implications of false alerts. Information received should be used by RCC's to identify system weaknesses. This information should be forwarded to the Office of Search and Rescue, Commandant (CG-SAR).

(b) A sample message format is provided in Appendix C. The same text should form the basis of a false alert feedback letter.

Section 2.3
SafetyNET Messaging

2.3.1 General

SafetyNET messages are a tool used by Coast Guard SAR Mission Coordinators (SMCs) to alert the maritime public to a distress or potential distress situation. Example text is outlined in Appendix C, Section C.4. Organizational responsibilities and guidance on procedures was taken from Reference (r), the International SafetyNET Manual.

2.3.1.1 When to Issue a SafetyNET Message. SafetyNET messages should be issued whenever the SMC determines that important maritime information needs to reach beyond the coverage of NAVTEX UMIBs. In cases near the outer ranges of NAVTEX coverage, both a NAVTEX UMIB and a SafetyNET message should be broadcast. ***SafetyNET messages shall be broadcasted when UMIBs would normally be required for Sea Area A3.***

2.3.1.2 Who Should Issue SafetyNET messages. The International Maritime organization registers and authorizes Rescue Coordination Centers (RCCs) to broadcast, via SafetyNET, shore to ship distress priority alerts and other urgent information. SafetyNET messages are drafted using an INMARSAT-C supported web interface. Controllers at the nine Coast Guard District RCCs, plus RSCs Guam and Puerto Rico, have user names and passwords to access the secure web site.

2.3.2 SafetyNET Message Procedure

The following steps shall be followed for each situation requiring an INMARSAT-C SafetyNET broadcast. The INMARSAT-C web site offers an extensive Help Guide for understanding the fields and buttons on each web form. This help section should be referenced for additional information.

(a) ***Determine the type of message to send and whether the message should be distress, urgent, or safety priority.*** In general, messages sent during the uncertainty phase of SAR should be sent at a safety priority, messages sent at the alert phase should be sent with urgent priority, and messages sent during the distress phase will have distress priority. <u>A cost will be incurred for using priorities other than Distress or Urgent</u> (see Section 2.3.5). Select the message form on the web interface based on the type and priority of message to be sent.

(b) ***Draft message in accordance with Section 2.3.3 and Appendix C. Request a receipt for every message.***

(c) ***Print the screen.*** (see Section 2.3.4).

(d) ***Send the message.***

(e) ***Record the Message Reference Number (MRN).*** The MRN will be displayed across the top of the form after pressing send.

(f) ***Check status and save a copy of the message.*** The status of the message, with a link to a copy of the message, will be displayed on the Delivery Status section of the web site.

(g) ***Save a copy of the receipt.*** The message receipt is sent to the inbox after all repeats of the message have been broadcast.

(h) ***Compare the original message to a copy of the message received over an EGC receiver. If the message is not the same, cancel the message and send a new message. If the message is broadcast longer than needed, proceed to step (i).***

(i) ***Cancel the message.*** Messages are auto cancelled on the web page. If a case ends sooner than expected, cancel the message ahead of the scheduled auto canceling time. Messages that are not appropriately cancelled after the distress situation has been resolved inadvertently tie-up communication channels and the broadcasting unit may be levied with expensive fees until the message is finally cancelled.

2.3.3 Drafting a SafetyNET Message

Each SafetyNET message has addressing, subject, body (text of message), repeat count, repeat interval, and repeat echo options. Guidance on using these options is provided below.

2.3.3.1 Addressing a message for broadcast. ***Messages must be addressed to each satellite that covers the desired region of broadcast.*** Since the Atlantic is covered by both the AOR – E and AOR-W satellite regions; most messages addressed to a region in the Atlantic should be addressed to both satellites..

2.3.3.2 Addressing a message to a vessel. ***Messages to an INMARSAT-C mobile number must also be sent to a particular satellite.*** The recommended satellite selection for this type of message is "Best". The Best option sends the message to the satellite the terminal was last logged onto. If a message is sent to a satellite that the terminal is not logged into, the message will result in a fault of "absent" and will not be transmitted. The SMC should re-address the message to next applicable satellite until a successful transmission is made.

2.3.3.3 Subject. The subject of the message typed into the web form does not become part of the broadcast message. The subject will only appear under the subject heading on the delivery status table on the web site.

2.3.3.4 Text of SafetyNET Messages. The text of a SafetyNET message should contain as much information about the situation as is reasonable. For vessels, a description and last know position should be given when known. Both a latitude/longitude position and geographic description should be given if available. For sample messages, see Section C.4. of Appendix C.

2.3.3.5 RCC Name in Text. ***The name of the RCC sending the broadcast must be included in the text of the message.*** The name will be the keyword used for sending a "monitored" copy of the message back to the RCC. See Section 2.3.5. for more information on monitoring broadcasts.

2.3.3.6 Repeat Options.

(a) Echo. The repeat Echo option will broadcast the message after the first broadcast. Since a terminal cannot receive while it is sending messages, the Echo option allows a terminal that was sending a message during the original broadcast to still receive the broadcast. (Sending a message usually takes less than 6 minutes). The EGC receivers are manufactured to tilter out any messages already received. Terminals that have already received the broadcast will not receive a repeat copy. In almost all cases, the Repeat Echo option should be selected (Drop down box is “yes”).

(b) Repeat Count. The Repeat Count option is the number of times the message will be sent.

(c) Repeat Interval. The Repeat Interval option is the time period between each broadcast. This option is coupled with the Repeat count for how long the broadcast will be made, up to a maximum of 28 days, i.e., if a repeat count of 12 is selected, with a repeat interval of 4 hours, the message will be broadcast every 4 hours, up to 12 times for a total of 2 days of broadcasting. (24 hours in one day – 6 broadcasts a day).

2.3.3.7 Printing and Saving Drafted Messages. It is recommended that RCCs print the screen version of the message before sending. The screen version provides information about repeat count and interval that is not available from the version posted under the MRN number on Delivery Status. The version that is saved under the MRN should be saved electronically for records.

2.3.4 Monitoring SafetyNET Broadcasts

The International Maritime Organization (IMO) requires all Marine Safety Information (MSI) providers to monitor the broadcasts that they originate. ***Monitoring must be completed by viewing the actual message that is received over an EGC receiver*** (from Section 5.7 of Reference (r)). Messages sent directly to a vessel cannot be monitored**.** ***RCCs shall confirm receipt of messages sent directly to vessels via INMARSAT-C’s web interface.*** Status can be checked under delivery status and receipt can be requested. The message receipt indicates that message has been received by the vessel. It *does not* indicate that the message has been opened and read by the vessel.

2.3.4.1 Elements of Monitoring

(a) Check that the message has been broadcast;

(b) Confirm that the message is received correctly;

(c) Ensure that cancellation of the messages are properly executed;

(d) Observe any unexplained delay in the message being broadcast.

2.3.4.2 Non-receipt of Broadcast Message. ***If a monitored copy of the message is not received the following steps shall be taken:***

(a) ***The RCC shall contact COMMCOM.***

(b) ***COMMCOM shall troubleshoot the receiver system and CGMS backside.*** COMMCOM personnel will manually push through any messages that are not automatically forwarded. COMMCOM personnel will notify the RCC if the message was not received.

(c) ***If a message is not received, or was apparently not broadcast, the RCC shall cancel the broadcast and draft a new message for broadcast***.

(d) ***If the second broadcast is not received, the RCC shall contact the U.S. INMARSAT provider’s customer care to troubleshoot problems with the web service.*** Area

Command Centers and Commandant (CG-SAR) should be notified of any major problems with the web service.

2.3.4.3 Canceling Messages. The web service is set up to cancel messages after the Repeat count expires. It is the responsibility of the RCC to ensure the message was actually cancelled. Cancellation of messages should be verified under Delivery Status on the web page and by monitoring the messages broadcast over the satellite. The Rep # should not exceed the Repeat Count in the original message. ***If a message does not auto cancel correctly, or if a case ends prior to the all repeats being broadcast, the message shall be cancelled using the cancel option on the delivery status screen. In addition, a cancellation message shall be broadcast to insure that the mariner is aware that a SAR situation no longer exists, requires their assistance, or a case has been suspended pending further developments. This message shall be sent with the same priority as the initial SafetyNET message.*** The MSG # that appears on the monitored copy of the SafetyNet message should be used to reference the message being canceled. *Do not use the MRN # assigned by the web page*. For sample messages, see Section C.4 of Appendix C. Sending a cancellation message will not auto select the cancel option. Ensure the message is no longer being broadcast using the cancel option before broadcasting a cancellation message.

2.3.4.4 Back-up Monitoring. If the Coast Guard monitoring system for SafetyNET is not operational, the National Geospatial Intelligence Agency (NGA) will provide forwarding services via e-mail.

2.3.5 Message Types

The Coast Guard is authorized to send messages with SafetyNET service codes of Distress, Search and Rescue coordination, and Nav-Warning per Annex 4, Section C of Reference (r). The Distress service message can be sent with Distress Priority to a circular region. The SAR Coordination message can be sent with Distress, Urgent, and Safety Priorities to a circular or rectangular region. The Navigational-Warning service message can be sent with Urgent, Safety, and routine Priorities to a NAVAREA region. To send these types of messages using the web interface the Shore to Ship Distress Alert, Search and Rescue, and Navigational Warning EGC message forms are used. The table below describes, in general, what messages are most applicable during each of the SAR emergency phases, whether an Alarm sounds on a vessel for each message, the addressing format for that message, and a typical header that is displayed on the received message. (Headers are dependent on the manufacturer of each receiver.)

Table 2-2 SafetyNET Message Types

Emergency Phase	Web form(s)	Priority	Alarm	Addressing	Header of bcst msg
Uncertainty	Search and Rescue	Safety	No	Circular	SAR <priority> Call to Area: (specific Circular or Rectangular region)
	Navigational Warning	Safety	No	NAVAREA	MetWarn/Fore <priority> Call to Area: (# of Navarea)
Alert	Search and Rescue	Urgent	Yes	Circular	Search and rescue: (specific Circular or Rectangular region)
	Navigational Warning	Urgent	Yes	NAVAREA	NavWarn/Fore Safety Call to Area: (# of Navarea)
Distress	Shore to Ship Distress Alert	Distress	Yes	Circular	Distress <priority> Call to Area: (specific Circular region)
	Search and Rescue	Distress	Yes	Rectangular	Search and Rescue (specific Circular or Rectangular region)

Note: Area and District command centers will incur a fee for any SAR messages sent with a priority of Safety.

Section 2.4
Maritime Mobile Service Identity (MMSI) Numbers

2.4.1 Introduction

The International Maritime Organization (IMO) has adopted the International Telecommunication Union's (ITU) Maritime Mobile Service Identity (MMSI) as an internationally recognized method for identifying distress alerts from automated radio equipment (i.e. DSC alerts). In addition, foreign 406 MHz EPIRBs are also being encoded with MMSI data.

MMSIs are nine digits and, like a call sign, uniquely identify a specific vessel. The first three digits of the MMSI indicate the country to which the vessel is registered. The final six digits serve as the Ship Station Identifier.

Vessels using MMSIs can be identified by consulting the MMSI database maintained by OSC Martinsburg or by contacting the following sources:

2.4.1.1 For U.S. MMSIs (338, 366, 367, 368, 369 or 303): FCC Watch Officer (202) 632-6975;

2.4.1.2 For all other countries: ITU Publication "List of Ship Stations"; MARS Database on ITU website; or via POCs listed in the International RCC Directory: http://www.itu.int/online/mms/glad/cga_mids.sh?lng=E

2.4.2 MMSI Assignment and Registration

2.4.2.1 SOLAS Class Vessels. The FCC assigns and will continue to assign marine radio licenses (and MMSI numbers) to U. S. SOLAS class vessels, which were required to have a DSC capable radio by 1 February 1999. The FCC sends the information contained on the vessel licenses to OSC Martinsburg, for inclusion in OSC's MMSI Database.

2.4.2.2 De-licensing of Recreational Boat Radio Stations. An FCC regulation requires that all marine radio type accepted after 1 June 1999 have DSC capability. This only refers to new radio designs existing designs can continue to be manufactured as presently configured (without DSC) for as long as the manufacturer desires. Despite the fact that all newly type accepted VHF-FM marine radio types contain DSC, the de-licensing of recreational boat radio stations that occurred as a result of 1996 Congressional action also removed the most effective means of assigning MMSIs to this constituency.

2.4.2.3 MMSI Assignment for non-SOLAS Class Vessels. In order to avoid having recreational boaters apply for an otherwise unnecessary license from the FCC in order to receive a valid MMSI, and pay the corresponding licensing fee, a new process for assigning MMSI numbers has been developed. The FCC issued a Public Notice in March 1997, soliciting for alternative management of the MMSI issuing process for non-SOLAS class vessels. Boat U.S. and The United States Power Squadron have a signed a Memorandum of Understanding (MOU) with the FCC and the Coast Guard in which they are authorized to issue MMSI numbers for non-SOLAS class vessels. Boat U.S. and The United States Power Squadron have also agreed to collect registration data from boaters and to download this information to the Coast Guard for search and rescue purposes. The Boat US and the U.S. Power Squadron are also authorized issuers of MMSIs. MMSIs may be applied for online at http://www.boatus.com/mmsi.

2.4.2.4 MMSI Assignment for U. S. Coast Guard Vessels and Shore Units. Information concerning the process of determining or acquiring MMSIs for Coast Guard specific vessels and shore units can be obtained from the Office of Communication Systems (CG-622). U.S. Coast Auxiliary surface vessel operators should request assignment of MMSIs using the same method as for a U.S. Non-Federal user. Additional information on MMSIs can be found at the site: http://www.navcen.uscg.gov/?pageName=mtMmsi. This site also provides general information on the MMSI numbering system.

2.4.3 MMSI SAR Vessel Identification System

In response to the SAR Program's requirement for accurate registration information on the owners of DSC radios, OSC Martinsburg has replaced the SAR ID Database with the web-based Maritime Mobile Service Identity (MMSI) Vessel Identification System ("MMSI Database"). The MMSI Database can be accessed via the Coast Guard MISLE system under vessel look-up. This database provides the SAR Planner with a rapid, reliable means of obtaining vessel information when planning a SAR case. The application allows the user to search for vessel information by Vessel Name, Vessel Call Sign, Official or State Registration Number, MMSI Number, IMARSAT Number, EPIRB Registration Number, or Soundex Search (vessel name only).

Queries will return all communications and contact information available for the vessel from the MMSI Database, as well as from the Lloyd's database. The MMSI Database includes available information from the Federal Communications Commission, Australian Maritime Safety Agency, International Telecommunications Union, International Registries – Liberia, International Registries – Marshall Islands, and also recreational boater information collected by Boat U. S. and The United States Power Squadron, SAR watchstanders that work cases with vessels not registered in the MMSI database should add new records to the database with as much information as possible.

Section 2.5
National Distress and Response System (NDRS) and Rescue 21

2.5.1 General

The Coast Guard is authorized by federal law (14 U.S.C. §102) to develop, operate and maintain "...rescue facilities for the promotion of safety on, under, and over the high seas and waters subject to the jurisdiction of the United States...". This authorizes the Coast Guard to provide distress and safety communications for the boating public, both commercial and recreational. The system established and maintained by the Coast Guard to provide this service is the VHF-FM National Distress and Response System (NDRS). The primary function of the NDRS is to receive distress alerts, coordinate SAR operations, and communicate with all maritime interests in waters (including inland waters) in which the Coast Guard has SAR responsibilities. A secondary function is to provide short-range command and control communications for all Coast Guard missions.

Since 1948, the Coast Guard has been dedicated to the concept of a terrestrial based VHF-FM System as the primary national system for short-range safety and distress communications. A VHF-FM project was established in 1970 to implement nationwide VHF-FM coverage; survey existing facilities, requirements, and needs; and forecast future Coast Guard mission requirements. The system was designed to provide short-range (20 NM from the coastline) distress, safety, and command and control communications in all areas of maritime activity where the Coast Guard had jurisdiction. The title “National VHF-FM Radiotelephone Safety and Distress System” was shortened to the “VHF-FM National Distress and Response System (NDRS)”.

Currently the National Distress and Response System Modernization Project (NDRSMP) is replacing the NDRS short-range communication system outdated legacy equipment with an integrated communication equipment suite called Rescue 21. To clarify, the NDRS is the name for the short-range communications function, while Rescue 21 is the name of the equipment suite used to implement the NDRS function. Rescue 21 is an upgrade that is occurring not only to the remote communication sites and connecting infrastructure, but also at the Sectors, Stations, and MSUs.

2.5.2 NDRS Coverage

The VHF-FM National Distress and Response System (NDRS) provides distress, safety, and command and control VHF-FM communications coverage in all areas of maritime activity in which the Coast Guard has SAR responsibilities. Coverage is required for:

(a) Coastal areas to at least 20 nautical miles offshore and in adjacent tidal waters. In areas where heavy concentrations of boating activity exist greater than 20 nautical miles offshore, coverage will also be provided to the extent practicable.

(b) All large bodies of inland waters such as Puget Sound, Long Island Sound, Chesapeake Bay and the U.S. waters of the Great Lakes.

(c) Navigable waterways where commercial or recreational traffic exists and the Coast Guard has SAR responsibility.

2.5.3 NDRS Hardware

The current NDRS is a collection of independently controlled VHF-FM base stations with multi-channel transceivers located at more than 300 sites in the continental U.S. (CONUS), Puerto Rico and the Caribbean, Alaska, Hawaii, and Guam. Each site has a transceiver, an antenna, and remote control hardware. In most cases, primary power is provided commercially, although backup power is available at a few selected locations. Locations were selected and distributed to provide the widest coverage possible; consequently, NDRS hardware is frequently co-located with other non-Coast Guard communications equipment. Since antenna height significantly affects the coverage area, the Coast Guard attempts to locate these sites to provide the greatest possible antenna height. As a result, NDRS transceiver sites are frequently referred to as "High Sites". Sectors control base stations locally or remotely through the best available means. Particular attention was paid to optimizing the receiving capability. The system was designed to achieve a high state of operational readiness using leased equipment and maintenance contracts.

2.5.4 Channel 16

Channel 16, 156.8 MHz, is designated as the maritime international distress and calling frequency and is monitored by Sectors on a 24-hour-a-day basis via the NDRS. When a non-distress call is received on this frequency, the caller is usually asked to move to a working channel, if possible, to keep the distress channel available. ***Great care must be used to ensure communications are not lost with the person(s) calling the Coast Guard, in distress or not***.

2.5.4.1 Active Listening. Two-way radio communications are often less effective due to weak reception/transmission, atmospherics, language dialects, or a heightened emotional state due to an emergent situation. When the information received is not absolutely clear to comprehend, it is *strongly recommended* that an effort be made to repeat the most critical information back to the sender to affirm the specific details. Inaccurate or incomplete information can result in search planners and operational units coordinating a response in a different manner based on the information provided. Time spent on ensuring that the information received is valid and accurate is worthwhile so that responding units can maximize their efficiency. An additional benefit of this practice is that other mariners operating in the general vicinity of a distress situation are better informed regarding the case particulars and may be more inclined to render assistance in a timelier manner than a unit that has to deploy from shore or divert from another mission to respond.

{Example: "Roger Sir, I understand that you are disabled ¼ nautical miles southwest of the sea buoy and are in need of assistance."}

2.5.5 Other Uses of NDRS

In addition to distress traffic, the NDRS is the primary tactical, short-range command and control communications system used by Coast Guard Sectors, stations, and equivalent units. Typical uses include communications between Sectors/stations and their underway vessels; COTPs; and Vessel Traffic Service controllers and vessels. ***In addition to these uses, the Coast Guard must transmit marine safety information broadcasts over the***

NDRS at specified intervals. Note: that the receiver monitoring Channel 16 is inactive at any site that is transmitting safety broadcast or other VHF communications.

2.5.6 Channel 16 Monitoring Requirements

All ships required to carry a VHF radio by SOLAS, Federal Communications Commission or Coast Guard regulations are additionally required to maintain a continuous watch on Channel 16. Ships are exempted from this watch only when participating in a vessel traffic service, or when communicating on another VHF channel.

2.5.6.1 Channel 16 SEELONCE Broadcast. The Rescue 21 communications system provides direction finding as an integrated function. This is a significant tool that will assist in locating vessels in distress. Because every call on channel 16 will generate a line of bearing on the Geo Display it is important to remember that weaker signals will be stepped on or blocked out by the stronger signals. ***If a mayday is detected and the Operational Unit (OU) watchstander and/or Communications Unit (CU) watchstander are unable to isolate the call because of heavy non-emergent traffic then the CU watchstander shall send out a "SEELONCE MAYDAY" broadcast (Reference (s), chapter 2.F or Section 4.1.6.8) to limit the traffic and subsequently the LOB's that appear on the Geo Display screen.*** This action should assist the OU and CU watchstanders in isolating the mayday signal.

2.5.6.2 VHF-FM Idiosyncrasies. The Rescue 21 communications system is not immune to those idiosyncrasies that plague the VHF-FM system. These issues include Tropospheric ducting (skip), echoing, block-out, transmission reception quality, and transmission bounce.

(a) **Tropospheric Ducting** is where a radio transmission is received at the command center that is beyond the communications system operating limits. This can also be related to skip or tunneling. The speed of a radio wave in the atmosphere is determined by the dielectric property of the air. This property depends on the pressure, temperature and humidity of the air. In general as we move upwards through the atmosphere the pressure decreases and temperature falls. This means that the dielectric property changes with height and allows a slight increase in the speed of a radio wave as we move upwards through the atmosphere. This in turn means that if a radio wave moves away from the earth at an angle less than 90 degrees, then the upper part of the wave travels faster than the lower part. Therefore even under normal conditions this can in effect bend, or refract, the wave back down to earth.

The normal rate of change of dielectric constant with height refracts the wave so that it follows a curved path of about 1.3 times the radius of the earth. Therefore, we typically can receive signals which are 1.3 times further than we can see by line of sight.

Tropospheric ducting occurs when we get a sharp rate of change in the dielectric constant as we move upwards through the atmosphere. This occurs when we get a rapid increase of temperature and a rapid decrease in humidity (dew-point) with height.

Under these conditions we now have the radio wave bent back towards the earth. However, the radio wave can then reflect back off the earth and become refracted again to return earthwards once more. Occasionally, this can happen a number of times with little attenuation but with some fading. The result can be long distance reception of radio waves that would normally have been far beyond the radio horizon. See Figure 2-2 below. The above information and Figure 2-2 were found at:

http://homepage.ntlworld.com/colin.martin5/radio/ducting.html

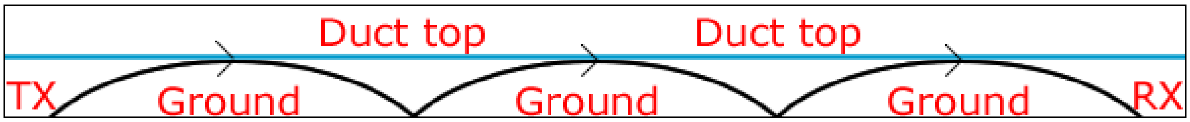


Figure 2-2 Ducting

(b) **Echo or signal distortion** can happen when a signal is simultaneously broadcast over all RFF's within a region using the Rescue 21 system as in Figure 2-3 below. It is expected that the levels of echoing and signal distortion will be minimal. However, if units experience a significant degradation of service to the maritime public, as a result of using the simultaneous method of broadcasting, the specific incidents should be documented and a report sent via chain of command to Commandant (CG-62).

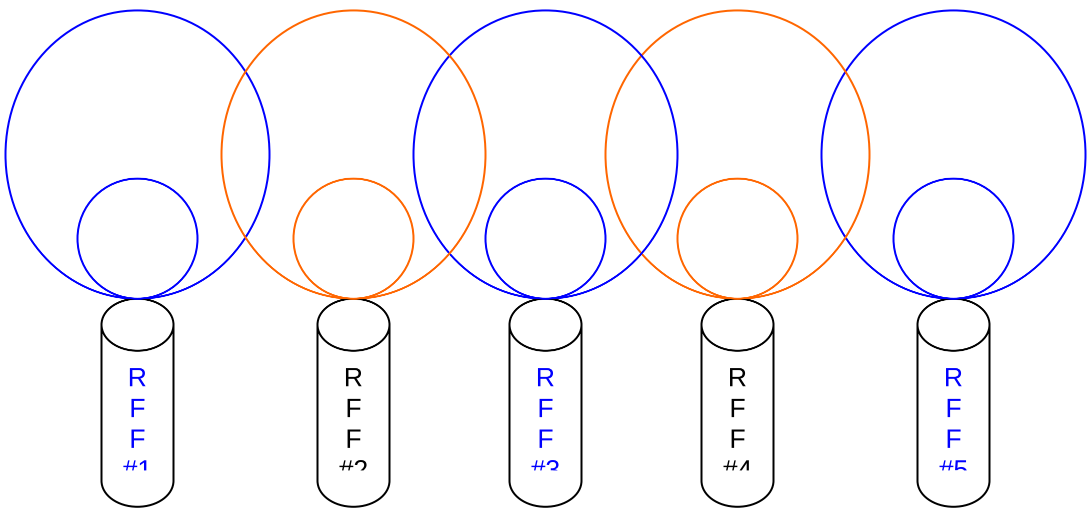
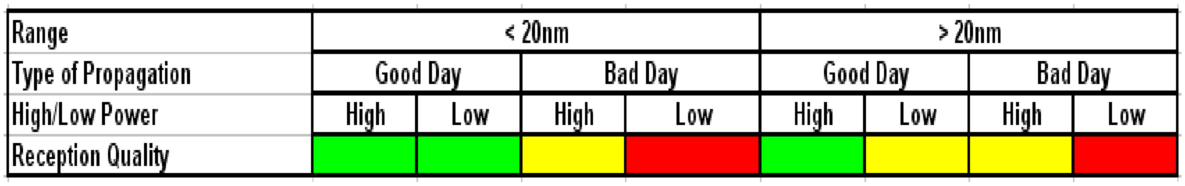


Figure 2-3 Echoing

(c) **Block-out** is where one transmission is heard at a time. This usually occurs when a stronger signal steps on a weaker signal.

(d) **Transmission reception quality** can be affected by range, atmospheric effects (ducting) and signal strength. See Figure 2-4 below.



Range	< 20nm				> 20nm			
Type of Propagation	Good Day		Bad Day		Good Day		Bad Day	
High/Low Power	High	Low	High	Low	High	Low	High	Low
Reception Quality								

Figure 2-4 Transmission Reception Quality

(e) **Transmission bounce** is where a signal is reflected off a building or large structure and is then received in the command center as shown in Figure 2-5. The bounced signal may create a LOB in the direction of the building or structure it bounced off of. If the signal is strong enough the command center may receive 2 LOB from different directions with the same voice transmission just milliseconds apart. The CUC will have to use the local knowledge to determine the most likely direction of the call if the distressed caller cannot be reached.

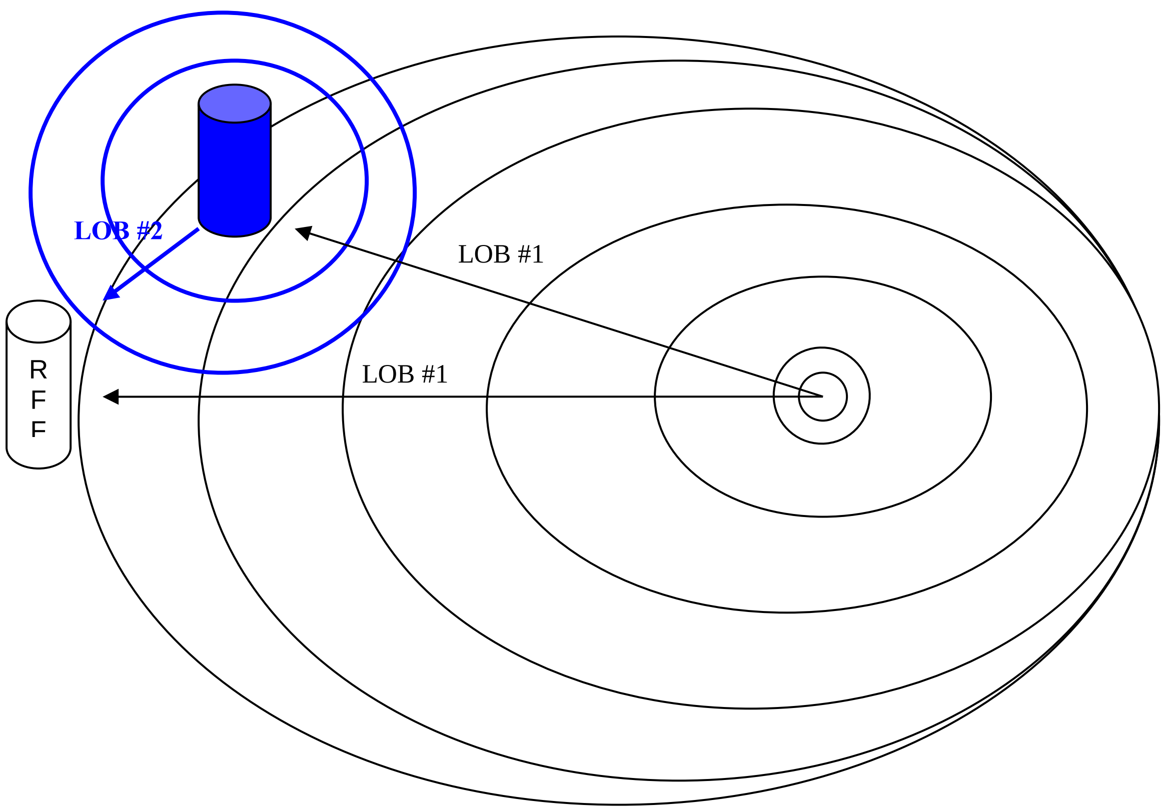


Figure 2-5 Transmission Bounce

2.5.7 New Capabilities Provided by the Rescue 21 System.

2.5.7.1 Available channels/circuits. Each high-level site or Remote Fixed Facility (RFF) will have 6 radios.

Radio 1: VHF Guard – Dedicated channel 16

Radio 2: VHF(1) – Open to select channels

Radio 3: VHF(2) – Open to select channels

Radio 4: UHF – Open to select channels

Radio 5: DSC Guard – Dedicated to channel 70 (data only)

The open channels can be distributed to the regional stations for use at the Sector command center's discretion. For example, each high level site has 3 channels for general use, and if a command center has 5 high-level sites within their AOR, then that totals 15 channels from which to choose for distribution. The Sector command center maintains full control of every RFF at all times.

2.5.7.2 Digital Selective Calling. The basic functionality of DSC is described in Section 2.2. In addition to the basic functionality, Rescue 21 also provides the ability to plot the DSC call on a geographic display and to rapidly interrogate the MMSI database to obtain any available information associated with the originating MMSI.

2.5.7.3 Communications Coverage. The Rescue 21 communications coverage has been upgraded to receive a transmission of a 1-watt radio 2 meters high out to 20NM. The majority of maritime radios are 5 to 25-watts and are higher off the water, increasing reception range.

(a) In regions where the Remote Fixed Facilities or RFFs, formerly referred to as high-level sites, are shared (when one RFF covers a portion of 2 AORs), the Sector region in which the RFF resides has primary control.

(b) ***If the shared RFF is needed to perform Coast Guard missions in the secondary region then the secondary user must request control of the RFF.***

(c) ***The primary user shall relinquish control of shared towers for higher priority missions, such as, SAR, MEDEVAC, etc***.

2.5.7.4 Conferencing or Phone Patching. Conferencing is a function that allows USCG radio operators to communicate with Federal, State or local agencies. For example, if a Coast Guard boat needs to communicate with an ambulance waiting on shore, the Sector communications unit controller is able to call the ambulance company and patch the ambulance and Coast Guard boat directly with a few keystrokes in a console-to-console connection. Once the two units are connected all transmissions will be heard over both of the frequencies being used by each asset. It is advisable that the Coast Guard use working channels when connecting into such a phone conference.

2.5.7.5 Automated Broadcasts. The automated broadcast feature can be used for single or repetitive radio broadcasts. The broadcast can either be recorded in the operator's voice or broadcast with a voice synthesizer. Once the broadcast has been composed, recorded and is ready for release, a prompt will confirm the request for release so that broadcasts are not released prematurely. Additionally, the prompt will reappear each time the broadcast is to air. This will allow the operator to cancel the broadcast if it is no longer needed or change the broadcast as necessary.

2.5.7.6 Recording and Playback. All communications within the R21 system are recorded and are available for immediate playback.

Section 2.6
Urgent Marine Information Broadcasts (UMIBs)

2.6.1 General

Urgent Marine Information Broadcasts (UMIBs) are a tool used by Coast Guard SAR Mission Coordinators to alert the maritime public to a distress or potential distress situation. Specific communications procedures and formatting to be used for UMIBs are outlined in Chapter 12 of Reference (p), the Coast Guard Telecommunications Manual.

2.6.1.1 When to Issue a UMIB. UMIBs should be issued whenever the SMC determines that important maritime information needs to reach the widest possible audience. ***UMIBs shall be used upon the receipt of***:

(a) all uncorrelated MAYDAY channel 16 calls;

(b) uncorrelated VHF-FM DSC distress calls;

(c) flare sightings;

(d) overdue vessel reports; and

(e) other situations as deemed necessary by the SMC.

UMIBs should be issued on a schedule as outlined in Table 12-1 of Reference (p). In general, this means a UMIB is issued upon receipt, and every fifteen minutes thereafter for the first hour. After that time, UMIBs are issued along with scheduled broadcasts until cancelled, or as directed by the originator on a case-by-case basis.

2.6.1.2 Who Should Issue a UMIB. Qualified communications personnel at COMMSTAs and Sector Command Centers, when directed by appropriate authority, will issue UMIBs. ***All UMIBs shall comply with the requirements and provisions Reference (p).***

2.6.1.3 Text of UMIBs. The text of a UMIB should contain as much information about the situation as is reasonable. For vessels, a description and last known position should be given when known. Both a latitude/longitude position and geographic description should be given if available. ***UMIBs that are to be broadcasted on VHF-FM shall include the time of the incident in both local time and Greenwich Mean Time (GMT).***

The Rescue 21 system will provide the format for the draft automatically; however, watchstanders must assure that all the pertinent information is provided. It will also allow automatic scheduling and broadcast of the UMIB on the time interval determined by the Duty Officer.

2.6.2 UMIB vs. Callouts

Callouts differ from UMIBs in that they are a radio broadcast directed toward a specific vessel, rather than directed at a broad audience, as is the UMIB. Callouts also do not imply or require a state of “urgency” whereas the UMIB by definition conveys urgency. Usually callouts are appropriate at the earlier stages of an overdue vessel case in an attempt to establish communications with a specific vessel. When callouts fail, a UMIB will be issued. The use of callouts should not unduly delay the use of a UMIB.

2.6.3 UMIB vs. MAYDAY Relay

Mayday Relays are intended to alert the maritime public of an incident involving imminent danger to life. They are appropriate under three circumstances:

(a) When a unit not in distress seeks assistance for a unit that is in distress;

(b) When a responding unit realizes that additional assistance beyond their own capability is required; and

(c) When a distress message is heard by a unit not in a position to assist and that message is unacknowledged.

The majority of Coast Guard originated "Mayday Relay" messages would fall under (a) above. It is a value judgment made by the controller based an evaluation of all relevant circumstances, i.e. weather, previous indication of distress, or debris sighting.

Section 2.7
Cellular Telephones and *CG

2.7.1 Cellular Telephones

Maritime cellular telephone usage is growing rapidly, and an increasing number of boaters are relying on cellular telephones in conjunction with, or sometimes instead of, VHF-FM radio to communicate with the Coast Guard. Cellular telephones can be a reliable supplemental means of communication for boaters in distress to contact the U.S. Coast Guard for help. Cellular telephones are NOT a replacement for VHF-FM radios, which remain the most effective and preferred method of voice communications, particularly in an emergency. While a cellular telephone is not the recommended or preferred method of distress communications, when properly used it does meet the requirements of reliable communications as outlined in the Maritime SAR Assistance Policy.

2.7.1.1 The Coast Guard continues to encourage the use of VHF-FM radio as the primary method of distress notification. Cellular telephones are not an "alternative" to VHF-FM, which affords additional functionalities that are valuable in SAR, in contrast to the serious limitations of using a cellular telephone, particularly in an emergency.

(a) VHF-FM allows broadcast capability while cellular limits communications to point-to-point communications. Cellular telephone conversations cannot be heard by other boaters in the area who may be in a position to render immediate aid to someone in distress.

(b) VHF-FM allows easy direction finding on the generating station. Determining the general area (generally a 10-15 mile radius) of a cellular call requires close coordination with cellular service providers to identify the cellular "cell" from which it was placed, which is a time consuming endeavor.

(c) VHF-FM allows mariners to easily receive Broadcast Notice to Mariners, Urgent Marine Information Broadcasts, Urgent Weather Advisories, and Marine Assistance Request Broadcasts while cellular telephones will not receive this critical information.

2.7.1.2 Due to the limitations of cellular telephones, as outlined in Paragraph 2.7.1.1, SAR checklists should include the following additional items for cases involving their use:

(a) caller's complete cellular telephone number including area code;

(b) user's cellular service provider or carrier (i.e., "Bell South Atlantic");

(c) whether or not a roam number is needed to recall the user and what the complete roam number is;

(d) whether or not other means of communications are available (establish other communications with the caller before terminating the cellular call);

(e) wattage of the cellular telephone, antenna height from the waterline, and approximate battery strength;

(f) establish a communications schedule or require the caller to call back at a scheduled time if possible; ensure user understands the cellular telephone, if there is sufficient battery strength, must not be turned off in order to receive further communications;

(g) ask if the user has an alternate power source available, such as a charged back-up battery or the ability to plug into the boat's power system;

(h) if a Maritime Assistance Request Broadcast will be made, notify the caller that their cellular telephone number will be broadcast when the Commercial Assistance Provider or Good Samaritan contacts the Coast Guard on the alternate working frequency; and

(j) obtain a shore-side point of contact.

2.7.1.3 Most cellular service providers offer some of the following services to assist in locating the origin of cellular calls from disoriented boaters.

(a) **Call Trace:** As long as there is a connection, the carrier's technician can determine which cell is receiving the call and, if power and antenna height are available, an approximate arc of distance from the cell tower.

(b) **Call Trace Modified:** After the call is initiated and the technician is notified, the caller can be instructed to call back at a specified time and the technician can determine through the use of signal strength at several cell sites, a more accurate probable position of the caller.

(c) **Cell Traffic Recording:** A carrier can determine the cell location of the last call placed by the subscriber given the cellular telephone number.

(d) **Tap:** This function provides notification when a call is made from the user's phone; beneficial in overdue cases.

(e) **Caller ID:** Indicates the number of the calling party, provided CG emergency line does not go through most private branch exchanges (PBX). Requires subscription from local carrier. If number is not displayed, Caller ID indicates whether carrier limitation or privacy blocking is the cause.

2.7.1.4 **Cellular Tower Locator**. When SAR watchstanders have determined that a case is in the distress phase, they may contact cellular companies to obtain call-identifying information through the cellular tower locator process. 18 U.S.C. § 2702 permits cellular companies to release call-identifying information to a government entity. However, to obtain this data without permission of the individual, exigent circumstances must exist. ***SAR watchstanders must determine that the case is in the distress phase, and shall articulate that they believe the subject is in imminent danger of death or serious physical injury. If a SAR watchstander determines that a case is in the alert or uncertainty phase, the watchstander shall complete pre-comms and ex-comms to investigate or obtain information on a vessel's location.*** When a distress call is received via Cell Phone and the caller's location is not known, use the procedures in Table 2-3 to identify the location of the cell tower and determine the tower's footprint. To supplement this procedure, a list of information to pass and questions to ask when talking with the cellular provider are provided in Paragraph 2.7.1.5 below.

Table 2-3 Cellular Tower Locator Process

Step	Action
1	Obtain the caller's name, cellular number, and cellular provider.
2	If unable to obtain provider from the caller, enter the cellular number into http://www.fonefinder.net/ to determine the provider.
3	Contact the provider's Subpoena/Court Order Compliance Center and request the tower location (and height) for the most recent call. T-MOBILE – (973) 292-8911 AT&T – (800) 635-6840 option 4 or (800) 291-4952 option 4 VERIZON – (800) 451-5242 option 4 US CELLULAR – (630) 875-8270 or (865) 777-8200 (after hours)
4	Explain that you are from a Coast Guard emergency response center; you have received or are the intended recipient of a distress call from a cellular phone serviced by the provider IAW 18 U.S.C. § 2702(b)(1) & (3). ***If applicable***, tell the provider's Center that you have determined that an emergency exists that involves immediate danger of death or serious physical injury; IAW 18 U.S.C. § 2702 (b)(8), this emergency justifies disclosure of cell tower information without delay.

(a) Federal law generally prohibits the voluntary disclosure of customer communications or records by a cellular provider. Two of several exceptions to this prohibition under 18 U.S.C. § 2702 may assist SMCs and SAR watchstanders in gathering information to support the successful conduct of a SAR case. Under these exceptions, cellular providers can make voluntarily disclosures:

(1) 18 U.S.C. § 2702(b)(3), with lawful consent of the customer or subscriber; or

(2) 18 U.S.C. § 2702(b)(8), to a government entity, if the provider in good faith believes that an emergency involving danger of death or serious physical injury to any person requires disclosure without delay of information relating to the emergency.

(b) Under 18 U.S.C. § 2702, a cellular provider may disclose customer communications voluntarily, but are under no legal obligation to do so, even if the request is made to support SAR operations.

(c) The request for information and the rationale used to justify the request must be documented within MISLE.

(d) Multiple requests for communications information from various Federal, State, and/or local SAR resources for the same SAR case should be avoided.

(e) Communication companies vary on their policies regarding the release of the information. It is harder to get the information from some companies than from others. The same is true regarding the operators with whom you will speak. You may need to be persuasive. If the operator does not give you the desired information, ask for the supervisor. If the supervisor will not give it to you, you may consult the appropriate duty attorney for additional guidance.

(f) 18 U.S.C. § 2702(b)(1) permits providers to disclose call-identifying information "to an addressee or intended recipient of such communications or an agent of such addressee or intended recipient." SAR controllers may apply this provision when receiving a call directly from the mariner seeking assistance or when receiving a third-party relay of a request for Coast Guard assistance. Likewise, this provision would apply if any "agent" of the Coast Guard, including but not limited to off-duty Coast Guard personnel or Auxiliarists received the initial cellular call and then relayed it to the SAR controller.

(g) **Policy.**

(1) ***If a person involved in a SAR case is threatened by death or serious physical injury, the SMC is authorized to request cell phone location data from an electronic service provider during any emergency phase (uncertainty, alert, or distress).***

(2) ***Prior to requesting cell phone location data from an electronic communication service provider, SMCs shall articulate and document, in a timeline entry, that a person involved in a SAR case is either threatened by or involved in an emergency that involves danger of death or serious physical injury.***

(3) ***Prior to requesting cell phone location data from an electronic communication service provider, SMCs shall provide an informational brief to the next higher level in the SAR operational chain of command for any SAR case classified in the uncertainty or alert phase. A timeline entry shall be entered upon completion of this brief.***

(4) ***SMCs shall ensure that any information provided by an electronic communication service provider is attached to the SAR case file.***

2.7.1.5 Information to pass and questions to ask when talking with the cellular provider. SAR Controllers should tell the Service Provider Operator the following things:

(a) If you have the distressed caller on the three-way line:

(1) I am with the United States Coast Guard.

(2) I am a Search and Rescue Watchstander.

(3) I have on the line a person who is one of your wireless service customers, and who right now requires assistance from the Coast Guard. Their distress call was received via his/her cellular telephone.

(4) In order to dispatch search and rescue resources I will need to know what cell or quadrant this phone call is being made from and which tower is receiving this transmission.

(5) Since your customer is on the line with me now, he can authorize you to release that information to me right now.

(6) Please go ahead operator and ask the caller what you might need to release this information to me now.

(b) If you cannot keep the caller on the line, or do not have access to three-way calling, or received the distress call via relay from a third party, then tell the service provider:

(1) I am with the United States Coast Guard.

(2) I am a Search and Rescue Watchstander.

(3) I have just received a distress call from a person calling on a cellular phone serviced by your company. I have the name and telephone number of the caller.

(4) In order to release search and rescue resources I need to determine the location of this caller.

(5) The only way to determine the position of the caller is to utilize the information you have on the cell and tower position of this call.

(6) Pursuant to Federal law, the Coast Guard, as a law enforcement entity and federal agency with emergency response authority, is entitled to this information if it is the intended recipient of the call or in the event that lives are in danger. It is our belief that the Coast Guard was the intended recipient of this maritime distress call [and, *if applicable*, if we do not dispatch search and rescue resources to this call this person could be injured or killed].

(7) Would you please release this information to me?

(c) If you get resistance from the operator:

(1) I am prepared to fax to you and to your supervisor a memorandum drafted by our lawyers and signed by the Coast Guard District (or Sector) Commander explaining this authority and why you should release such information as soon as possible. (see para. 2.7.1.6 below)

(2) Can I please have your fax number and the name of your supervisor? I need to bring this to his/her attention as soon as possible.

(d) If there is still resistance:

(1) Please give me the contact information for your in-house attorney. This matter needs to be dealt with as expeditiously as possible.

2.7.1.6 Standard Release of Call-Identifying Information Letter. If, after explaining the SAR situation and relevant authority to the provider, the SAR controller is unsuccessful at securing a disclosure of information from the provider, the SAR controller should have available a standard letter, signed by the USCG District or Sector Commander that can be immediately faxed to the provider's offices. This letter, on USCG letterhead, should explain the legal authorities under which the release of the call-identifying information is allowed. The SAR controller should encourage the provider's operator to consult with available management. The following is a Sample Letter Requesting Release of Call-Identifying Information:

3130
Date

Cellular/Wireless Communications Provider
Fax Number:

Dear Sir or Madam:

I am faxing this letter to request the urgent release of the cellular quadrant and tower location of the call made from the cellular telephone number (insert #) in accordance with 18 U.S.C. § 2702.[1] The caller has made an emergency distress call intended for the U.S. Coast Guard.[2] [*If appropriate*: *This is an emergency involving danger of death or serious physical injury to any person requiring disclosure without delay of communications relating to the emergency*. If available, add brief summary of facts supporting this statement.] Without the cell quadrant or tower location, the Coast Guard may not be able to locate the caller in time to render assistance to the caller and his/her passengers.

Please release this call-identifying information to my search and rescue controller. If you have any questions, I urge you to contact your supervisor and legal counsel immediately. Time is of the essence.

Thank you very much for your cooperation.

Sincerely,

RELEVANT COMMANDING OFFICER

CAPT/CDR
U. S. Coast Guard

[1] 18 U.S.C. § 2702 (b) provides:

A provider… may divulge the contents of a communication—

(1) to an addressee or intended recipient of such communication or an agent of such addressee or intended recipient;

. . .

(3) with the lawful consent of the originator or an addressee or intended recipient of such communication, or the subscriber in the case of remote computing service;

. . .

(8) to a governmental entity, if the provider, in good faith, believes that an emergency involving danger of death or serious physical injury to any person requires disclosure without delay of communications relating to the emergency.

[2] 14 U.S.C. § 521(a) provides: "In order to render aid to distressed individuals, vessels, and aircraft on and under the high seas and on and under the waters over which the United States has jurisdiction and in order to render aid to individuals and property imperiled by flood, the Coast Guard may . . . perform any and all acts necessary to rescue and aid individuals and protect and save property."

2.7.2 *CG Agreements/Routing of *CG Calls

In an effort to improve Search and Rescue incident response the Coast Guard has asked all wireless providers, *except those in Alaska*, offering a specialized keying sequence, such as *CG to reach maritime emergency assistance, to remove this feature. ***Any units holding a *CG agreement shall terminate the agreement.*** If any unit is unable to terminate the agreement with the cellular provider then refer that company to Commandant (CG-SAR), US Coast Guard.

The Coast Guard has requested that cellular companies begin work to reroute all *CG calls to the 911 Public Service Answering Point (PSAP) nearest to where the call originated, discontinue all active advertising, promotion and reference to the *CG service as a way to alert the Coast Guard for maritime distress, and to eventually eliminate the *CG service offering nationwide. Currently the *CG service is only available in Alaska.

2.7.2.1 **Calls for assistance from other Regions.** If a sector command center receives a call, distress or otherwise, from someone that is not in their region then determine the path the caller took to reach the contacted unit. For example, were they transferred from 911, the blue pages, *CG, or directory assistance. Once the path is identified and is not the fault of the caller, notify the operations officer of who was responsible for misdirecting the call so the responsible party can be notified of the proper routing of emergency maritime calls.

2.7.3 911

The Coast Guard must be proactive in ensuring that maritime distress calls to 911 are promptly routed to the appropriate command center. Sectors should liaison with all 911 services within their AOR to ensure they have appropriate check-sheets for maritime distress incidents and that they are aware of which Coast Guard command center they should be forwarding the calls.

Section 2.8
Alternate Means of Distress Notification

2.8.1 Distress E-mail and Text Messaging Policy

Some communication providers offer E-mail and text messaging capabilities. E-mail and text messaging are not designed for distress communication, and the CG does not endorse their use for distress alerting purposes.

(a) The CG will not provide E-mail addresses to the public for the purposes of facilitating E-mail distress alerts, and no CMDCEN or RCC shall be required to monitor E-mail for distress alerts.

(b) Although the CG does not endorse the use of E-mail or text messaging for distress alerting, all discernable distress alerts, regardless of format, shall be acted upon expeditiously by CG personnel.

(1) CG units that receive an E-mail or text message distress alert shall notify the appropriate CMDCEN or RCC by telephone.

(2) E-mail or text message distress alerts shall not be forwarded for notification purposes except as a follow-up to voice notification to a CMDCEN or RCC.

2.8.1.1 Telephone Policy. The commanding officer or officer-in-charge of each unit shall ensure personnel are proficient in handling telephone calls, particularly those of a distress nature, terrorist threat, or a bomb threat before assigning them the duty of answering telephones. In addition, if the CG unit cannot take action in response to a distress call, terrorist threat, or bomb threat, the commanding officer or officer-in-charge shall ensure personnel know how to relay the information to appropriate supervisors or authorities.

2.8.1.2 Distress Cellular Telephone Policy. Marine cellular telephone usage has grown rapidly, and an increasing number of boaters are relying on cellular telephones in conjunction with, or sometimes instead of VHF-FM radio. Cellular telephones are not considered a replacement for a VHF-FM radio.

(a) Important points to remember regarding cellular telephones:

(1) A voice call made via cellular telephone may be recorded on the SCC's DVL as long as the call is made to a distress telephone line. When properly used, cellular phones meet the requirements of reliable communication as outlined in this Addendum. Cellular telephone communications are point-to-point. Cellular telephone conversations cannot be heard by other boaters in the area who may be in a position to render immediate aid to someone in distress.

(2) Determining the geographic location of a cellular call is time consuming and requires close coordination with cellular service providers to identify the "cell" from which it was placed.

Section 2.9
Lost Communications with a Coast Guard Asset

2.9.1 Lost Communications Procedures

Chapters 8 and 9 of Reference (p) discuss communications requirements for Coast Guard vessels and aircraft. Communications schedules for operational cutters, boats, and aircraft are established by the cognizant Operational Commander (OPCON). The decision to initiate a Search and Rescue case following lost communications with a Coast Guard asset is also the responsibility of that unit's OPCON. This decision is a judgment call, but units should not wait to alert the SMC once a communication schedule is missed and subsequent attempts to contact the asset fail.

2.9.1.1 The following is taken from Chapter 9 of Reference (p) regarding Lost Communications with a Coast Guard Aircraft: ***"If the Aircraft Commander fails to check in on the primary or secondary frequency within five minutes of their communications schedule, the guarding station shall initiate an alert. The aircraft's parent command shall be notified first, followed by the cognizant District Command Center…."***

2.9.1.2 As with all search and rescue incidents, time is the enemy of a successful outcome. Lost Communication cases are essentially "overdues," but unlike most cases of overdue private vessels, the stringent communications schedule requirements of Coast Guard assets allow the SMC to proceed more rapidly through the Uncertainty to Alert to Distress emergency phases.

Section 2.10
Recorded Radio Transmissions and Telephone Lines

2.10.1 Guidance

2.10.1.1 The following guidance is taken from Chapter 6 of Reference (p):

Use of Recording or Monitoring Equipment

Coast Guard personnel, in the conduct of their official duties, shall not engage in clandestine, surreptitious, or other covert[1] use of telephone recording, listening, or monitoring equipment or aid or acquiesce in the use of such equipment.

Recording equipment is authorized for use at Coast Guard Command Centers, VTS, and COMMCEN units to record telephone or radio conversations since they primarily concern air safety, maritime safety, or SAR. The Coast Guard will not require beep tones or prior consent for the recording of calls.

Equipment installed on telephone lines only to provide a recorded announcement, voice mail service, or invite the caller to leave a message are considered office labor saving devices rather than communications equipment, and do not require approval.

Authorization to install and use monitoring equipment for situations not listed above must be obtained from the servicing legal office.

Inviolability of Information. The Coast Guard adheres to a policy of "inviolability" regarding the handling of wire or radio communication information. "Inviolability" means that no communicated information (including organizational messages, e-mail, and voice) will be released or divulged beyond the expectation intended by the originator of the information. Refer to Chapter 6 of Reference (p) for additional information on internal routing and readdressals.

The Coast Guard frequently intercepts communications from masters to owners reporting their vessel disabled, aground, or in a condition that indicates the possible need for assistance. The Coast Guard, in the performance of its duty to protect life and property at sea and along the coast, may properly act on this information and offer the services of the Coast Guard to the vessel in need of assistance. ***This information thus obtained shall not be released for publication.***

Broadcast messages without designation of address are addressed to all concerned and there is no restriction on their release.

2.10.1.2 ***Public requests for the release of recorded radio or telephone transcripts shall be referred to the applicable Servicing Legal Office***.

2.10.2 Recording Manipulation Software/Devices

In some instances the use of recording manipulation software/devices may be required to help determine the validity of distress, uncorrelated mayday, or hoax calls. The use of any recording manipulation software/devices is intended as a tool to help the SMC to make a logical determination for escalation and/or suspension of a SAR case where the caller's intent is uncertain. ***SAR case packages shall include a copy of the original***

unedited recording and a copy of the final edited version used to help make any escalation or suspension decisions.

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[1] Clandestine - concealed or hidden, especially for some illicit purpose; in an operation emphasis is placed on concealment of the operation; Surreptitious - to take away secretly; done, gotten, made, etc. in a secret, stealthy way;

Covert - concealed, hidden or disguised; in an operation emphasis is placed on concealment of the identity of the sponsor. *Source: DOD Dictionary of Military Terms as amended 17 March 2009*

Section 2.11
Ship Security Alert Systems

2.11.1 Background

The International Maritime Organization (IMO) Safety of Life at Sea (SOLAS) regulations mandate carriage of shipboard equipment called Ship Security Alert Systems (SSAS) for sending covert alerts to shore for vessel security incidents involving acts of violence (such as piracy or terrorism). The regulations went into effect 1 July 2004 for new passenger and cargo ships of at least 500 gross tons; existing passenger vessels and cargo vessels must have the equipment installed prior to the first radio survey after 1 July 2004 but before 1 July 2006. International guidelines do not specify the exact equipment configurations for SSAS; however, two common SSAS systems utilize the Search and Rescue Satellite-aided Tracking (SARSAT) and Inmarsat systems.

While not directly related to Search and Rescue operations, SSAS systems impose several unique procedural requirements and the potential for incidents involving dual or ambiguous alert involving both security issues and SAR response.

Vessel security incidents include all events that potentially compromise the safety of a vessel's crew or pose a potential security threat to other vessels or coastal states through acts of violence or terrorism. Annex J of Reference (o) provides specific Coast Guard policy guidance for actions in response to a variety of vessel security incidents. Ship Security Alert Systems provide one means of external alerting for a vessel security incident, but by their nature, require specific actions upon receipt by the Coast Guard in addition to the guidance in Reference (o).

2.11.2 Routing of Ship Security Alerts

The SSAS transmits a security alert to the Coast Guard either directly or via a communications service provider (CSP) indicating the security of the ship is under threat or has been compromised. The shipboard portion of the system is intended to allow covert activation without raising the alarm onboard or with other ships. ***According to IMO standards, flag states, upon receiving a ship security alert, must notify the coastal state in whose vicinity the ship is operating and authorities of other nations.*** Additionally, it is imperative that the flag state authority not attempt to contact the ship directly in order to preserve the covert nature of the alert.

As the recognized flag state authority for the United States, LANTAREA (RCC Norfolk) is responsible for receiving and initial actions resulting from Ship Security alerts. When a case involving a SARSAT SSAS beacon is passed from LANTAREA to another Coast Guard RCC, LANTAREA will notify the USMCC that subsequent SARSAT alerts for that case should be routed directly to the RCC that has assumed responsibility.

While communication service providers should always route SSAS alerts directly to LANTAREA for initial processing, there have been instances where initial SSAS alerts are routed to other command centers simultaneously or in lieu of LANTAREA. Upon receipt of a SSAS alert, command centers should immediately notify and forward the alert to LANTAREA.

2.11.3 Dual and Ambiguous Alerts

The nature of a ship security alert means the sending vessel is in a distress situation albeit due to a security threat. Through alternative means of communication (DSC, EPIRB etc), the distressed ship may endeavor to secondarily alert response authorities of their situation. ***In those instances where a vessel sends dual alerts or there is ambiguity as to the nature of their alert, LANTAREA, along with the geographically responsible command center shall make every effort to determine the status of the vessel without contacting the vessel directly. If after attempting to resolve the ambiguity it is unclear whether the vessel incident is either a search and rescue incident or a vessel security incident, operational commanders shall respond to the incident as a SAR case while using due diligence to ensure that responding resources are aware of the potential threat and must evaluate the situation once on scene.***

Section 2.12
U.S. Coast Guard Auxiliary Interpreters

2.12.1 Background

The USCG Auxiliary Interpreter Corps was established in 1997 to provide exceptional linguistics assets to any level of the Coast Guard. The Interpreter Corps consists of over 330 volunteer Auxiliary members who possess a high proficiency in 43 foreign languages. Of key importance is their familiarity with Coast Guard terminology and missions, important factors when needed for interpreting during operational missions. The Interpreter Corps is a ready resource for aid in conducting SAR missions when persons in distress do not speak or understand English (or only poorly) or when working with assisting foreign agencies or resources.

2.12.2 Accessing the Auxiliary Interpreter Corps

2.12.2.1 The listing of CG Auxiliary Interpreter Corps volunteers is accessed via the CG Intranet at http://icdept.cgaux.org/interpreter/index.php?t=u. Once on the site you will need to create an Auxiliary Member Zone ID. Once logged in, from the Master Dashboard select "Interpreter" under the qualifications on the right. Then select the desired location. A listing of interpreters will be provided based on your entries. If no interpreters are provided for your location, broaden the request. This may be done by NOT selecting a city and, instead, selecting a state only.

2.12.2.2 The list of available interpreters resulting from your query will provide a variety of information about each individual. Of key importance are their availability, contact numbers and linguistic competency level. The linguistic competency level may be important depending on the mode of communication (spoken (phone, radio, etc.) vs. written (facsimile, email, etc.)) that is involved in the case. The linguistic competency levels are:

(a) Level "A" interpreter fluently reads, writes, speaks and understands a foreign language in addition to English.

(b) Level "B" interpreter speaks and understands a foreign language in addition to English, but does not necessarily fluently read or write in any language.

CHAPTER 3
SAR Operations

Section 3.1
Overview

3.1.1 SAR Incidents Profile

More than 95 percent of all Coast Guard SAR cases occur within 20 nautical miles of shore. Coast Guard helicopters and boats, our primary quick response assets, handle the majority of incidents to which the Coast Guard dispatches its own resources. Approximately 90 percent of all cases involve assistance or rescue only -- no searching. Of all cases, 8 percent involve minor searches (less than 24 hours) and 2 percent of all cases involve major searches lasting more than 24 hours.

While a total of only 10 percent of Coast Guard cases involve searches, the Coast Guard spends more than $50 million annually on these searches in operating costs alone. The condition of those in distress and the probability of continued survival degrades the longer assistance is delayed. Therefore, it is essential to reduce the time spent searching whenever possible.

3.1.1.1 Keys to reducing the time required for providing assistance include:

(a) Reliable and timely distress alerts;

(b) Accurate distress position reports;

(c) Rapid response with sufficient resources; and

(d) Efficient searching, detection, localization, classification, and identification.

The Search and Rescue Optimal Planning System (SAROPS), coupled with accurate environmental data, is an essential tool for planning efficient, effective searches in the coastal and offshore environments.

3.1.2 SAR Operations Stages

The success of a SAR mission often depends on the speed with which the operation is planned and carried out. The prompt receipt of all available information by the RCC is necessary for thorough evaluation of the situation, immediate decision on the best course of action, and a timely activation of SAR facilities. While no two SAR operations follow exactly the same pattern, SAR incidents generally pass through defined stages, which can be used to help organize response activities. These stages should be interpreted with flexibility, as many of the actions described may be performed simultaneously or in a different order to suit specific circumstances. SAR operations generally proceed through the five stages: *Awareness, Initial Action, Planning, Operations,* and *Conclusion.* The Planning and Operations Stages may be repeated as many times as necessary as a pair (plan, operate; plan, operate; …) to reach the Conclusion Stage.

3.1.2.1 Awareness Stage. The SAR organization cannot respond to an incident until it becomes aware that people or craft need assistance. Therefore, the public should be encouraged to report any abnormal occurrence that they have heard about or witnessed.

(a) A communications station usually receives the first information that a ship or other craft on the water is in distress. An RCC will often receive first notification that a ship or other craft is in distress from a communications station with which it is associated, or via its own communications facilities.

(b) The RCC must keep a complete record of information it receives. Pre-printed forms often are used to ensure that full information about the SAR incident is obtained and remains available for review.

3.1.2.2 Initial Action Stage. Once an RCC receives an initial report about persons or craft in distress, some immediate action often is appropriate pending receipt and evaluation of more complete information. RCCs usually have in their plans of operation a checklist of steps to accomplish for each type of incident with which the RCC expects it may become involved. After evaluating all available information and taking into account the degree of emergency, the SMC should be assigned, the appropriate emergency phase declared, and all appropriate personnel and facilities informed. Three emergency phases have been established for classifying incidents and to help in determining the action to be taken for each incident. These are the:

(a) Uncertainty Phase;

(b) Alert Phase; and

(c) Distress Phase.

Depending on how the situation develops, the incident may have to be reclassified. Frequent re-evaluation is a crucial function that the SMC performs during a SAR incident, particularly for overdue craft. All reports received before and during a SAR operation must be carefully evaluated to determine their validity, the urgency for action, and the extent of the response required. While evaluation of reports may be difficult and time-consuming, decisions must be made and action taken as quickly as possible. If uncertain information cannot be confirmed without undue delay, the SMC should act on a questionable message rather than wait for verification.

3.1.2.3 Planning Stage. Comprehensive planning of SAR response tasks is essential, especially when the location of the distress situation is unknown and the survivors move due to wind and water currents. Proper and accurate planning is critical to SAR mission success; if the wrong area is searched, there is no hope that search personnel will find the survivors regardless of the quality of their search techniques or the amount of their search effort. Safety concerns dictate that complete search (and rescue) action plans be provided to all participating facilities so each knows what to expect from the others. Planning of SAR operations requires proper training of the SMC and other RCC watchstanders. Computer use can eliminate much of the detailed work in search planning and can improve accuracy. While computers can be very useful tools, they can never eliminate the need for human intelligence and experience. In fact, a sophisticated computer-based tool like SAROPS requires more analytical thinking skills for its effective use than earlier, simpler tools did. In return, it can provide much better, more efficient and more effective search plans when properly used.

3.1.2.4 Operation Stage. The SAR operations stage encompasses all activities that involve searching for the distressed persons or craft, providing assistance and bringing them to a safe place. In this stage, the SMC assumes a monitoring and guidance role, ensuring that the search plan is received, understood and followed by all SAR facilities. The RCC staff usually will spend most of this stage planning subsequent searches based on updated information and the assumption that the present search will be unsuccessful. ***Every effort shall be taken by the RCC to have a subsequent search ready prior to the completion of***

the current search patterns. Valuable time will be lost if the RCC delays subsequent planning waiting for the outcome of the current search or if they are not informed of deviations from the planned searches by the SRUs.

3.1.2.5 **Conclusion Stage**. SAR operations enter the conclusion stage when:

(a) Information is received that the aircraft, ship or persons who are the subject of the SAR incident are not in distress (False alert);

(b) The aircraft, ship or persons for whom SAR facilities are searching have been located, the survivors have been rescued and delivered to a place of safety, and all distressed persons have been accounted for (Case Closed);

(c) During the distress phase the SMC determines that further searches would be to no avail because further search efforts cannot raise the cumulative Probability of Success (POS) significantly (either the searching done so far has been so thorough that the probability of the search object remaining undetected is very small, or the search area has become so large and the probability density so uniform and thinly spread that even a huge search effort could not improve the POS significantly), or because there is no longer any reasonable probability of survival of the persons on board (Active Search Suspended Pending Further Developments).

3.1.3 Investigation: Data Collection and Analysis

SAR response is necessarily reactive in nature. The Awareness Stage is generally initiated by some event that alerts the SAR System to the existence or possibility of a SAR incident. Examples of such events include distress broadcasts from distressed craft, reports of emergency beacon activation, sudden severe weather in areas known to be populated with vessels that could be endangered by it, etc.

Often information is incomplete about an incident or potential incident when the Awareness Stage is initiated. Therefore, it is incumbent upon all SAR personnel involved, but especially the SMC, to continue investigative efforts to learn as much as possible about the incident and related matters. These investigative efforts must continue at least until the case conclusion (closed or active search has been suspended pending further developments). If a case study is done, then investigative efforts will continue until the case study has been completed. Investigative efforts require good interviewing skills to obtain pertinent information from reporting sources and good analysis skills to piece together the facts and data obtained in order to develop one or more consistent, coherent “pictures” or “scenarios” of what may have happened to the survivors. There are a variety of tools and aids for investigation, including data collection forms, historical summaries and knowledge of past similar incidents. Methods for gathering more information include following leads, identifying and interviewing additional potential reporting sources who may have pertinent information about the distressed, missing, overdue, or unreported craft and/or its passengers and crew, communications searches, etc. These investigative methods should be used throughout the prosecution of the case. Active searching on scene using visual and electronic sensors is also an investigative technique, but it is a highly specialized and very expensive method that requires a significant amount of planning and coordination to be effective. However, it may be the only way to successfully resolve the case and save lives. It is important to understand that searching is done in addition to, not instead of, other investigative activities.

3.1.4 SAR Incident Data Collection: The Watchstander's "Art"

The collection of accurate, detailed incident data upon notification of a potential distress is a crucial element of the Awareness stage of a SAR incident. For example, communications with people in distress may be terminated abruptly, and the initial information collected may be the only means to affect a successful search and rescue effort. Despite this, the time taken to collect all of the information on the SAR incident checksheet could delay the Coast Guard's initial response and could unnecessarily put those in distress at greater risk. When responding to calls for assistance, watchstanders should focus on initially collecting only the most critical and relevant information necessary to determine the severity of the situation and an appropriate response. Usually, this information consists of the items on the Initial SAR Incident Checksheet: vessel's position, number of persons on board, vessel's description, and nature of distress. For most cases, this will be sufficient information to determine an appropriate initial response and dispatch resources to assist. Those in distress should then be notified as soon as Coast Guard or other resources are dispatched, so that they know that help is on the way. Once these steps are completed, watchstanders can then continue the process of completing the Initial SAR Incident Checksheet, and any supplemental checksheets as necessary.

3.1.4.1 The ability to effectively communicate with persons in distress requires both skill and experience. Mariners whose stress level is high may speak quickly or incoherently; resulting in crucial information being passed that is not easily understood. Coast Guard radio watchstanders must be acute listeners and clear speakers. Watchstanders who speak in a clear, calm voice can often reduce the stress level of those with whom they are communicating. This in turn can help ensure that crucial information passed by the boater is more easily understood.

3.1.5 Standard Checksheet Formats

The use of SAR incident checksheets for the collection of SAR case data is required. The standard formats for Coast Guard SAR Incident Checksheets are provided in Appendix G. These sheets detail the minimum information to be gathered for each situation. However, the primary goal of gathering information is to reduce uncertainties about the survivors' location, status, and intentions as much as possible. Therefore, obtaining any and all available additional information related to these topics is strongly encouraged.

3.1.5.1 Use of these standard formats is strongly recommended. Modifications in format, or the creation of additional data fields, are authorized as deemed necessary by the operational commander to accommodate local practices. ***Modifications shall not eliminate information to be collected.***

3.1.5.2 ***The Initial SAR Incident Checksheet shall be completed for all incidents.*** The Supplemental SAR Checksheet contains other information that should be collected as circumstances warrant. Standard checksheets are also provided for specific incident types.

3.1.5.3 ***SAR Controllers shall not hesitate to launch resources prior to completing the checksheets.*** If the situation dictates, launch first then make all attempts to complete the checksheets as time permits.

3.1.5.4 While completing the checksheets, SAR Controllers should ascertain if personal flotation devices are being worn by persons on board at the specific points indicated on the sheets and advise the reporting source of the Coast Guard's intended actions.

3.1.6 Search Planning

There are basically only two methods for planning searches—manual and computer simulation. The manual search planning method is found in Volume II of reference (b), the *International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual*. Although there are several computerized versions of the manual method (sometimes with slight variations from *IAMSAR*) in use in various parts of the world, they are not fundamentally different from the manual method itself. In some cases these computerized versions of the manual method have access to more detailed environmental data than is normally associated with paper-and-pencil methods, but otherwise the computer is simply being used as a tool to perform the same computations and display the same results the paper-and-pencil manual method would produce. Consequently, the quality of the results often is not substantially better than could be obtained with pencil and paper. The USCG's search-planning tool, SAROPS uses a simulation approach. The main advantage of simulation is that it allows a more realistic representation of real-world complexity than the grossly over-simplified manual method at all stages of the search planning process.

3.1.7 Uncertainty, Probability, and Probability Density Distributions

Searching necessarily involves uncertainty. If the search object's location were known or could be accurately predicted, no searching would be necessary. Therefore, the first uncertainty the search planner must deal with is the object's location at the time SRUs can be on scene. This involves uncertainties about the pre-distress movements of the distressed craft with consequent uncertainty about the time and location of the distress incident, uncertainty about the types of objects (disabled craft, PIW, raft, etc.) that may be adrift, and uncertainty arising from conflicting or incomplete information given rise to two or more possible scenarios. A scenario is an event or chain of events that describe a possible incident or the pre-distress motion of the distressed craft leading up to the incident. When describing a scenario, the pre-distress chain of events will be described using the conjunction 'and', as in the Fishing Vessel left port and then traversed to the "North" fishing grounds and then possibly left for a port "A". If the conjunction "or" is used, then be alerted that a second scenario is required to capture all the possible scenarios or uncertainties around the possible incidents. For example; the Fishing Vessel left port and either traversed to the 'North' fishing grounds or the 'South' fishing grounds; then two scenarios are required since giving the available limited information both scenarios are possible (North or South), but the fishing vessel could not have done both. Even when these are known within close limits, if a significant amount of time will pass between the time of a distress and the arrival of resources on scene, uncertainty about the object's location will grow due to uncertainties in the available data about the environmental factors that cause drift, and uncertainties in knowledge about how the search object will respond to those factors. In addition, detection of the object once resources arrive on scene and begin searching is by no means certain. These uncertainties require the search planner to think in terms of probabilities and relative likelihoods (also known as probability weights) such as A is "very likely" while B is "unlikely." On a scale of 0 to 10 where 0 is "Ignore" (almost never happens) and 10 is "Almost certain," A would be scored as "9" and B would be scored as "3," making A scenario or search object type three times as likely as B. Weights are generally used when describing the relative likelihoods of competing scenarios or the relative likelihoods of different search object types within scenarios. After scenarios, subsequent drift, and any previous searching have been evaluated and the time has come to plan the next search, the three probabilities of primary concern are:

3.1.7.1 The probability that the search object will be in some bounded area (probability of containment or POC) when search facilities can be on scene searching.

3.1.7.2 The probability that the search object will be detected; assuming it will be in an area during the time the area is searched (probability of detection or POD).

3.1.7.3 The probability of finding the search object (probability of success or POS) based on both the POCs for the areas searched and the PODs from searching those areas.

3.1.7.4 This is a simplistic view since the true situation is very dynamic. Search objects in the marine environment are almost always in motion due to drift forces. This means that for any fixed area, the POC value changes continuously. The act of searching itself causes changes in POC values since, according to the Rule of Bayes, searching a region without finding the search object reduces the POC estimate for that region and increases the POC estimates for other, unsearched, regions. However, this simple model is useful for illustrating some basic concepts.

(a) The first concept is that for any given search area,

$$POS = POC \times POD$$

For non-overlapping search areas that are covered more or less simultaneously, the total POS is simply the total sum of all the POS values for the individual search areas. The cumulative POS (POS_{CUM}) is the probability that all searching done to date would have located the search object.

(b) The second concept is that there is always a tradeoff between POC and POD. For a given level of search effort, increasing the size of the search area to include more of the possible search object locations will increase POC, but the POD will be decreased because the effort will be more thinly spread giving a lower coverage factor. Going the other way, decreasing the size of the search area will reduce the POC but will increase the coverage factor and POD. Finding the search area(s) to cover with the available effort so that POS is maximized is called optimal effort allocation.

3.1.8 The Goal of Search Planning

The ultimate goal of search planning is to find the survivors of a distress incident as quickly as possible. The way to achieve this goal is to increase the cumulative probability of success (POS_{CUM}) as quickly as possible using available and assigned resources. “Optimal effort allocation” is the process of finding the combination of search area, coverage, and resource assignments that produce the most efficient search plan. This is a mathematically complex process that requires a sophisticated computer program. The manual method found in reference (b) produces “near-optimal” search plans based on a number of simplifying assumptions and corresponding “optimal search factors”. Unfortunately, the extreme degree of simplification required often produces results that are not a very good match for the real-world situation. However, SAROPS does a much, much better job of modeling real-world complexity and generally produces much more nearly optimal operationally feasible search plans than any other method. That is not to say that SAROPS is “perfect” or that its results cannot be improved upon by applying some additional human thought processes and analysis. SAROPS recommendations should always be carefully reviewed for practicality and sensibility.

Section 3.2
Search Planning Methods and Tools

When developing a search plan, search planners must be detectives and information distillers. They must aggressively pursue leads and obtain all information available. They must continually think "outside the box."

Coast Guard search planners shall plan searches in one of two ways, subject to the guidance provided in this chapter: With SAROPS (preferred primary means) or manually in accordance with reference (b) and Appendix H to this Addendum. Each of these methods is discussed in more detail below, along with their capabilities and limitations. Further guidance on usage is also provided.

3.2.1 Historical Background

Search theory is the scientific study of mathematical methods and algorithms for developing optimal search plans. It is one application of a branch of the applied science known as *operations research,* and it was developed by the U. S. Navy during World War II to aide in searching for enemy submarines and finding downed Allied fliers adrift on the ocean. In both areas, operationally practical methods were developed from the scientific theory and used to good effect. Today's manual search planning method is a direct descendant of these early methods. The digital computer has provided the tools to greatly enhance the effectiveness of these methods.

3.2.2 Planning Searches Manually

The *IAMSAR Manual*, *Volume II,* provides the basic guidance and worksheets for planning searches manually. This method, with the modifications described in Appendix H, is the approved standard for manual search planning in the U. S. Coast Guard. This method requires and depends only on resources and data that are either locally available or can be obtained and entered by the search planner. ***All USCG personnel who fulfill SMC/RCC responsibilities shall be familiar with the IAMSAR Manual search planning methods and modifications described in Appendix H of this Addendum.***

3.2.2.1 ***SAROPS is the preferred method for planning searches and shall be used whenever it is feasible to do so.*** It is designed for use in both coastal and oceanic environments, and in the Great Lakes. At present, use of SAROPS is impractical in rivers and small enclosed or nearly enclosed bodies of water. In the very unlikely event that SAROPS will be unavailable to a Coast Guard command center for any significant period of time, that command center should consider passing its SMC responsibilities, at least for cases requiring search planning, to another command center with SAROPS capability. If SAROPS is unavailable and passing SMC duties to another command center is deemed impractical, then the manual method may be used for planning coastal, oceanic, or Great Lakes searches when:

(a) The distress incident time is known within plus or minus one hour,

(b) The region of possible distress locations is best described by a position and the probable error about that position, and

(c) The commence search time is less than 24 hours after the distress incident.

3.2.2.2 ***If the distress occurs in restricted waters such as smaller bays and estuaries that are nearly enclosed, rivers, lakes other than the Great Lakes, etc., until SAROPS capability is expanded to include these special areas, the search must be planned manually using the guidance provided in Appendix H. However, the SAR Tools portion of SAROPS shall be used to create, plot, and document search patterns and other case-related geographic information as appropriate.***

3.2.2.3 ***The full SAROPS suite shall be used whenever the above conditions are not met.*** For simple situations in reasonably open waters, both methods should produce similar results; SAROPS however provides advantages that make it the appropriate choice in all situations where it can be employed. Further information, guidance and cautions are provided in Appendix H.

3.2.3 Planning Searches with SAROPS

3.2.3.1 ***SAROPS shall be used to plan searches whenever the criteria given above for using the manual method are not met.*** Further information, guidance and cautions are provided in Appendix H.

3.2.3.2 SAROPS is available to all Area, District, Sector Command Centers in the Coast Guard. It is hosted on approximately 16 servers around the Coast Guard. All Command Centers with RCC responsibilities have access to all SAROPS servers, so the system is quite robust. If a Command Center's normal SAROPS server is down or otherwise inaccessible, another server may be used. SAROPS is implemented as a set of extensions to the ArcGIS®-based Common Mapping Framework-Lite (CMF-L) geographic information system (GIS) software. Raster nautical charts, satellite imagery, and many, many other digital GIS products may be imported into CMF-L and viewed as "layers." However, users should be prudent in their use of this capability since importing many complex layers will tend to cause excessive server and network loading and will adversely impact system performance and responsiveness.

3.2.3.3 All SAROPS servers obtain surface wind and surface current environmental data from the Environmental Data Server (EDS) hosted at the USCG Operations Systems Center (OSC) in Kearneysville, WV. The EDS is accessed via CGDN+, the Coast Guard's private data network. The EDS maintains global and regional gridded surface wind and sea surface current databases that are updated from one to four times daily (depending on the specific source and data product posting schedule). Updates are based on near-real-time outputs from circulation models run by NOAA and the U. S. Navy. In addition, a traditional static database of seasonal climatological average sea current data is available. Tidal currents are computed from a standard tidal current model. Although these two data sources appear in the EDS list of available products, they actually exist on each SAROPS server and are available even if the EDS or connectivity to it is down. All EDS-listed data may be accessed and viewed either from CMF-L independently of any active SAROPS cases, or as part of an active SAROPS case.

3.2.3.4 SAROPS uses a Monte Carlo (a.k.a. "particle filter") simulation approach to support the search planning function. The manual method computes only one or two drift trajectories ending at one or two "datums" and then assumes the possible search object positions are distributed around those datums according to one particular type of statistical distribution known as a circular bivariate normal distribution. SAROPS, on the other hand, generates thousands of simulated search objects (particles) according to one or more "scenarios" described by the search planner. A SAROPS case may contain as many as four distinct search object types simultaneously to handle situations where the actual search object may be any one of the chosen one to four types. For example, a MAYDAY report is received from a vessel but communications are then lost and it is not known whether the search object is the vessel disabled and adrift, a life raft, or a person in the water. To simulate search object drift, SAROPS draws independent random samples from the wind, current, and leeway data for each particle, computes corresponding independent drift trajectories and then "maps" the resulting positions as a probability grid. Instead of using average wind and current values over the entire drift interval as the manual method does, SAROPS moves each particle in short time steps (presently every 20 minutes), obtaining wind and current data from its databases at every step based on the particle's computed position and the time on the simulation clock. SAROPS also recognizes land features using a vector shoreline database that closely, but not exactly, matches the shoreline shown on nautical charts. The user has the option of making the SAROPS shoreline data visible so it may be compared with the base map and nautical charts. These features provide more general, and more realistic, distributions of possible search object positions than those assumed by the manual method. SAROPS can represent distributions of initial distress positions and times around a position, within an area represented by corner points of a polygon, or along the intended track of a voyage/flight. Legs of a voyage/flight may begin or end at a position or an area (such as a fishing area). The manual method is designed to handle only known distress positions and times well, and then only when the uncertainties are relatively small and the environment is essentially uniform over the area of interest.

3.2.3.5 In addition to simulating search object drift and producing a probability grid of more likely and less likely locations, SAROPS also has an optimal search planning module. This "Planner" module accepts as input data necessary to estimate sweep widths, as well as data to describe each search facility and it's on scene endurance. Planner then attempts to perform a "constrained optimization" that maximizes the POS while assigning a search area to each search facility that exactly consumes all of its available on scene endurance and ensuring that search areas do not overlap. Importantly, SAROPS accounts for the simultaneous motions of search facilities and search objects during the search, both when planning searches and later when evaluating search results. SAROPS also accounts for the effects, on each of the thousands of simulated search objects, of prior searching when estimating values for POS, cumulative POS, and POCs for probability maps. SAROPS takes these effects into account when making optimal search plan recommendations for subsequent searches. The manual method cannot do this, although it does use another technique based on extensive simplifications to develop search area recommendations.

3.2.4 Amver System

Although it is not a search planning system, Amver is a computerized system for maintaining the dead reckoning position of participating vessels worldwide and is therefore a valuable resource for finding search and rescue facilities near a distress incident, especially one that occurs in a remote offshore location. Merchant vessels, including some commercial fishing vessels and mega-yachts, of all nations making coastal and oceanic voyages are encouraged to send movement reports (sailing plan, periodic position updates, and final report) to the Amver Center at the OSC via assigned coast or international radio stations or satellite service providers. Norway, Poland, and the U.S. (for certain vessels) require their merchant vessels to participate; other vessels participate voluntarily. The information is stored in the database at the Amver Center and used for SAR efforts. Recognized RCCs worldwide handling an oceanic SAR operation can request Amver information from any U.S. Coast Guard RCC. Amver is accessed via CGDN+. Amver information is available to RCC/RSC SAR planners in three categories.

3.2.4.1 **Surface Picture (SURPIC)** is a program that identifies and plots Amver vessels worldwide. This is especially useful in the event of a maritime emergency. RCC input includes the distressed vessel's position, type and time of SURPIC. Output is a text list of the closest vessels within a defined area and a selected subset of available vessel information. A graphic display of the information is available for U.S. Coast Guard RCCs. SURPIC information can be faxed or e-mailed to a foreign RCC requesting help. SURPICs can be generated for the current time, a point up to 30 days in the past, or a point up to 14 days in the future. The three types of SURPICs are:

(a) **Radius SURPIC:** A surface picture defined by a distress position, a distance from the distress position (radius), and a Date Time Group (DTG) for the SURPIC.

(b) **Rectangle SURPIC:** A surface picture of a specific area defined by a northwest corner and a southeast corner, and a DTG for the SURPIC.

(c) **Trackline or Snapshot:** A surface picture defined by the starting and ending position of a trackline, a distance from the trackline, and a DTG for the SURPIC. This SURPIC is useful in determining which vessels will be in a given area at a certain time (e.g., a space shuttle launch, an aircraft that may have to ditch, or an overdue vessel on a known course).

3.2.4.2 **Lloyd's Vessel Data:** The Lloyd's Vessel Data displays static information from the Lloyd's Registry describing the vessel such as: vessel name, international radio call sign, the Inmarsat number, Lloyd's number, hull ID (official number of registry), length, width, the year and month in which the vessel was built, and the true and registered nationality and address of the owner company. Data on tens of thousands of vessels are obtained from Lloyd's and updated monthly.

3.2.4.3 **Voyage Information:** Includes information on the current voyage; the vessel's current predicted position; a record of the most recent Amver reports received; and Amver and Lloyd's vessel data.

3.2.5 Commence Search Point and Pattern Orientation Guidance

All factors, including safety, endurance, projected survival times, navigation, environmental conditions and available resources, should be carefully considered when determining the orientation of search patterns and placement of commence search points.

3.2.5.1 A sample of factors to consider includes:

(a) When expected survival time is short, the decision may be made to place the commence search point at the datum position so as to put the SRU as close to the expected position of survivors as early as possible. Another alternative is to ensure the first search leg of the pattern passes through or over the datum position, placing the CSP accordingly.

(b) The resource's (includes aircraft, small boat and other available assets) proximity to the search area. The decision may be made to place the CSP at the point closest to the SRU's departure point in order to facilitate the start of searching as quickly as possible.

(c) The decision may be made to place the CSP at a point farthest away from the departure point, so as to have the SRU finish its search as close to its recovery point as possible. This addresses other considerations, such as: having the SRU pass through datum prior to searching; inserting a SLDMB at datum prior to searching; and having the SRU finish its search as close as possible to a base intended as a staging point for subsequent searches.

(d) For missions with multiple air SRUs, all CSPs and search pattern orientations should be coordinated so that all aircraft on scene during the same periods of time are creeping in the same direction so as to assure horizontal separation. ***Vertical separation of at least 500 feet must also be assured by assigning different search altitudes to aircraft that are in adjacent search areas at the same time.*** Strict adherence to these rules is paramount to risk assessment and safety of flight issues. It may also be appropriate to consider horizontal separation for surface assets in situations where visibility is reduced (fog, night, and heavy precipitation).

(e) A poor choice of pattern orientation can significantly reduce search effectiveness. For example, a PS pattern where the direction and rate of creep match the direction and rate of the search object's drift during the search is almost completely ineffective and has little chance of success.

(1) In manual search planning, it is generally recommended that search legs be oriented parallel to the expected direction of drift to minimizes pattern distortion relative to drifting search objects.

(2) SAROPS, on the other hand, examines the effects of relative motion when evaluating different choices for CSP and pattern orientation. Often it is able to take advantage of relative motion effects in ways that are impossible with manual computation, resulting in patterns where search legs are not parallel to the expected average drift direction.

(3) Search planners are encouraged to view SRU movements through their respective patterns and compare them with the moving/changing probability grid and/or moving particles underneath those patterns by using the Time Slider or Animation features.

(4) Search planners are also encouraged to re-orient the patterns recommended by Planner, evaluate them, compare their POS values with the originals, and use the patterns that produce the highest POS values.

(f) Other orientation considerations include the direction of the sun, especially early and late in the day and the direction and size of the swells. Looking into the sun makes detection very difficult and small objects such as PIWs and rafts can sometimes be obscured from view while in the trough between large swells.

3.2.5.2 There are many, sometimes conflicting, factors to consider prior to making a final decision about where to place the CSP. Each SRU should carefully evaluate the search action plan to ensure commence search points and pattern orientations for the assigned sub-area and those for adjacent assignments meet safety requirements and provide the best opportunity for detecting the search object. ***The SMC must be notified immediately upon discovery of any safety issues and should be notified of all other apparent deficiencies as early as practicable***. Although communications between the OSC and SMC should always be immediately available, OSCs are usually authorized in the search action plan to make necessary changes as long as the SMC is informed.

3.2.6 Search Area Designation

Extended search activities are often done in "epochs" of time. For example, a search involving several facilities is planned and a search action plan with specific taskings for these facilities is promulgated. Planning for a subsequent search then begins so that it may be implemented quickly should the present search effort fail to locate the survivors. The two periods when facilities are on scene would form two search epochs. ***Search epochs shall be designated with letters (A, B, C…) where a letter is assigned to each epoch in time sequence. The first planned search epoch shall be designated "Alpha," the second "Bravo," and so forth.*** The letter designator also applies to the overall search area for the corresponding epoch. ***Individual search sub-areas within an epoch shall be designated with numerals following the letter designator (A-1, A-2, etc.). If an individual search facility's assignment spans two or more search epochs, it shall be named for the search epoch for which it was planned.*** For example, if an Alpha search is planned for two helicopters and one HC-130, then all three will carry the "Alpha" label, even though the HC-130 may still be on scene when a subsequent search involving other helicopters or crews takes place. However, if the Alpha search was planned for only two helicopters, and a "subsequent" search was planned for another helicopter and a HC-130, but the HC-130 could be on scene before the Alpha search was actually completed, the HC-130's assigned sub-area would receive a "Bravo" designator. For search planning and search area/sub-area designation purposes, it is also permissible to divide single physical sorties into parts at epoch time boundaries chosen by the search planner. Thus, in the first example above, the HC-130's on scene endurance for Alpha search planning purposes might be only half its actual on scene endurance, while the other half would be included in planning for the Bravo search.

Searches that are part of the initial response and are, in some sense, unplanned, may or may not be named according to the above conventions. Their effectiveness also may or may not be considered when planning subsequent searches. Generally such searches are very localized and do not involve large amounts of effort. Sometimes such searches are not very effective due to weather, limited visibility, darkness, etc. The search planner will have to decide whether to assign designators and/or include their negative results when planning subsequent searches.

No matter what scheme is used, there will be situations where it is not clear how an epoch/area/sub-area should be designated and reliance will be placed on the search planner's judgment.

Section 3.3
Search Planning Considerations

3.3.1 General

The goal of search planning is to deploy the available resources in the best way possible so as to maximize the probability of success (POS) as quickly as possible. A search plan that achieves this goal is called "optimal." Minimizing the time required to achieve the maximum possible POS with the available resources is very important to the saving of lives since the prospects for continued survival following a distress incident often decline rapidly with the passage of time.

3.3.1.1 The basic problem of optimal search has the following mathematical and statistical elements:

(a) A probability density distribution on search object location (so the probability of containment, POC, for any subset of the possible locations can be estimated),

(b) A detection function relating the probability of detecting (POD) the object if it is in a searched area to the density (coverage) of the searching effort expended there,

(c) A known finite amount of available searching effort, and

(d) An optimization criterion of maximizing probability of finding the object (POS) in the minimum time subject to the constraint on effort availability.

3.3.1.2 **SAROPS**. The SAROPS probability grid, computed from the distribution of particles and their respective probabilities of not having been detected by prior searching, represents the first element. For the second element, SAROPS contains the necessary tables and algorithms for determining the appropriate sweep widths and corresponding detection functions based on the user's inputs of search object descriptions, environmental parameters affecting detection, and search facility parameters (type, sensors, etc.). SAROPS addresses the third element by computing the available searching effort from the user's inputs describing the search facilities, search speeds, on scene endurances, etc. Finally, for the fourth element, the Planner module seeks to find the best search plan it can within its allotted computing time, where the plan with the highest POS is judged to be the "best."

3.3.1.3 **Manual Method.** The manual method also addresses each of these elements, but manual computation requires so much simplification that it works adequately only in the simplest of situations. The manual method has difficulty with anything more complex than a single known distress position and time in an area where averaged wind and current vectors accurately represent the environmental situation over the entire area and time of interest.

3.3.2 Improving Likelihood of Locating Search Objects Quickly

Search planning is based on a myriad of variables including environmental factors, the nature of the distress incident, the possible search object(s), and the available search platforms and their capabilities. Search planners can improve the likelihood of locating search objects quickly by doing the following:

3.3.2.1 Obtaining, correlating and analyzing all information, including lines of bearing/range rings from receiving stations that may be relevant, any germane local knowledge, any hazardous conditions (e.g., weather, shipping lanes, condition of the distressed craft, shoals/reefs/rocks), etc., that may be related to the distress incident. The objective is to establish:

(a) The distress time and position or range of possible times and positions as accurately as possible,

(b) The type(s) of search object(s) that may have resulted from a distress incident.

3.3.2.2 Selecting the most appropriate available environmental data for estimating the search object's drift within the general search area. Early deployment of one to several SLDMBs should be given very serious consideration whenever there is significant potential for an extended search.

(a) Determining the availability and capabilities of search and rescue units (SRUs) and other potential search facilities. In general, it is both more effective and more efficient to deploy/employ sufficient search facilities to make an early successful conclusion highly probable, rather than use a more limited response in the hope that no more resources will be necessary or that gradual escalation will minimize the commitment of resources.

(b) While it would be both impractical and imprudent to commit every available resource to every SAR incident, committing more than the bare minimum required for a "best case" scenario generally saves both more lives and more resources in the long run than a more gradual approach.

(c) ***Every SAR case is different so RCC watchstanders must exercise sound judgment when deciding upon the scale of the response.*** Watchstanders should bear in mind that situations requiring SAR responses can only get larger and more complex with the passage of time until the survivors are found and rescued.

3.3.2.3 Including additional search criteria within the search plan based on local knowledge.

3.3.3 Initial Conditions

The initial data, estimates and assumptions on which a search plan is based, often determine whether a search will be successful. Therefore it is necessary to establish the time and position of the distress incident as accurately as possible. Sometimes this is quite easy, as when a craft accurately reports its position at the time of the distress. ***At other times, such as when a craft is unreported or overdue, a substantial investigative effort must be initiated and maintained throughout the case until the survivors are found or active search is suspended pending further developments. In addition, the pre-distress movements of the craft must be considered in order to properly match possible distress positions with possible distress times.*** SAROPS can be very helpful in this regard providing the structure to handle the various scenarios' inputs and a means to weight the various scenarios.

3.3.3.1 Very often there is insufficient information to establish exactly where and when a distress occurred, even when a craft reports itself in danger. In cases of overdue or unreported craft, there is often conflicting information, especially in the early stages. ***In such situations, the search planner must develop scenarios that describe what may have happened. Such scenarios must be consistent with a substantial subset of the available information.*** If one scenario is not consistent with all the available information, additional scenarios should be considered and constructed to account for remaining available information. ***Assumptions must be made to fill gaps in the available information and complete each scenario.***

Known facts must be clearly labeled as such. Even more importantly, assumptions must be labeled and treated as such. Otherwise, an assumption that is made early and repeated often may take on the appearance of fact and cause a serious misdirection of response efforts. Scenario development and analysis require careful thought and sound judgment, taking care to avoid jumping to unwarranted conclusions or becoming fixated on only one of several possible scenarios (a.k.a. "scenario lock," a form of "tunnel vision"). The development and subsequent weighting of all the possible scenarios is the key and critical element that the search planner brings to the SAROPS planning tool.

3.3.3.2 Uncertainty estimates associated with the distress incident have a large impact on the size of the area that must be searched. ***The search planner must always bear in mind that the uncertainty associated with any piece of data is a reflection of how much total confidence may be placed in it.*** The nominal accuracy of the method or device used for fixing or estimating a position is the *minimum* probable error of position that should be considered. Although these values are available for selection in SAROPS, the search planner should not automatically assume they are the most appropriate values to use. Other factors that may increase the probable position error used for planning the search should always be considered.

(a) For example, if the *Mary Jane* reports itself in distress and taking on water "50 miles southeast of Cape Fear" based on a GPS fix, that does not mean the quality of the information as reported is as good as the average quality of GPS positions. It would be more prudent to assume the range and bearing given were only approximate, possibly an estimate made by eye from a nautical chart while the reporting source was under stress. The resulting uncertainty about the distress position would then be much larger than the uncertainty associated with GPS navigation in general.

(b) Reporting source stress can cause other, more subtle problems. For example, there have been several occasions when persons in distress reported very precise GPS-derived positions that were actually waypoints far from their current location that had been entered into or recorded by the GPS device at some earlier point in time. Consideration should be given to the delay between the time of incident (e.g. man overboard) and the time a navigational fixed can be taken, since during that time delay the vessel will have moved away from the man overboard.

(c) Although GPS positions can be very accurate when GPS receivers are used properly, that accuracy can significantly differ from the accuracy of other parts of the search planning system. Even though the environmental data products available to SAROPS are generally much more accurate and comprehensive than historical averages, they are derived from computer models and their gridded wind and current values may be slightly displaced from real-world locations. For example, the model-based location of a specific feature such as the north wall of the Gulf Stream or an eddy that has spun off from the Gulf Stream may be offset from the actual location by one or two grid points due to modeling error. Assuming a very small initial position error (X) based on GPS positioning might not allow the initial distribution of particles to sample from the true range of possible surface currents whereas a larger X uncertainty value would.

(d) For all of the above reasons, search planners should be extremely cautious about relying too much on the high degree of accuracy that is possible for reported positions when high-precision navigation is in use. An accurate position with little uncertainty is highly desirable for rescue missions, but such small uncertainties are not necessarily the best thing for search planning purposes. When search planning becomes necessary, some additional allowance in the X uncertainty should be considered for unanticipated sources of uncertainty. Very small initial position errors are discouraged for maritime search planning purposes, especially off shore. Exceptions to this rule of thumb include:

(1) Accurately known voyage/flight departure and destination positions. Intermediate waypoints are not exceptions since, even with very precise navigational capabilities, there is no guarantee that the operator of the craft would necessarily get as close as possible to those planned waypoints while en route; and

(2) Areas where the currents and winds are fairly homogeneous (i.e. do not vary significantly over a fairly wide area). More accurate navigational/position information based on the method used to determine the position can be reasonably assumed in these situations when the search planner has a high degree of confidence in the ability of the distressed person(s) to competently use the reported method.

(e) In all situations, when searches are unsuccessful, the entered position information is one of many factors where adjustment may be appropriate during the examination and trial of alternate scenarios.

3.3.3.3 There may also be uncertainty in exactly what is the object of the search. SAROPS contains a hierarchal pick-list of search objects that have known leeway drift characteristics. The pick-list is presented from the general to increasingly more specific categories of search objects. When a search object is chosen, SAROPS assigns to each particle in that object class, its own unique leeway coefficients for the leeway equations. The spread of those coefficients is greater for the more general classes than the more specific classes. The spread is also a function of the underlying quality of the background study conducted for that particular class of search objects.

(a) Choosing the most specific category of the search object or search objects for which the controllers has information will result in the most realistic leeway drift equations being applied and establishing the best estimation of probability density distribution during the time of searching.

(b) Up to four (4) search objects can be chosen in SAROPS. The search objects can be weighted independently for each scenario from zero (Ignore completed) to ten (Highly Likely). If additional information becomes available during the course of the case, a more specific search object category maybe chosen or a category may be eliminated from consideration for searching. Using a zero weighting is sometimes useful in these cases as it will help document a previous choice or that the object used to drift and help develop the scenario but is not the object of the search.

3.3.4 Drift Theory

On average, the Coast Guard conducts more than 5,000 searches annually, at a cost of about $50M. A fifth of the searches continue longer than 12 hours. In longer searches, knowledge of the drift of the search object becomes very important to the search planner. If the search object is not in the region covered by the search, there is no chance of finding it. Thus, the better the drift of an object is known, the more likely it will be found. Shortening the search increases the probability that the person(s) in distress will survive. Survivors and their craft are small solid objects suspended at the often-turbulent interface between two huge fluid masses - the ocean and the atmosphere. The forces of these two entities exerted on the search object cause drift. When there is no wind, objects will move with the current. When wind is present, it has two effects. First, friction with the water surface creates waves and alters the surface current. Second, the wind acting on the exposed surfaces of the object creates leeway. Drift is estimated as the vector sum of the total water current (including any contributions from wind stress on the water's surface) and the leeway as described in Section H.3.4.

3.3.4.1 **Datum Marker Buoy (DMB).** Datum Marker Buoys (DMBs), both radio and self-locating, are tools for determining total water current in a search area. When using DMBs, search planners should use their best judgment to estimate the sphere of influence for which the DMB information is valid. The sphere of influence is smaller in the vicinity of high currents; i.e., the Gulf Stream, Florida Straits, or known variable current areas such as Georges Banks off of New England. Time is also a consideration. Marine science experts, such as those at the International Ice Patrol (IIP), are available to assist in estimates. As a rule, the sphere of influence should be no larger than that for water current information already available, such as the environmental information provided to SAROPS from EDS. Since on scene ocean currents are so poorly known and hard to predict, the Coast Guard uses DMBs to provide a measure of the currents in search areas. Some DMBs now in use are located by radio direction finding (RDF) from the search unit, which must relocate the RDF/DMB for each ocean current estimate. This has two major disadvantages. First, using an aircraft to re-locate a DMB is an extremely expensive way to obtain a very small amount of data. Second, the time spent relocating the DMB is time that must be subtracted from the available search effort. Radio DMBs are being phased out in favor of self-locating datum marker buoys.

3.3.4.2 **Self-locating Datum Marker Buoys (SLDMB)** utilize satellite-based technology to determine buoy position. SLDMBs provide frequent, high-resolution position information independent of the search unit (search unit does not have to relocate the DMB). The SLDMBs drift with the water mass, providing high quality current information. The use of satellite technology greatly reduces the cost of a position determination in comparison to the cost associated with the RDF/DMB. Section 4.11 provides information and employment guidance for SLDMBs.

(a) SLDMBs improve the efficiency and effectiveness of Coast Guard SAR operations. The goal of the search is to find people so they can be rescued. The use of SLDMBs offers the opportunity of doing the job better, while also saving money.

(b) Search planners should use SLDMBs whenever possible. Planners should specifically direct units to deploy SLDMBs.

(c) Early deployment of several SLDMBs in the area of interest is strongly encouraged. This will provide a more complete picture of the surface currents. SAROPS contains tools that can use the data from multiple SLDMBs to estimate the current vector field over the area of interest. In addition, all data obtained during the operational life of deployed SLDMBs are provided to the National Data Buoy Center and shared with the oceanographic community. This includes, in particular, NOAA and Navy developers who use the data to improve the sea surface current models that produce the products SAROPS uses. In short, no SLDMB data is ever wasted, even if the survivors are found immediately after SLDMBs have been deployed. The only way to "waste" an SLDMB is to leave it on the shelf until the batteries expire or some other problem develops that will cause the buoy to malfunction upon deployment.

3.3.5 Additional Search Criteria for Search Planning

When creating a search plan there are additional search criteria that should be considered.

3.3.5.1 The following is not a comprehensive list but examples of what to look for and possibly include when planning a search. Often times these possible search areas are missed or forgotten about when planning a search.

(a) Oil platforms;

(b) Buoys;

(c) Shoal water;

(d) Rock outcroppings;

(e) Sandbars;

(f) Reefs;

(g) Uninhabited Islands;

(h) Abandoned Oil wells; and

(i) Old Piers, etc.

Section 3.4
Initial Response, Search Planning, and Search Operations

Effective, efficient prosecution of a SAR incident requires well thought out procedures. Not every incident will develop into a full-blown SAR case, but every case has the potential to greatly expand. Guidance within this section will aid the SAR Watchstander in developing the thought processes necessary for a rapid and thorough reaction upon receiving notification of a potential or actual distress.

3.4.1 Offshore Incidents

As defined in reference (a), the Commandant has divided the Maritime SAR area into two sections, Atlantic Area and Pacific Area Commands, responsible for efficient coordination among all SAR regions and sectors within their sections. The Area and District RCCs generally have responsibility for offshore incidents. Search planning is done with SAROPS in accordance with the guidance provided above.

3.4.2 Coastal Incidents

3.4.2.1 Initial Response Search Area. The Sector Command Center generally has the responsibility for coastal incidents. When an SRU is dispatched, it should be sent to the position where the search object is expected to be (datum) when the SRU arrives on scene. This includes estimating the object's drift between the time of the incident and the ETA of the SRU on scene if the search object was not reported to be anchored or aground. Often it will be sufficient to mentally estimate the drift based on local knowledge and/or on scene conditions due to the short time spans associated with initial responses near the coast and the high level of activity involved when initiating a response.

(a) When the search object is not located upon arrival on scene, the default initial response for the responding SRU(s) is to conduct a search with an average coverage of 1.0, unless otherwise directed by the SMC.

(b) For an expanding square search (SS), this means the track spacing should equal the sweep width.

(c) For a sector search by a surface craft, this means the search radius should be about twice the sweep width.

(d) For a sector search by aircraft SRUs, the minimum radius should be the distance the aircraft can cover in one minute at search speed, or twice the sweep width, whichever is larger. Since aircraft can often cover the area several times in a short period, they should cover the area repeatedly until coverage of at least 1.0 is reached. For example, if the search speed were 90 knots and the sweep width was 0.1 NM then a single six-sector pattern with a radius of 1.5 NM (distance covered in one minute at 90 knots) would achieve a coverage of about 0.19 in about 9 minutes. Covering the area six times would produce a total average coverage of about 6 x 0.19 = 1.1 in about an hour.

(e) If the reported position of the distressed craft is in shallow water, it could be either anchored or adrift. Orient the search area and the first leg in the direction of drift, that is, in the same direction as the total drift vector. If success is not achieved quickly, extending the search down the drift line may also be appropriate.

(f) The SMC should initiate a SAROPS case as soon as practicable and its results, if available in time, may be used to guide the initial search response. In any event, if the initial response does not locate the survivors quickly, a more comprehensive search plan will be required and SAROPS will be needed.

3.4.2.2 ***The SRU shall also keep the SMC constantly updated on conditions, findings, and when nearing completion of the initial response search.*** This direction should not preclude a SRU from using an alternate search pattern or area when it is clearly indicated (e.g., narrow waterway or other physical barrier).

3.4.2.3 **First SRU on scene procedures**. Pre-established operations and search procedures for the first SRU on scene are to immediately report the on scene conditions and findings to the SMC. If the object of the SAR incident is not initially located, begin the appropriate search pattern. *Important note:* The objective is to perform an accurate search pattern *relative to the search object*. If the search object is adrift and likely to have a high drift rate (strong winds and/or currents), it is often better for surface SRUs to use more traditional DR navigation techniques without correcting for set and drift than to use modern high-precision navigation systems like GPS to trace a nearly perfect pattern over the bottom. The DR technique automatically compensates for the water current component of the search object's drift, which is especially important when searching for PIWs. For aircraft SRUs, the same effect may be obtained by deploying a smoke float at datum and flying the search pattern relative to that object. Surface SRUs may also find smoke floats to be helpful aids.

(a) For surface SRUs -- usually an expanding square search (SS) is performed. If the search area is confined or there is reason to have a high degree of confidence for the selected datum (i.e., debris found), the surface SRU may use a sector search (VS). For an initial search, use the appropriate track spacing from Table 3-1 when the sweep width is not readily available.

(b) For helicopter SRUs. Helicopters are a suitable platform to perform SS and VS pattern searches. Depending on the proximity to the coast and environmental conditions, an area with a larger radius covered multiple times may be appropriate for a helicopter during the initial search due to a higher search speed. For an initial search, use the appropriate track spacing from Table 3-1 when the sweep width is not readily available.

Table 3-1 Initial Track Spacing

Initial Track Spacing (NM)		
Search Object	Good Conditions wind < 15 kts seas < 3 ft	Poor Conditions Wind ≥ 15 kts seas ≥ 3 ft
PIW	0.1*	0.1*
< 15 ft	0.5	0.2
≥ 15 ft	1.0	0.5
* or > 0.1 depending on SRU's minimum navigational accuracy and maneuvering capability		

3.4.2.4 SMC Action. ***In coastal SAR, the initial response datum shall be quickly established.*** In the interest of saving time and effort when doing drift computations manually, the datum for the initial response may be determined by calculating drift using the object's last known position and the effects of water current and wind without considering leeway divergence (Figure 3-1). Time of datum must take the underway and transit times for the SRU into consideration. When using SAROPS, there is no time or effort penalty for including leeway divergence so it is automatically included when that tool is used.

If the initial response SRU reports arriving on scene without finding the search object, the SMC shall develop a more comprehensive search plan and shall notify appropriate additional resources that they may be needed and may deploy some of them immediately if conditions warrant. Examples of issues to consider include, but are not limited to, the survival prospects of the distressed person(s), remaining daylight hours, remaining endurance of the initial response SRU, etc. In any case, no more than two hours should be allowed to elapse after the initial resource arrives on scene before a more comprehensive search plan is put into effect, which may require deployment of additional resources.

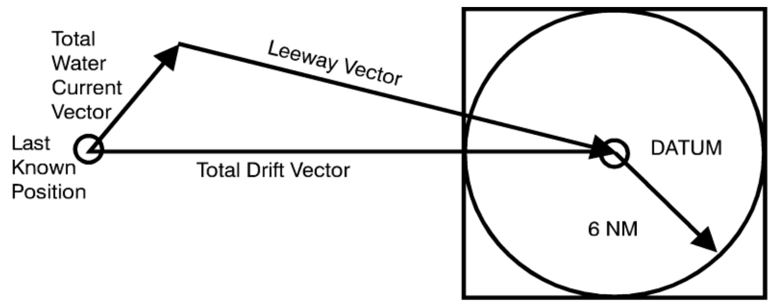

Figure 3-1 Vessel Adrift (Quick Manual Calculation for Initial Response)

(a) Factors to be considered for establishing this initial datum in coastal conditions are primarily tidal, river, coastal, longshore and wind driven currents. ***SMCs shall maintain data on water currents applicable to their local SAR environment.*** The annotated bibliography contained within Appendix K has sources of such information.

(b) Local sources such as marinas, Coast Guard Auxiliarists, harbor masters, sailing and yacht clubs, pilot stations, oceanographic research institutions, state fish and game or park services, local sheriff and marine police, fishermen, marine operations and salvage companies may all contribute to develop a local data base of knowledge.

(c) Other references and sources of information regarding water current are outlined in the National SAR Supplement. Stations and search planners are reminded that one way to determine total water current for estimating drift is by using a DMB.

(d) An extremely important source of local, real-time on scene environmental data is fishermen and other boaters. Timely, on scene environmental data from any source should not be overlooked.

3.4.2.5 Search Area. In the coastal environment, search areas that result from the guidance given above are usually large enough to include most objects if 6 or less hours have elapsed since the distress incident. If more than 6 hours have elapsed, or other conditions indicate (i.e. distress location is best described by an area or a voyage/flight scenario, the object type is uncertain, etc.), SAROPS should be used.

3.4.2.6 Search Patterns. The search patterns listed in Chapter 5 of the *IAMSAR Manual* can be used by any search unit. The National SAR Supplement expands upon the computations and techniques for performing coordinated vessel and aircraft search patterns. The complexity of some patterns may preclude their use by SRUs with limited navigational capability. The Square Pattern (sometimes called Expanding Square) and Sector Pattern are often the patterns used for initial search efforts. The information in the following paragraphs is provided as an aid to using these two patterns. A Course and Leg Identifier tool for these patterns is available and should be carried in SRUs for easy calculation of courses and times for each search pattern leg. This tool may be obtained through the federal supply system under DEPT. of TRANSP., USCG-PLOTTER (6-79) SN 7530-01-GF2-9010.

(a) **Square Single Unit -- Sierra Sierra (SS).**

(1) This pattern is used when there is a high degree of confidence the search object is close to the estimated datum position. The first leg is normally in the direction of the search object's drift. All course changes are 90 degrees to the right. If possible, the datum position should be marked with a suitable floating marker that will be visible from several track spaces away, such as a smoke float. Every effort should be made to keep the floating marker in the center of the pattern. Usually traditional DR navigation methods are used to accomplish this.

(2) The pattern shown in Figure 3-2 has 1 NM track spacing. The length of each leg is indicated. For different track spacing, multiply the distances shown in the pattern by the desired track spacing to find the length of each search leg.

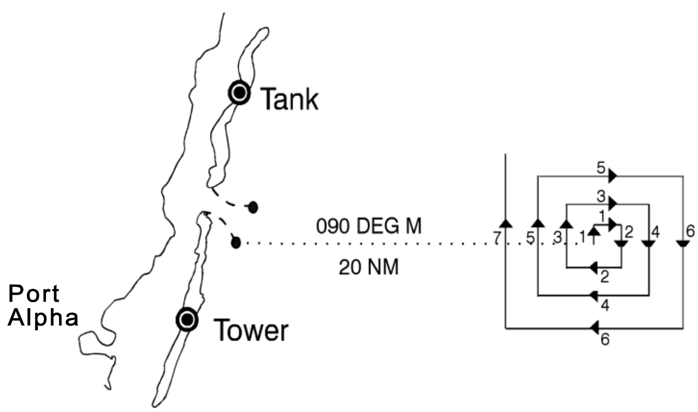

Figure 3-2 Square Pattern: Single Unit

To determine the time required to transit each leg, use Table 3-2, Square Pattern Computations. Enter the Table with the track spacing and SRU speed. Multiply the number from the Table by the length of the search leg shown in Figure 3-2 to get the time required to complete that leg at the given search speed.

Example: Track spacing = 3 NM, speed = 10 kts:

- Find the length of the second southerly leg. Solution: Multiply the length of the second southerly leg of Figure 3-2 (4) by the 3 NM track spacing to get 12 NM.
- Find the time required to complete this search leg. Example: Enter Table 3-2 with a track spacing of 3 NM and a search speed of 10 knots and read the value "18:00" (18 minutes and zero seconds). Multiply this value by 4 (leg factor in Figure 3-2). The result is 72 minutes to complete the leg.

- Coverage is computed as the ratio of sweep width to track spacing (C = W/S) in the usual fashion.
- POD is obtained from the appropriate POD vs. Coverage curve in Figure N-10 of the *IAMSAR Manual, Volume II*.

Table 3-2 Square Pattern Search Computations

Track Spacing	Speed (kts)								
	3	5	8	10	15	20	60	80	90
0.5	10:00	6:00	3:45	3:00	2:00	1:30	0:30	0:225	0:20
1.0	20:00	12:00	7:30	6:00	4:00	3:00	1:00	0:45	0:40
1.5	35:00	18:00	11:15	9:00	6:00	4:30	1:30	1:075	1:00
2.0	40:00	24:00	15:00	12:00	8:00	6:00	2:00	1:30	1:20
2.5	50:00	30:00	18:45	15:00	10:00	7:30	2:30	1:555	1:40
3.0	60:00	36:00	22:30	18:00	12:00	9:00	3:00	2:18	2:00
3.5		42:00	26:15	21:00	14:00	10:30	3:30	2:405	2:20
4.0		48:00	30:00	24:00	16:00	12:00	4:00	3:03	2:40
4.5		54:00	33:45	27:00	18:00	13:30	4:30	3:255	3:00
5.0		60:00	37:30	30:00	20:00	15:00	5:00	3:48	3:20
6.0			45:00	36:00	24:00	18:00	6:00	4:33	4:00
7.0			52:30	42:00	28:00	21:00	7:00	5:18	4:40
8.0			60:00	48:00	32:00	24:00	8:00	6:03	5:20
Note: All times in minutes and seconds Note: Interpolation may be used in this table									

(b) **Sector Search Patterns.** These patterns are best used when the datum is established within close limits, a very high coverage immediately around the datum is desired, and the area to be searched is not extensive. The patterns resemble the spokes of a wheel and cover circular search areas. Datum is located at the center of the wheel and should be marked with a suitable floating marker. By marking datum, the SRU has a navigation check each time the SRU passes through the center of the search area. Note that this means the search area is "drifting" with the floating marker, which is usually desirable. While there are many types of sector search patterns, a six-sector pattern is usually used. It consists of three equilateral triangles with one corner of each triangle in the center at datum. See Figures 3-3 and 3-4. The search radius is also the length of the crossleg. The track spacing ranges from zero at datum to a maximum equal to the search radius at the end of each search leg. This search pattern can be used in both single and multi-unit searches. Sector searches have a very high Probability of Detection (POD) near datum as a result of the very high coverage there.

(1) **Sector Search Pattern: Single Unit -- Victor Sierra (VS)**, Figure 3-3. When practical, the first leg of the search is normally in the direction of search object drift. All turns in this pattern are 120 degrees to the right. All legs of the search pattern are equal to the chosen radius. Upon completion of the pattern, a second pattern is started with the heading of the new first leg 30 degrees to the right of the final course of the first pattern.

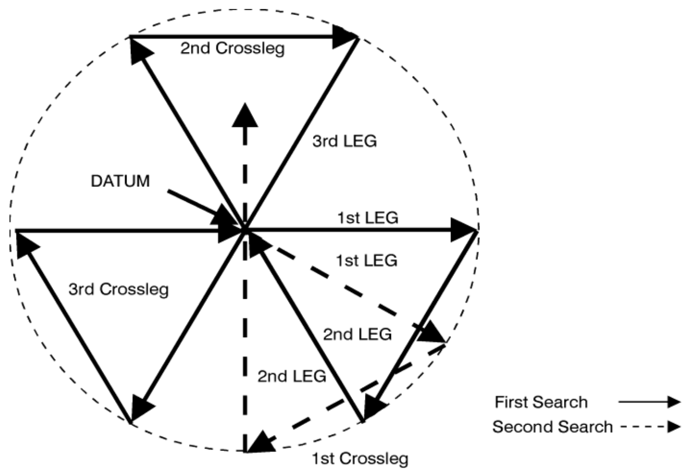

Figure 3-3 Sector Pattern: Single-Unit

(2) **Sector Search Pattern: Two-Units -- Victor Mike (VM).** The VM pattern may be used when two surface SRUs are available, Figure 3-4. As the first SRU begins a Victor Sierra search, the second begins its pattern at datum in a direction of 90 degrees to the left of the first leg of the first SRU. If the SRUs arrive on scene to begin the search at the same time, the second starts at a lower speed than the first. When the first SRU is about one leg ahead of the second, the second accelerates to search speed. The slow start of the second SRU prevents the SRUs from arriving at datum at the same time. When both have completed one VM pattern, the coverage is the same as if a single SRU had completed two VS patterns.

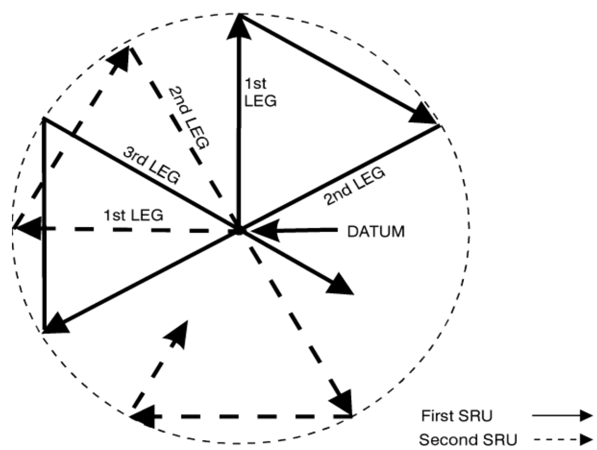

Figure 3-4 Sector Pattern: Two-Unit

(3) The sector search pattern becomes too complicated for more than two SRUs. When more than two SRUs are available, consider using a multi-unit parallel track (PM) search pattern, or dividing the search area into smaller areas and conducting single unit searches. Sector search distance and time calculations are as follows:

a. To determine the distance traveled by each SRU completing a sector search, multiply the radius (R) by nine. (Trackline = 9 x R NM)

b. To determine the Total Time (T) for a search, multiply the time (t) for one leg from Table 3-3 by nine. (T = 9 x t)

c. To determine Total Area (A) covered in a search, square the radius (multiply the radius (R) by itself), and then multiply the resultant by pi (3.14). (A = R x R x 3.14)

d. To determine coverage (C), multiply the total distance SRUs traveled while searching by the sweep width (W) and divide the result by the area (A) covered. (C = (Trackline miles x W)/A)

e. To estimate the average POD over the area covered, use the "Poor search conditions" POD curve from Figure N-10 of the *IAMSAR Manual*, *Volume II*. (A requirement for "Ideal search conditions" is parallel search legs, which the VS and VM patterns clearly do not have.)

Table 3-3 Sector Pattern Search Computations

Radius	Speed (kts)								
	3	5	8	10	15	20	60	80	90
0.5	10:00	6:00	3:45	3:00	2:00	1:30	0:30	0:225	0:20
1.0	20:00	12:00	7:30	6:00	4:00	3:00	1:00	0:45	0:40
1.5	30:00	18:00	11:15	9:00	6:00	4:30	1:30	1:075	1:00
2.0	40:00	24:00	15:00	12:00	8:00	6:00	2:00	1:30	1:20
2.5	50:00	30:00	18:45	15:00	10:00	7:30	2:30	1:555	1:40
3.0	60:00	36:00	22:30	18:00	12:00	9:00	3:00	2:18	2:00
3.5		42:00	26:15	21:00	14:00	10:30	3:30	2:405	2:20
4.0		48:00	30:00	24:00	16:00	12:00	4:00	3:03	2:40
4.5		54:00	33:45	27:00	18:00	13:30	4:30	3:255	3:00
5.0		60:00	37:30	30:00	20:00	15:00	5:00	3:48	3:20
6.0			45:00	36:00	24:00	18:00	6:00	4:33	4:00
7.0			52:30	42:00	28:00	21:00	7:00	5:18	4:40
8.0			60:00	48:00	32:00	24:00	8:00	6:03	5:20
Note: Time to complete one leg (t) in minutes and seconds Note: Interpolation may be used with this table									

3.4.2.7 Describing Search Areas. Search areas are described through various methods falling within the general categories of Corner Point, Trackline, Center Point, and Grid. Chapter 5 of the *IAMSAR Manual, Volume II*, provides a description of each of these methods. In addition, the specific methods below may be useful.

(a) Center Point-Landmark. The center point, or datum, may be designated by a bearing and distance from a geographic landmark. For example: Datum bears 060 degrees M, 10 NM from "Port Alpha" South Jetty light, major axis 000 degrees M, 6 NM by 6 NM (Figure 3-5).

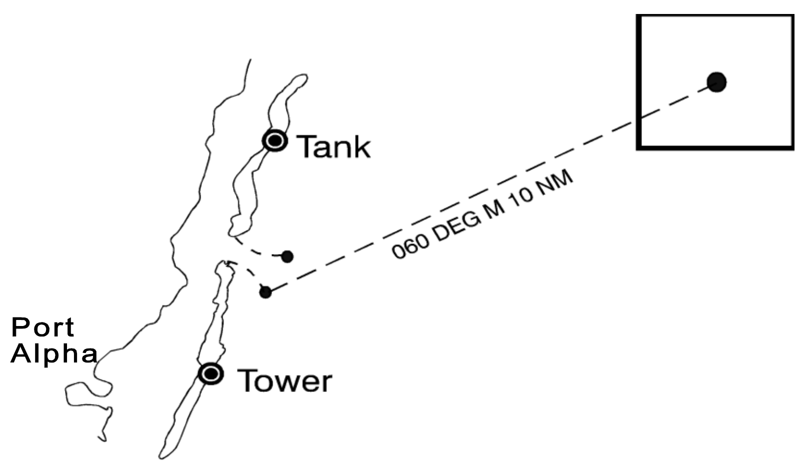

Figure 3-5 Center Point-Landmark

(b) Landmark Boundaries Method. Two or more landmarks are given as boundaries of the search area along a shoreline. For example: Search area from "Port Alpha" South Jetty, south to the Tower to 10 NM offshore (Figure 3-6).

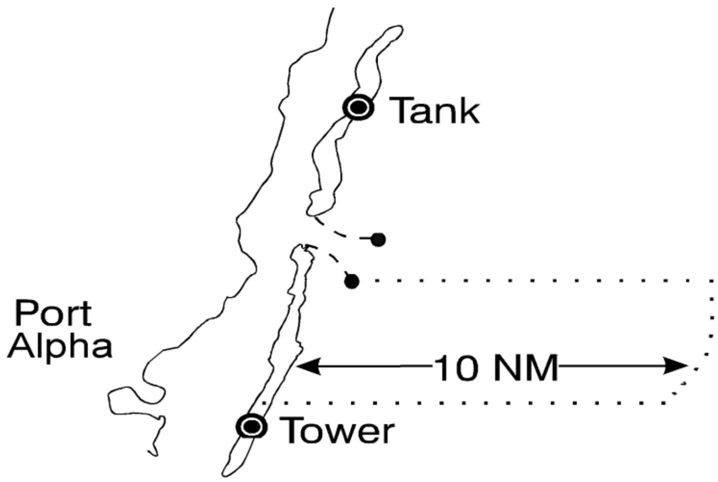

Figure 3-6 Landmark Boundaries Method

3.4.2.8 Track Spacing. Track spacing (S) is the distance between adjacent parallel search legs. The desired track spacing is a function of corrected sweep width, which is a measure of detection capability and will vary with search object type and environmental conditions, and the desired coverage. For a given desired coverage, the more difficult an object is to detect, the closer together the search legs must be.

NOTE: In darkness or extremely low visibility, surface search craft should periodically stop their engines and listen. If it is known or if there is a high probability that the PIW has night detection aids, a search may be conducted with track spacing compatible with the sweep width for the type of detection aid.

(a) Track Spacing by search object type, size and search unit. Detection capability also varies by search unit. The Tables and Graphs in Appendix H show the uncorrected visual sweep widths for search platforms for certain objects and correction factors for weather, fatigue and altitude in the case of aircraft. The most frequent search platforms used by Coast Guard resources for coastal SAR cases are small cutters (WPB), boats (MLB/RB-M/RB-S), and helicopters (HH-65/HH-60). It is recommended that Coast Guard units copy and laminate the appropriate tables from Appendix H for each SRU and include them in the SRU pilot or coxswain kit as a quick on scene reference for initial searching while more thorough search planning is being conducted.

(b) Persons in the Water (PIWs). In most cases, a track spacing of 0.1 NM is the lower practical limit for accurate surface navigation, and is recommended for initial coastal surface PIW searches. Search legs for helicopter SRUs should allow at least one minute of level flight. Once on scene, helicopters should search the assigned area repeatedly using patterns of different orientations to achieve a coverage equivalent to using a 0.1 NM track spacing when searching for PIWs. Caution: In some areas, currents with high gradients (large changes over short distances and or times) rapidly induce a large uncertainty in estimating where the PIW may be. The net result is a larger search area that may be difficult to cover at 0.1 NM track spacing with the available resources. SAROPS can often provide substantial assistance in determining appropriate search patterns, especially since it can model the simultaneous motion of search objects and SRUs when evaluating alternative search plans. These may look considerably different from those generated by traditional "rules of thumb." Search planners should give such recommendations serious consideration and step through them with SAROPS' Time Slider or Animation features to make a careful assessment before rejecting them because they do not fit the traditional mold. Additional guidance and cautions are provided in Appendix H.

3.4.3 Flare Incidents

Federal law requires all vessels 16 feet or greater in length to carry visual distress signals. Vessels 16 feet in length or less are also required to carry visual distress signals suitable for night use between sunset and sunrise. Most vessel operators elect to carry flares in order to fulfill this requirement.

3.4.3.1 The nature of flare distress signaling makes planning and execution of searches difficult due to:

(a) The wide variation of flare types;

(b) Range of possible maximum altitudes;

(c) The skill level and position of the reporting source/observer;

(d) The weather; and several other factors.

3.4.3.2 For that reason, the accuracy of the initial information received from a reporting source and/or observer is most critical. As with all SAR cases, a prompt, thorough and proper response yields the greatest chance of effecting a rescue. Otherwise, the search planner may have no choice but to dispatch SRUs to search a large area to account for long range sighting possibilities. For example, a hand-held flare in a recreational boat seen on the horizon by a beach observer, assuming the observer's eye and the flare are both six feet above the water, will be approximately 5.75 NM away while a parachute flare rising to 1200 feet and seen on the horizon by the same beach observer could be more than 40 NM away. Specific policies regarding response to flare incidents follow. Guidance on evaluating and planning for distress flare incidents is provided in Appendix I. The SAR Tools provided with SAROPS contain a tool for estimating the area containing a flare that has been sighted.

3.4.3.3 **Red and orange flares and pyrotechnics** ***are recognized as marine and aviation emergency signals and shall be treated as a distress and responded to unless available information indicates otherwise. Unresolved (insufficient information to either close or suspend) red or orange flares require first-light searches.***

3.4.3.4 **Other flares and pyrotechnics**: Searches and follow-up searches for the sources of flares or other pyrotechnics other than red or orange flares will depend on the specifics of the case. These sightings should be carefully investigated to determine the appropriate level of response.

(a) ***The time taken to investigate or seek other correlating factors for other color flares must be tempered with the prevailing environmental conditions and impact on survival***.

(b) A more immediate response may be appropriate in situations where any delay would likely result in harm to the potential persons in distress prior to rescue units arriving on scene.

3.4.3.5 Initial Search Object. When a flare is observed at night, the initial search object should be the distress-signaling device unless other information indicates a specific object, such as the reporting source observing the point of origin (vessel, PIW, etc.).

(a) If search object drift is required, the same provisions for drift for first light searches should be followed.

(b) The provisions of Section 3.4.5, which covers night and reduced visibility searches, should guide subsequent night searches.

(c) When a flare is observed in daylight, the guidance provided for first light search objects should be followed.

3.4.3.6 First Light Search Object. When planning a first light search following a flare sighting in the absence of local information on probable search objects, the planner should use the factors for leeway associated with the object listed in Table H-7 as: power vessel/sport boats/cuddy cabin /modified v-hull. A similar object for sweep width should be chosen (power boat 20 foot) unless local information would justify another object. In SAROPS, the equivalent choice is Vessels/Sport boats/Cuddy cabin with a length of 20 feet.

3.4.3.7 Searching the Initial Flare Cone. When the sighting of a flare occurs in a location where a vessel could have anchored or grounded, the first light search should include the initial flare cone area in addition to the drifted area.

3.4.4 Distress Beacon Incidents / SARSAT (Search and Rescue Satellite-Aided Tracking) Alerts:

Distress beacons (EPIRBs, ELTs, and PLBs) are some of the most important tools available to SAR authorities. The various distress beacon systems are covered in Section 3 of reference (a) and Section 2.1.4 of this Addendum.

3.4.4.1 Risk Management Regarding Alert Positions. In some instances, the indicated position for an alert is so significantly distant from available SAR resources that it is impractical to immediately dispatch resources to assist. Similarly, there are situations in which distress alert information is sketchy and the immediate dispatch of SAR resources would jeopardize the safety of others or leave a relatively large area of responsibility (AOR) without SAR coverage. In these situations, RCCs should spend a reasonable amount of time investigating and evaluating the situation prior to dispatching resources. Additionally, RCCs may attempt to alert alternative resources (e.g., Good Samaritans, Amver participants, other agencies, etc.) that may be in a position to assist.

Table 3-4: Cospas-Sarsat System Components
ELTs, EPIRBs and PLBs operate on the internationally protected 406 MHz emergency frequency. When activated, a 406 MHz distress beacon will transmit a unique digital code, referred to as a hexadecimal identification (HEX ID), which specifies the beacon type and enables registration data to be associated with the beacon.
Upon activation, beacon alerts are detected and relayed by the Low Earth Orbit satellite (LEOSAR), Geostationary Earth Orbit satellite (GEOSAR) and Medium Earth Orbit satellite (MEOSAR) constellations to earth stations referred to as Local User Terminals (LUTs). There are three types of LUTs: Low Earth Orbit LUTs (LEOLUTs) receive and process alert data from LEOSAR satellites; Geostationary Earth Orbit LUTs (GEOLUTs) receive and process alert data from GEOSAR satellites; and Medium Earth Orbit LUTs (MEOLUTs) receive and process data from MEOSAR satellites.
The LUT processes the data and transmits a distress alert message to the appropriate Mission Control Center (MCC) via a data communication network.
The MCC performs matching and merging of alert messages with other messages received, geographically sorts the data, and transmits a distress message to either another MCC for processing, the appropriate SAR authority (i.e. a Rescue Coordination Center – RCC) or a foreign SAR Point of Contact (SPOC).
The RCC evaluates the distress alert, evaluates available distress beacon registration data, and coordinates the SAR response to aid persons in distress.

3.4.4.2 COSPAS-SARSAT System Components. Table 3-4 describes the five components that comprise the COSPAS-SARSAT System.

(a) LEOSAR Satellites:

(1) LEOSAR satellites have a limited field of view of the Earth's surface due to the satellite's relatively low orbit altitude (e.g. 800-900 km above the Earth's surface). Each satellite orbits the Earth every 100 minutes.

(2) Doppler processing is used to calculate an independent (satellite-derived) location of the distress beacon signal received from a LEOSAR satellite. The LEOLUT requires a minimum of three distress beacon transmissions to calculate a Doppler location. The interval between satellite passes is approximately 30-45 minutes, depending on where the distress beacon is located on the Earth's surface.

(3) Once the distress alert data is received, it is stored for subsequent down link when a LEOLUT comes into view.

(4) The accuracy of a LEOSAR Doppler processed satellite location is normally 3-5 km.

(b) GEOSAR Satellites:

(1) GEOSAR satellites maintain a geographically fixed orbit (their view of the Earth does not change) and have a much greater view of the Earth's surface due to their higher altitude of approximately 36,000 km.

(2) The GEOSAR system complements the LEOSAR satellite constellation by providing a continuous distress beacon detection capability and relaying of the distress alert almost immediately upon detection.

(3) Doppler processed distress beacon locations cannot be derived from GEOSAR satellites due to their geographically-fixed orbits. However, GEOSAR satellites can relay a distress beacon's HEX ID and, if the distress beacon is equipped with internal Global Navigation Satellite System (GNSS) protocol, can provide the beacon's internally- derived (e.g., GPS) position.

(4) Due to the curvature of the Earth, GEOSAR satellites are limited to detecting distress beacons between 70 degrees north and 70 degrees south latitude. Consequently, they provide no Polar distress alert detection capability.

(c) MEOSAR Satellites:

(1) MEOSAR is the next generation space-based distress alerting system. The MEOSAR space segment and associated ground segment will in the future replace the LEOSAR system

(2) MEOSAR payloads are deployed throughout various GNSS constellations (e.g., GPS – U.S.; Galileo – European Commission; and GLONASS – Russian Federation). These satellites orbit the Earth approximately 20,000 km above the surface. Consequently, they have a much larger view of the surface than LEOSAR satellites but less than GEOSAR satellites

(3) Due to their larger field of view and the number of satellites in orbit, the MEOSAR system will provide redundant, continuous global coverage (Figures 3-7 and 3-8)

(4) In particular, MEOSAR system will:

a. Incorporate the best attributes of LEOSAR and GEOSAR satellites by providing a large field of view and the ability to calculate an independent location;

b. Calculate independent distress beacon locations by measuring differences in Time of Arrival (TOA) and Frequency of Arrival (FOA) data from multiple MEOSAR satellites (referred to as Difference of Arrival (DOA) position);

c. Provide more consistent and reliable distress beacon alert detection; and

d. Provide more precise locations and faster transmission of distress alerts as compared to the LEOSAR/GEOSAR satellite system.

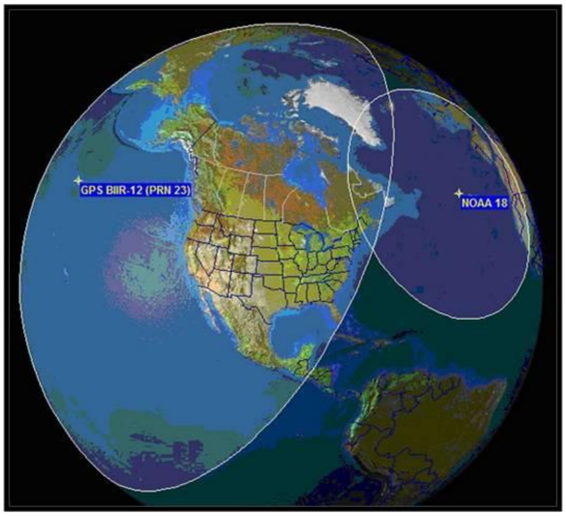

Figure 3-7: Satellite field of view: MEOSAR versus LEOSAR

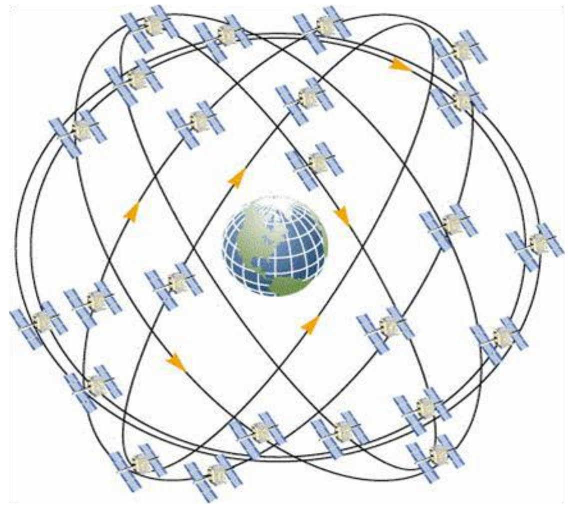

Figure 3-8: GPS (MEOSAR) redundant global coverage

(5) A minimum of three MEOSAR satellites must be in receipt of the distress beacon's transmission in order to calculate a MEOSAR independent position. MEOSAR position updates for a particular distress beacon will normally be provided to RCCs at least every 15 minutes, and provided sooner if there is a significant change in the distress beacon's computed position.

(6) When fully operational, the MEOSAR system will deliver significantly improved performance as compared to the LEOSAR system. GNSS Location Protocol Distress Beacons: A GNSS location protocol distress beacon contains a GNSS chip which is capable of calculating the beacon's location based on satellite navigation signals. The GNSS position is then encoded into the distress beacon alert message and transmitted through the LEOSAR, GEOSAR and MEOSAR satellites to the LUT. GNSS location-protocol distress beacons have the capability to deliver a distress position to SAR authorities much faster than a LEOSAR independent position.

3.4.4.3 Limitations of the Cospas-Sarsat System: As with any search tool, search planners must be cognizant of the limitations of the Cospas-Sarsat system:

(a) The prevalence of false alerts (e.g., inadvertent activation), interference, and persistent distress beacon transmissions can reduce the efficiency of the system;

(b) Distress beacon mishandling, technical malfunctions, design flaws, and improper testing/ installation can diminish system effectiveness; and

(c) Failure to recover distress beacons and secure transmissions once a distress or inadvertent activation is resolved can impede the receipt of legitimate distress signals.

3.4.4.4 406 MHz Distress Beacon – Unlocated First Alert: A first alert is the initial notification transmitted to an RCC indicating that a 406 MHz distress beacon signal has been detected. An unlocated first alert message is transmitted when a distress beacon is initially detected, but no encoded, Doppler or DOA position information available. These alerts are typically associated with distress beacons that do not have GNSS internal location protocol and have been detected by a GEOSAR satellite, or in some instances there are an insufficient number of MEOSAR satellites necessary to generate an independent DOA location. Once an alert message is sent to an RCC for an activated distress beacon, the RCC will receive subsequent alerts for the alert site until position is confirmed, regardless of location.

(a) Unlocated first alerts for U.S. coded distress beacons are only distributed for distress beacons that are registered, that are associated with a U.S. Government special program, or have the vessel craft or aircraft ID encoded in the beacon ID.

(b) Unlocated first alerts associated with registered, U.S.-coded EPIRBs are transmitted to the appropriate Coast Guard RCC based on the vessel homeport specified in the distress beacon registration data base (RGDB). Unlocated first alerts for certain non-U.S. distress beacons for countries in the U.S. service area are transmitted to the Coast Guard RCC based on country code in the Beacon ID. Distress beacon registration points of contact are usually the most promising leads for information, particularly for voyage plans, persons onboard, safety equipment and additional points of contact.

3.4.4.5 406 MHz Distress Beacon Alert General Response Policy:

(a) Upon receipt of a 406 MHz distress beacon alert, the RCC shall evaluate all available information, including the beacon's independent (satellite-derived) and internal (GNSS) positions, beacon registration data, and any other potentially correlating information to validate the existence of distress, its location and nature.

(b) The RCC shall evaluate distress beacon alerts in correlation with other indications of distress. For all notifications of 406 MHz detection received from sources other than SARSAT, RCCs should attempt to correlate the information with other information available at the time and assign an emergency phase as appropriate.

(c) The RCC should expand their investigation, as appropriate, to determine the cause of a distress beacon activation and dispatch SAR assistance.

(d) 406 MHz distress beacon alerts are classified as being in the Distress Phase. The distress notification requires an immediate response until assistance is provided, or the RCC has determined with a high degree of confidence that the distress beacon activation was unintentional or a false alert.

(e) MEOSAR remains in the Early Operational Capability (EOC) phase pending commissioning of additional ground systems and improved slow moving beacon location data. JRCCs should continue to use data provided by LEOSAR/GEOSAR to validate MEOSAR data when available.

3.4.4.6 406 MHz Distress Beacon Alert Response Policy: Types of distress beacon alerts and response policy guidance are provided below and summarized in Table 3-5.

(a) **Unlocated Distress Beacon First Alert:** Unlocated distress beacon first alerts are equivalent to receipt of a MAYDAY broadcast and are classified as in the Distress Phase. RCCs shall use all means available to affirm or refute the existence of distress, ascertain the nature of the distress and its location, and assist persons in distress, including issuing a UMIB as required.

(b) **MEOSAR/LEOSAR Validation:** MEOSAR remains in the Early Operational Capability (EOC) phase pending commissioning of additional ground systems and improved slow moving beacon location data. JRCCs should continue to use data provided by LEOSAR/GEOSAR to validate MEOSAR data when available. Operational MEOSAR (DOA) position data shall be used to validate LEOSAR (Doppler) positions. If the LEOSAR and MEOSAR systems provide conflicting distress beacon locations prior to position confirmation, the LEOSAR position shall be given priority, taking into account the information on accuracy provided for each position. The RCC must undertake a diligent investigation to reconcile the data and ascertain an accurate distress location.

(1) The MCC considers all available LEOSAR (Doppler), MEOSAR (DOA) and encoded position information to confirm beacon position (as provided in a position confirmation alert. For example, if an RCC receives a LEOSAR distress alert position and a MEOSAR position that matches within 20 km (the threshold for position confirmation), the RCC shall consider the alert to be in the Distress Phase, the LEOSAR position to be valid for distress response and initiate response actions prior to receiving LEOSAR satellite pass subsequent position data.

(2) When a RCC receives a distress alert because a LEOSAR “B” solution with a probability greater than 20 percent is in its SRR, and the RCC has not received position confirmation, the distress alert shall be considered in the Alert Phase. RCCs shall coordinate with the RCC responsible for the “A” solution while evaluating the “B” solution. The RCC shall check vessel type/description and homeport/registration POC data against the distress beacon alert position. This practice often helps substantiate valid “B” solutions.

(3) When a RCC receives a distress alert because a LEOSAR “B” solution with a probability less than 20 percent is in its SRR, and the RCC has not received position confirmation, the distress alert shall be considered in the Uncertainty Phase.

(c) **LEOSAR A/B Solution:** LEOSAR A/B solutions are an inherent aspect of Doppler processing and indicate the relative probability that the distress beacon signal is in one location (“A” solution) or the other (“B” solution).

(1) When an RCC receives a First Alert message with position unconfirmed and the “A” solution is in their SRR, the distress alert shall be considered in the Distress Phase.

(2) If available, MEOSAR data shall be used to validate LEOSAR positions and determine which solution is the actual location of the distress beacon, taking into account information provided about the accuracy of each position. Note that the USMCC uses all available LEOSAR (Doppler), MEOSAR (DOA), and encoded position data to confirm position.

(3) If a position confirmation alert is received (e.g. when a LEOSAR A or B distress alert position is validated by MEOSAR data), RCCs shall consider the distress

alert in the Distress Phase, the position valid for distress response, and initiate response actions prior to receiving subsequent position data.

(4) A LEOSAR 50/50 split solution is no different than an A/B solution, but merely indicates an equal probability that the distress beacon is in either location. When an RCC receives a 50/50 split solution it shall also be considered in Distress Phase regardless of whether the "A" or "B" solution is in its SRR.

(d) **Receipt of GNSS Encoded and Independent Location**: The following policy applies to the receipt of distress beacon alerts with GNSS location protocol and Doppler (LEOSAR)/DOA (MEOSAR) processed independent locations:

(1) Upon receipt of a distress beacon alert, the RCC shall determine whether the alert contains an encoded location and, if so, evaluate that position and assess whether it has been confirmed by independent location calculated by the LEOSAR or MEOSAR system (as provided in a position confirmation alert). There are a variety of factors that could degrade the accuracy of a GNSS derived location; consequently, the RCC may obtain an inconsistent or coarse (unrefined) position, which can raise doubt as to the actual location of the distress beacon. If a refined encoded position (identified with "4 seconds" position resolution in the RCC message) matches the confirmed position (within the associated 20 km match threshold used by the USMCC) then it should be given precedence.

(2) In the event the Doppler/DOA processed independent location does not correlate with GNSS location-protocol location, the independent location shall take precedence over the encoded location, absent any other corroborating information.

(e) **Communicating Position Coordinates:** RCCs in receipt of Cospas-Sarsat distress beacon alerts shall communicate beacon position coordinates to SAR facilities in degrees (DD), minutes (MM), and tenths of minutes (m) (DD-MM.m N/S DDD-MM.m E/W).

(f) **Notification of Country of Registry (NOCR):** NOCR alerts are sent to the distress beacon's country of registration (as coded in the 406 MHz distress beacon HEX ID) when the alert position is not located in the SRR of that country. For example, a U.S. coded 406 MHz distress beacon alert located outside the U.S. SRR will be geographically sorted and distributed to the responsible RCC or SPOC, as well as to the appropriate U.S. RCC (based on the homeport or airport if registered, if unavailable, AFRCC will receive PLBs and ELTs, USCG LANTAREA and PACAREA will receive EPIRBs).

(1) This practice was instituted due to concerns regarding the adequacy of SAR coordination and response services in some areas of the world and enables the country associated with the distress beacon country code to verify that an effective distress response has been undertaken.

(2) Upon receipt of a NOCR message, Coast Guard RCCs shall contact the responsible RCC or SPOC to ensure that a distress response has been initiated, with the assumption that U.S. citizens are in distress and require assistance.

(g) **Suspect MEOSAR Alert:** The MEOSAR ground segment has the potential to generate anomalies and forward "suspect" alert messages to RCCs. A MEOSAR alert is identified as suspect when the alert is based on a single satellite detection and no previous alert has been generated for the alert site. The USMCC will distribute suspect alerts to U.S. RCCs on a limited basis in order to mitigate the risk of discarding a legitimate distress beacon alert. There are two types of suspect alerts that can be received by U.S. RCCs:

(1) **U.S. Coded Distress Beacon Suspect MEOSAR Alert**: U.S. RCCs may receive distress alerts for U.S. coded distress beacons in the U.S. SRR that contain a cautionary note "suspect." Suspect alerts shall be distributed as an unlocated first alert message. For U.S. coded distress beacons, only suspect alerts with associated beacon registration data shall be distributed.

(2) **Foreign Coded Distress Beacon Suspect MEOSAR Alert**: In the event a suspect alert is generated for a foreign coded distress beacon with encoded location within the U.S. SRR, the alert will be distributed to the U.S. RCC based on the encoded location. The alert will only be sent to a foreign RCC associated with the distress beacon country code if the foreign RCC is outside of the U.S. service area (i.e., suspect alerts are not sent to U.S. SPOCs), the associated MCC for the foreign RCC has a corroborating alert, or the foreign RCC receives suspect alerts from its associated MCC based on national procedures. The U.S. RCC shall contact the foreign RCC to determine whether distress beacon registration information is available.

(3) Initially, all suspect alerts shall be considered in the Alert Phase. When a MEOSAR alert is identified as suspect, the RCC shall proceed with caution since the beacon HEX ID and/or associated encoded position may be unreliable. If the validity of suspect alerts can be substantiated by corroborating information, the suspect alert can be elevated to the Distress Phase. Additional information that can assist in determining the validity of a suspect alert includes the following:

a. Beacon registration data for the specific beacon HEX ID.

b. An encoded vessel or aircraft ID (i.e. MMSI, Aircraft 24 Bit Address, aircraft operator designator, radio call sign or tail number).

c. Correlation between the reported detection frequency and the beacon model detection frequency that is associated with its Cospas-Sarsat type approval number.

d. Another alert for the same beacon HEX ID.

(h) **Unreliable 406 MHz Distress Beacon Alert Message:**

(1) An unreliable message may be produced due to a variety of factors including technical problems with the beacon, satellite, LUT, MCC, or MCC communications networks. In the event a distress beacon alert is considered unreliable, no message fields will be decoded, and the distress alert will include an additional cautionary note immediately preceding the standard message title indicating, "UNRELIABLE BEACON (HEXADECIMAL) ID."

(2) *However, receipt of an unreliable distress alert does not imply the absence of distress.* The distress signal may be valid despite the fact that the beacon message may be corrupt. The distress alert and associated DOA or Doppler independent location may still be valid despite the unreliable nature of the message itself.

(3) Any unreliable distress alerts with location information shall be considered in the Distress Phase. The USMCC will distribute distress beacon alerts for unreliable HEX IDs when:

a. An independent MEOSAR DOA location or LEOSAR Doppler location is obtained; or

b. Registration data from the U.S. Beacon Registration database is available to investigate the alert.

(i) **Audible Report of Distress Beacon Activation on 121.5/243 MHz**: The Cospas-Sarsat system does not monitor 121.5/243 MHz distress frequencies; operation of EPIRBs on 121.5/243 MHz frequencies is prohibited. This prohibition, however, does not apply to ELTs in the U.S., which are typically carried on general aviation aircraft. Additionally, some man- overboard devices operate on 121.5 MHz and 406 MHz distress beacons do contain a low power 121.5 MHz homing signal with an audible tone, which is used for direction finding. Many ELT false alerts, for example, are caused by hard landings, inadvertent activation during maintenance, improper beacon testing, etc. Most reports of audible signals from distress beacons are reported by passenger aircraft, which have limited ability to determine the general location of a distress beacon. In instances when the audible tone of a distress beacon is detected by the Coast Guard, the signal should be investigated and its source located, if possible. The response policy for 121.5/243 MHz audible distress alerts is as follows:

(1) Receipt of an initial report of an audible signal from of a 121.5/243 MHz distress beacon should be considered in the Alert Phase, absent any corroborating information. The RCC shall attempt to correlate 121.5/243 MHz audible alerts with other potential indications of distress.

(2) Subsequent reports of an audible signal from a 121.5/243 MHz distress beacon shall be considered in the Distress Phase.

a. The RCC shall investigate the reports and attempt to locate the signal, determine its source and whether a distress situation is associated with the signal.

b. The reporting sources' position, course, speed, altitude, and the strength of the signal received is critical to localizing the source.

c. An Urgent Marine Information Broadcast (UMIB) shall be issued upon receipt of a subsequent report of an audible signal from a distress beacon. The duration and frequency of the UMIB is at the discretion of the SMC. The UMIB should contain text requesting individuals who have inadvertently activated a distress beacon to notify the Coast Guard.

(j) **Distress Beacon False Alerts.** Investigation into the cause of distress beacon activation is critical in ongoing efforts to improve beacon design, user education and mitigate false distress alerts, which plague the system. Operational commanders shall aggressively investigate and document the cause of all unintentional distress beacon activations with the intent to better understand the cause of inadvertent beacon activations. Where the opportunity presents, intent is to educate rather than penalize beacon users.

(1) Causal factors underlying unintentional distress beacon activations shall be documented in the USMCC Incident History Database (IHDB) in each instance.

The IHDB is the U.S. repository for data associated with distress beacon use. It is the only source for statistical data pertaining to false alerts. The importance of accurately documenting distress beacon activation and response, for both distress incidents and false alerts, cannot be overstated as this information is fundamental to system improvement.

(2) In all cases, investigators should educate distress beacon users on proper registration procedures and beacon usage. Coast Guard personnel should follow guidance in reference (b) and other appropriate directives in reporting all incidents to the FCC and actions taken. In instances of isolated and infrequent beacon false alerts, the SAR Coordinator in which the distress beacon is registered should send an administrative letter to the owner expressing concern and describing the impact on the SAR system of unintentional distress beacon activations. This correspondence should also emphasize the importance of maintaining current distress beacon registration data (for 406 MHz beacons and other "registered" distress alerting devices), user training and knowledge of applicable beacon types (e.g. EPIRB, ELT, and PLB). In the case of repeated false beacon alerts, close coordination with the FCC, distress beacon owner and the beacon manufacturer can help reveal causal factors including beacon design flaws, technical problems and operator error.

Table 3-5: Distress Beacon Alert and Corresponding Emergency Phase	
Beacon Alert	**Emergency**
406 MHz Distress Beacon: • **UNLOCATED FIRST ALERT:** 1st Alert received from GEOSAR, MEOSAR or LEOSAR system with no location for a U.S.-registered distress beacon. • **LOCATED FIRST ALERT (POSITION UNCONFIRMED):** 406 MHz LEOSAR "A" solution alert, or the receipt of a 50/50 Split for "A" or "B" solution. • **LOCATED FIRST ALERT (POSITION UNCONFIRMED):** LEOSAR, GEOSAR or MEOSAR alert with digital encoded GNSS position (referred to as an "E" Solution). • **LOCATED FIRST ALERT (POSITION UNCONFIRMED):** 406 MHz MEOSAR located (independent location). • **NOTIFICATION OF POSITION CONFIRMATION:** 406 MHz LEOSAR Doppler or MEOSAR DOA position confirmed via match within 20 km to encoded position or independent Doppler or DOA position. **Audible Report of Distress Beacon Activation on 121.5/243 MHz:** Multiple reports of audible alert.	**Distress Phase**
406 MHz Distress Beacon: • **UNLOCATED FIRST ALERT (POSITION UNCONFIRMED):** "Suspect" Alert 406 MHz MEOSAR for U.S. coded distress beacon with registration information.* • **LOCATED FIRST ALERT (POSITION UNCONFIRMED):** "Suspect" Alert 406 MHz MEOSAR for foreign-coded distress beacon with encoded location in U.S. SRR.* • **LOCATED FIRST ALERT:** 406 MHz LEOSAR "B" solution alert; probabilities greater than 20%. **Audible Report of Distress Beacon Activation on 121.5/243 MHz:** Initial report of audible alert.	**Alert Phase**
406 MHz Distress Beacon: **UNLOCATED FIRST ALERT**: 406 MHz LEOSAR "B" solution alert with probabilities ≤ 20%.	**Uncertainty Phase**
* " Suspect" Alert: A MEOSAR alert is identified as suspect when the alert is based on a single satellite detection and no previous alert has been generated for the alert site. Initially all suspect alerts shall be treated as in the Alert Phase. For foreign coded distress beacons, the RCC shall contact the foreign RCC to determine if distress beacon registration information is available. If the validity of suspect alerts can be substantiated by corroborating information, it shall be elevated to the Distress Phase.	

3.4.4.7 Alert Query Reports (SIT 951): RCCs should query the USMCC when amplifying information is required to prosecute a distress beacon alert. The USMCC can produce an Alert Site Query Report (Known as a "SIT 951" message), which contains information on active and closed alert sites processed by the USMCC. Queries may be based on time, site ID, beacon ID or geographical area. This information helps determine the presence or absence of 406 MHz distress beacon signals in a geographic area over a period of time, better understand the behavior of a specific beacon over a period of time or activity associated with an alert site. Reference (ss), provides additional information on this process and guidelines for interpreting these report

3.4.4.8 Use of Elementals - Moving Search Objects and Extended Drift: SAR planning for a moving search object is a complex undertaking. The RCC may be required to scrutinize each elemental location to ensure that the most recent/current position is utilized for SAR operations. The composite/confirmed solution position contained in a 406 MHz distress beacon alert position update message may not be the most accurate position for SAR planning. SARSAT data processing algorithms average several elemental position updates to generate the composite/confirmed (average) position. In instances when the system has been receiving distress beacon data for an extended period of time or in an environment where there is significant drift, the elemental position (raw data) from each satellite pass may provide a more accurate position of the distress beacon's actual location. This elemental position data is provided on each update message and can be manually plotted using the SARTOOL function within the SAROPS program.

(a) Figure 3-9 is an example of a moving object and position comparison. The figure illustrates how a composite position for a moving distress beacon becomes less accurate over time, which highlights the rationale for using elemental position data for SAR planning associated with moving distress beacons.

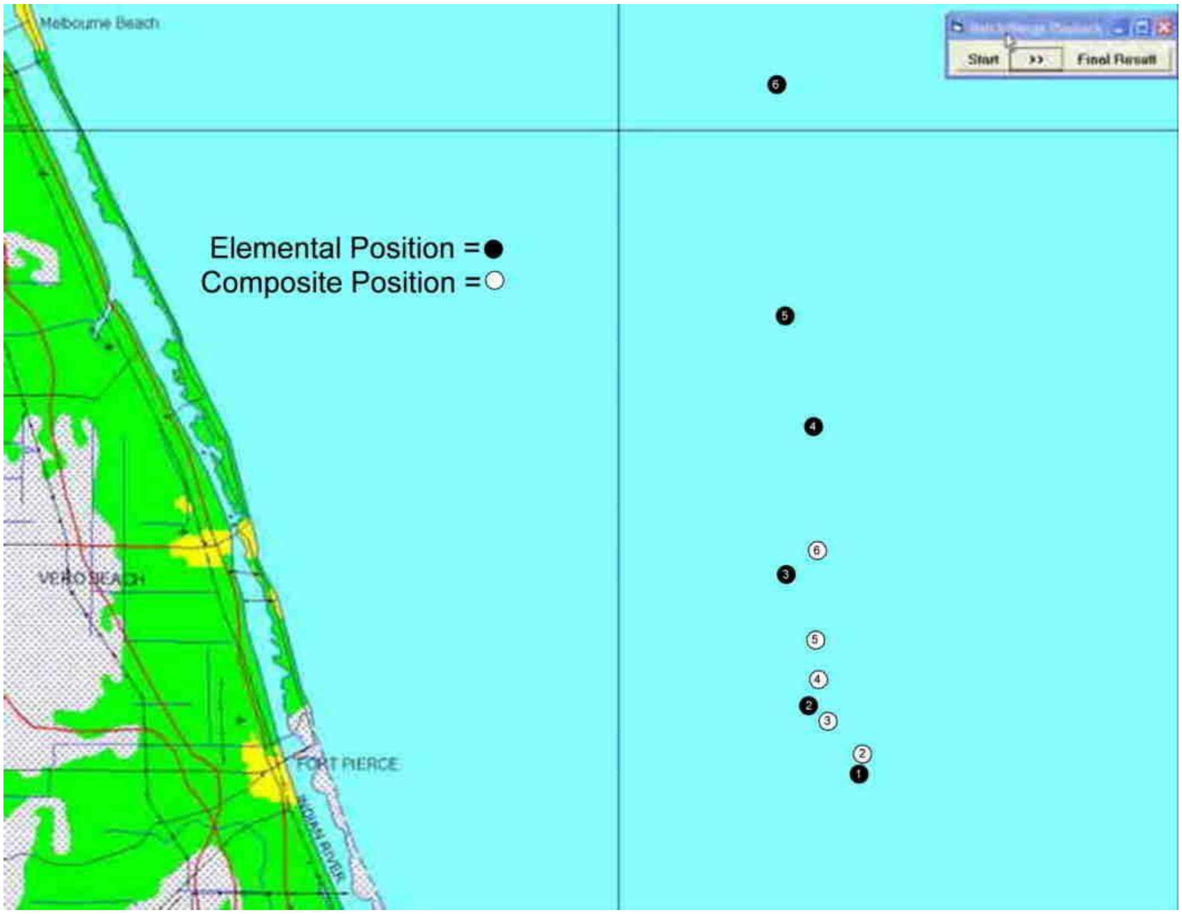

Figure 3-9: Elemental vs. Composite/Confirmed Positions for a Moving Search Objects

3.4.4.9 Datum Marker Buoy (DMB): 406 MHz distress signals are internationally recognized means for distress notification and shall not be used for any reason other than distress. 406 MHz distress beacons are not interchangeable with datum marker buoys. As such, search planners shall not normally use them as DMBs.

(a) SLDMBs are the appropriate tools for marking datum in extended search cases. ***When located, EPIRBs shall be recovered and, whenever necessary and possible, SLDMBs deployed in the same position to mark datum***. Standard radio DMBs work fairly well when no SLDMBs are available.

(b) In situations where the EPIRB is the only means of marking datum, close coordination between the SMC and the USMCC will be required.

3.4.4.10 Distress Beacon Recovery: Upon conclusion of SAR operations, or when SLDMBs have been deployed to mark datum in an ongoing SAR response, 406 MHz EPIRBs and similar distress beacons shall be recovered and secured, whenever safe and practical to do so. Failure to recover and secure unattended distress beacons risks future false alert and potential system performance degradation.

3.4.4.11 Distress Beacon Registration: *406 MHz distress beacon owners in the U.S. are* required by law to register their beacons with NOAA. SAR operations are greatly facilitated by up-to-date beacon registration data. Operational commanders and Coast Guard Auxiliary personnel must educate mariners and distress beacon owners regarding the 406 MHz distress alerting and locating capability and encourage beacon registration and regular registration maintenance. Units should also have spare 406 MHz EPIRB registration cards for users to fill out and mail to the USMCC. A sample registration card is in Appendix J. In addition, units should relay registration information to the USMCC. NOAA provides an online capability for distress beacon registration available at www.beaconregistration.noaa.gov.

3.4.5 Night and Reduced Visibility Searches

Reduced visibility, either due to night or weather, significantly reduces the effectiveness of a search, particularly for objects that are not readily located using radar or other electronic sensors. For planning and conducting searches during night or under otherwise reduced visibility conditions, the following guidance is provided.

3.4.5.1 Timeliness. In addition to SAR incidents occurring at night, it is common for incidents to occur towards the end of the day when mariners are returning (or due to return) from a day on the water. A rapid response with a full search using the remaining daylight may obviate the need for a night search. For searches with reduced visibility in daylight hours, getting search units into the area rapidly will provide some search coverage and facilitate a rapid resumption of full search capability should conditions improve.

3.4.5.2 Continual Searching. ***Searches shall not be stopped solely due to darkness or limited visibility. A number of factors must be considered when planning the level of effort to apply to searching through the night and during periods of reduced visibility, including:***

(a) ***Search units and sensors available*** (discussed in 3.4.5.3).

(b) ***Crew rest and search unit refit***. If time is needed to rest or replace crews, or to refit the search unit, it may be appropriate to do so during the time the unit's search effectiveness would be the lowest; ensuring availability for when search conditions are more favorable. SMCs/OSCs should direct units to return on a rotational basis to achieve both ends of crew rest/unit refit and continued searching when possible.

(c) ***Urgency of response***. The type of SAR incident, prevailing environmental conditions and likely condition and situation of the persons involved dictate the urgency of response. In some situations reduced non-stop search efforts may not greatly impact the survival of the persons involved. However, the survival of the persons involved can be very tightly associated with time, and searching even with low effectiveness in those instances is appropriate. Survival model runs provide information critical to these decisions.

(d) ***Persons in the water. For cases with known persons in the water search efforts shall continue overnight or throughout periods of reduced visibility except where prohibited due to crew fatigue, weather or other safety concerns.*** Absent specific operational (weather, fatigue, etc.) prohibitions, waiting for first light or improved visibility to search for confirmed PIWs is not acceptable.

(e) ***Keeping a search unit in the area during night and reduced visibility is also important for survivor confidence***. Sighting a search unit in the area lets survivors know the search is still on and will bolster their will to live.

3.4.5.3 Search units. The choice of search units, air or surface, depends greatly on safety of operations under the given conditions, the search object, and the sensors available on the various search units.

(a) With reduced visibility it is imperative to employ those search units with the best sensors for the conditions.

(b) The expected duration of reduced visibility conditions will also dictate, to some degree, the choice of search units. If reduced visibility is expected for only a short period, surface units may proceed into the search area immediately while air units, which can arrive more rapidly, may be timed to arrive when conditions are improved. For reduced visibility of longer duration, the decision to use surface and air search units will be more dependent on search object, the sensors available on each search unit, and the effectiveness of those sensors for existing weather conditions.

(c) There may be times when conditions do not permit units to conduct a search such as severe storms. Although not able to effectively search, deploying a surface unit in the search area ready to respond rapidly to a signal or chance sighting should be considered. ***When this occurs, risk management mitigation strategies must be employed.***

3.4.5.4 Search object. The ability to detect an object is based on the sensors available on assigned search units. Depending on the incident and sensors available, the primary search object may be something other than the overall object of the search.

(a) Unaided visual searches at night will not readily detect unlit objects. Even large vessels may be hard to detect if not illuminated and smaller objects such as rafts and persons in the water are nearly impossible to see. Under such conditions the primary search object should be a night signaling device (flare, strobe, light).

(b) Enhanced visual searches using night vision goggles under favorable conditions will permit keeping a PIW or small craft as the primary search object. The night vision goggles can take advantage of less bright light sources and reflective surfaces or materials.

(c) Night searches following a flare should have a primary search object of additional signaling devices. Sensors for other than visual search should also be utilized so that objects of interest within the search area may be investigated.

3.4.5.5 Search tactics. Searchers should utilize all possible means of detecting search objects, visual, electronic, and aural. These tactics are dependent on accurate search planning and coordination. The following should be considered in the planning and conduct of a reduced visibility search:

(a) The SMC should be fully aware of on scene conditions, as searches begin and any changes that occur during the search. Search units should pass to the SMC (or OSC if one is assigned), conditions upon arrival on scene and any changes. This information is critical to assigning appropriate track spacing to achieve the desired search results.

(b) At night all unnecessary lighting on search units should be secured, electronics lighting should be shifted to low light mode to minimize glare on the inside of windows and to preserve night vision.

(c) If the distressed craft or survivors are known to have distress signals, it is important for search units to make their presence known in hopes of getting the survivors to signal. Often the navigation lights alone may not be enough and additional lighting (blue light, search light) may be necessary to get a response. This tactic may be most appropriate for early on searches. The need to limit excess light for night vision considerations may be more appropriate for later searches where there has been ample opportunity for survivors to discharge or use any signaling devices.

(d) If a debris field is discovered, it may be appropriate for search crews to use lights or flares to illuminate the area to enable a better visual search of the concentrated area. This may mean sacrificing night vision for the crew in hopes of spotting PIWs or reflective material that the lights may illuminate.

(e) Ambient light sources should be exploited in a search.

(1) With bright shoreline lights, light colored objects or objects with reflective material in particular may be illuminated enough for the unaided eye to detect, while detection using NVGs will be greatly improved.

(2) A full or near full moon can also provide enough light for the unaided eye to detect an object and greatly improves NVG effectiveness. The reflection of the moon on the water also can be used to search for objects as it "moves" across the surface with the search unit's motion. This is particularly effective in calm conditions with the moon low in the sky.

(3) Large backlit objects may also provide a detectible profile when searching along a well-lit shoreline.

(f) Electronic sensors should be set according to search object as discussed in 3.4.6 below.

(g) On surface search units the engines should be secured (brought to idle if securing not possible) and all other noise minimized in order to call out to and hear calls from survivors. This is a particularly good practice when encountering a debris field or at regular intervals even though no debris is present.

(h) Search units should check buoys and fixed aids in the vicinity. PIWs may swim to something that floats or provides them some form of stability.

3.4.6 Electronic Sensors and Sensor Searches

3.4.6.1 Surface Vessel Radar. Appendix H contains recommended sweep width tables for surface vessel radar. In addition, the following information should be considered when planning searches utilizing surface vessel radars:

(a) The effective search range of radars varies greatly.

(b) Radar range sweep widths for small objects should only be applied in low sea states.

(c) Radar reflective devices significantly improve object detection probability.

(d) The decision of whether or not to utilize the surface vessel radar in a search, especially if it requires dedicating a crewperson who could be used for visual search, should be based on a comparison of the radar sweep width to those for other available sensors. Surface radar searches will generally be preferred when visibility is poor, sea state is low to moderate, and the object is equipped with a radar reflector. Radar sweep widths deteriorate rapidly with the onset of precipitation and/or seas of greater than 4 feet.

(e) Visual scanners should concentrate on the area in the immediate vicinity of the search unit during low visibility radar searches to avoid missing objects that pass through the area of heavy sea return.

3.4.6.2 Forward-Looking Airborne Radars (FLAR). The Coast Guard Research and Development Center has conducted research on Coast Guard fixed wing aircraft to determine detection capabilities of FLARs for SAR operations. From detection data collected under realistic search scenarios estimates of sweep width have been calculated. Appendix H includes the recommended sweep widths for the AN/APS-137, AN/APN-215, AN/APS-127, and RDR-1300.

(a) The AN/APS-137 radar, installed on the Coast Guard's HC-130 fleet, was evaluated for SAR object detection during three field tests conducted by the Coast Guard R&D Center and were reported on in Coast Guard R&D Reports CG-D-14-93, CG-D-07-94, and CG-D-18-94. The AN/APS-137 FLAR is an X-band, air-to-surface Inverse Synthetic Aperture Radar (ISAR) that provides high resolution, small-object detection, weather avoidance, sea surveillance, and Doppler display. The AN/APS-137 system has special selectable features that enhance system performance against weak radar returns. Sweep width recommendations for conducting and planning AN/APS-137 (aircraft) SAR searches are provided in Appendix H.

(b) The RDR-1300 model radar is found on the HH-65 and HH-60 aircraft. This radar is comparable to the APS-215 and the sweep width tables corresponding to the APS-215 are applicable for searches conducted using the RDR-1300 radar.

3.4.6.3 Side-Looking Airborne Radar (SLAR). Side-looking airborne radar is installed on some Coast Guard fixed wing aircraft. The AN/APS-135 model is currently installed on two C-130s at CGAS, Elizabeth City.

(a) Recommended sweep widths for SLAR on Coast Guard aircraft are shown in Appendix H. Specific findings of the research that are of interest to SAR planners are:

(1) SLAR models tested are capable of detecting 180-foot ships nearly 100% of the time in seas up to at least 6 feet and ranges up to 30 NM.

(2) Objects as small as 16-foot boats with metal equipment (engine, gas tanks, frames, etc.) can be detected better than 90% of the time in seas less than 3 feet and 30% - 50% of the time in seas of 3-6 feet. These objects can be detected in low sea states out to the 30 NM swath width limit.

(3) Four to ten person life rafts can be detected 40% to 70% of the time in seas less than 3 feet, but can be detected less than 15% of the time in seas of 3 to 6 feet.

(c) Presently these SLAR equipped aircraft are the primary iceberg surveillance platforms for the International Ice Patrol.

(d) SLAR has limited use during a search. SLAR is essentially an aerial surveying system. To adequately survey an area, the aircraft must fly level and straight. The SLAR aircraft or other SRUs can then identify the resultant SLAR film's objects.

3.4.6.4 Forward-Looking Infrared System (FLIR). FLIR data was collected in experiments conducted by the Coast Guard Research and Development Center. These studies tested the Northrop Corporation SeaHawk FLIR system, which is not being carried on any Coast Guard aircraft. Chapter 4 of this Addendum lists which Coast Guard aircraft carry FLIR capability.

(a) Extensive testing of FLIR as a SAR search resource with various objects has not been conducted. FLIR has a very narrow field of view. Most units operate with a 7-15 degree field of view. Recommended sweep widths and altitudes for use of FLIR are contained in Appendix H. Sweep widths should not exceed the effective azimuthal coverage of the system in use. Appendix H also contains illustrations of how to estimate a sweep width for a FLIR unit.

3.4.6.5 Night Vision Goggles (NVG). Many SAR incidents occur or become known to the Coast Guard during the afternoon or night. The greatest benefit of NVG is that this sensor enables searchers to conduct effective searches at night, thus search planners will not have to wait until first light the following day to begin effective visual searches. This will increase the probability of survival for those persons in distress. Research showed NVG searches from vessels are not recommended because the lookouts are prone to seasickness when using NVG, but they are effective from aircraft. Sweep Width Tables for NVG Searches are provided in Appendix H.

3.4.6.6 Photo Reconnaissance Support. Photoreconnaissance is one resource that may have limited benefit in locating those in distress in a large maritime search area. Aircraft equipped for highflying photography include Coast Guard fixed-wing aircraft equipped with Electro-Optical Sensor Systems (ESS), some U.S. Air Force aircraft, and some aircraft from other agencies. Satellite imagery is also continuously improving and may be available for the area of interest associated with a particular SAR incident.

3.4.7 Searches for Bodies

Coast Guard units are often requested to search for bodies. However, Coast Guard SAR units are not provided the specific gear (e.g., dragging equipment, etc.) or training to conduct underwater searches. Per United States Coast Guard Regulations 1992, COMDTINST M5000.3 (series), "when it has become definitely established, either by time or circumstances, that persons are dead, the Coast Guard is not required to conduct searches for bodies. If, however, requests are received from responsible agencies, such as local police, military commands, etc., Coast Guard units may participate in body searches provided that these searches do not interfere with the primary duties of the units." The participation normally is confined to a surface search or providing a support platform for other agencies to use their equipment**. *Any factors for Suspension consideration shall be based on the surface search efforts, as outlined in Section 3.8.3.***

3.4.8 Aircraft Incidents

Aircraft incidents present a particular challenge to SAR planners. The speed of aircraft and the distance they can travel in a short period of time often makes it difficult to determine the best area to search with the available resources. Once determined, the initial search area is often very large. Various systems associated with aviation safety and tracking can assist in narrowing initial datum and reduce the area to be searched.

3.4.8.1 Emergency Locator Transmitters (ELTs), if operating properly following an aircraft crash or ditching, may provide a position through Cospas-Sarsat or direction finding by SAR assets. However, once in the water aircraft rarely stay afloat and submerged ELTs will cease to provide a signal.

3.4.8.2 Aviation tracking radar systems are present throughout the United States and along the coast for defense and tracking of civil aviation. Several radar-tracking systems are covered in Chapter 2 of reference (a).

(a) Hill AFB provides technical certification and service for a nationwide array of linked air defense radar's that may provide valuable "near real-time" information to search and rescue planners prosecuting maritime or inland aircraft incidents. The radar information is fully archived for a 90-day period and playback of the event can give a "near real-time" dynamic picture of the subject aircraft's activities leading up to, and at the time of, the incident. Some of this information may be available from the local Air Route Traffic Control Center (ARTCC), which provides greater radar coverage, both in geographic areas and in lower altitudes. It archives "RAW" or "SKIN PAINT" aircraft radar contact information, while the information that is available to ARTCC systems is generally filtered to show only radar information from aircraft that are using a transponder. RCC requests for this information should be made directly to AFRCC: SAR Duty Officer, (800) 851-3051or (850) 283-5955, afrcc.console@tyndall.af.mil.

(b) Shortly after contact, AFRCC should be able to furnish a last known position of the incident aircraft. AFRCC should be given as much information as possible, as the radar system archives ALL air contacts received, and the incident aircraft must be selected from the data available. Within a period of up to a few hours, they will be able to call in an analyst who will review the radar system's archived information, review the available data and update the information. AFRCC will provide an electronic copy of the aircraft incident to the RCC, and assist in its interpretation. This playback will generally fit on a single floppy diskette and/or may be sent electronically. No special hardware or software is required to perform the playback; it will perform well on CGSWIII. The playback may be advanced rapidly, slowed, and paused as required. Each data point of the incident may be "clicked" to show that data point's related information, such as altitude, etc. Copies of the given screen pictures are also easily made using the existing "ALT-PRINT SCREEN" buttons on the PC and copying that information into the program of choice. NO special training is required.

3.4.9 Uncorrelated Distress Broadcasts & Alerts

This section provides the standard Coast Guard procedures to be used in prosecuting uncorrelated distress broadcasts. An uncorrelated distress broadcast is a distress broadcast that does not include position or identification information sufficient to generate a reasonable search area. A distress broadcast may use the internationally recognized distress word "MAYDAY" or any number of words that would indicate a need for assistance including, but not limited to, "help," "emergency," "trouble," "sinking," etc. An uncorrelated distress broadcast could also originate from a radio equipped with DSC where the radio was not interfaced with a GPS and the MMSI was not registered.

3.4.9.1 Thousands of distress broadcasts are received on VHF-FM channel 16 by Coast Guard units each year. Some are made by mariners who may not be able to transmit more than a single broadcast before the condition of the vessel, communications gear or their person renders them unable to transmit additional information. In these cases, we do not have the opportunity to establish direct communications with the caller, and may not be able to ascertain a location or identification. These situations severely hamper the Coast Guard's search planning and rescue coordination efforts. Regrettably, we also receive distress calls from calling parties with the clear intention to mislead or deceive our watchstanders. ***Despite this fact, all distress broadcasts shall be treated as legitimate distress calls unless determined otherwise.***

DSC is a relatively new radio capability that allows the maritime public to transmit a distress by holding down a button located on the radio for 3 seconds. When properly installed and registered in the MMSI database the distress and GPS location would be transmitted via channel 70 to the closest receiving station. The imbedded information contains the owner/operators information. However, if the radio was improperly installed, not integrated with GPS, and was not registered in the MMSI database, this would be considered an uncorrelated distress broadcast. The watchstander's only response option would be to issue a UMIB. A disadvantage to making a distress call via the DSC radio is that the transmitted distress is a data stream that does not allow the system to home in on the signal and create a line of bearing.

3.4.9.2 Watchstanders shall initially treat all distress broadcasts as distress incidents. ***All distress broadcast incidents shall be aggressively pursued and carefully documented.***

(a) ***The SAR mission coordinator (SMC) shall issue an urgent marine information broadcast (UMIB) for all distress situations, unless clearly not warranted.*** This is the minimum response requirement for uncorrelated distress broadcasts – callouts are not sufficient. ***The UMIB shall include text requesting mariners and shore stations that heard the distress broadcast to contact the Coast Guard with their position. The UMIB shall be broadcast for at least one hour at 15-minute intervals.*** Based on information provided as feedback or lack of feedback, the UMIB should be modified to take advantage of this information.

(b) ***When sufficient information exists to establish a reasonable search area, the SMC shall launch appropriate resources to respond to a distress broadcast. In the absence of such information, search planners shall engage in aggressive detective work, using all means at their disposal to narrow down a search area, including:***

(1) *Analysis of high-level site reception.* When an uncorrelated distress broadcast is received on two intersecting high-level sites, a reasonable search area may be developed from the overlapping area (depending on the size of overlapping area) and/or from the direction finding capability that provides a line of bearing from each high-level site. The appropriate degree of error for the direction finding system for each Remote Fixed Facility (RFF) needs to be applied. For search planning purposes, units equipped with the Rescue 21 communications system have +/- 2 degrees of error unless otherwise stated for a particular RFF. In some cases reception on a single high-level site may result in a searchable area due to the form of the land area in relation to high-level site location. Not receiving the distress broadcast on adjacent high-level sites may also allow elimination of overlap areas in initial search efforts. ***Caution must be taken when eliminating areas by using the minimum reception area ascribed by the arc of the non-receiving high-level site (i.e. for height of sending antenna use zero; distance will be determined by radio horizon of the high-level site alone).*** Additionally, the single line of bearing provided by the direction finding would help narrow the search and in most cases result in a reasonable search area. Reference Section 3.4.15 for additional direction finding and range policy.

(2) *Queries to ascertain if other boats or shore based radios heard the call over low-level antennas.* This should be accomplished via the UMIB. Additional queries may be made to refine this information. Knowledge of low-level antenna reception may yield additional reception area arcs, further narrowing the probable location of the distressed caller.

(3) *Replay the transmission.* For all uncorrelated distress broadcast cases, the SMC should immediately review recorded transmissions. The SMC should also immediately review all channel 16 transmissions addressed to the Coast Guard that cannot be readily identified as non-emergent. If possible, several different individuals should listen to the transmission to aid in verifying information. The SMC should be prepared to send an email with the distress transmission attached for the District command center upon request.

(4) *Additional considerations.* If the distress alert has been correlated with or corroborated by other information and the estimated POS for the initial SAROPS

search plan is below 75%, consider increasing the on scene endurance, if practicable, or providing additional SRUs and re-running the SAROPS Planner accordingly.

3.4.9.3 Auto-Distress Communications. In recent years, the Coast Guard has experienced an increase in the number of S-O-S transmissions and electronically synthesized MAYDAY calls on VHF-FM, as well as 2182 kHz distress alarms on MF/HF radio. Experience shows that these types of auto-distress transmissions are often triggered accidentally, creating potentially dangerous safety of life issues for the public and Coast Guard. For uncorrelated auto-distress notifications and alarms, the SMC does not need to launch unless there is a reasonable search area AND there are additional factors that would lead a controller to conclude that a mariner may be in distress. The reasoning is that a voice MAYDAY is an intentional act on the part of the mariner, whereas automatic broadcasts and alarms can be, and often are, triggered inadvertently.

(a) **Auto-Distress Broadcasts.** ***All Morse Code S-O-S transmissions and automated/ synthesized voice MAYDAY broadcasts on Channel 16 VHF-FM are transmitted without position or vessel identification and shall be treated as uncorrelated MAYDAYs. Upon receipt of an S-O-S transmission or automated/synthesized voice MAYDAY broadcast, the SMC shall thoroughly investigate the incident and broadcast a UMIB as a minimum response in accordance with the policy and discussion noted in Paragraph 3.4.9.2.*** Assets need not be immediately launched based solely on a single S-O-S or synthesized MAYDAY broadcast. Launching an asset would be appropriate if a reasonable search area can be determined *and* there are additional factors that may indicate an actual distress situation, i.e. voice MAYDAY, overdue vessels, flare sightings, local conditions or circumstances, etc. Note that this is a slight departure from the policy in 3.4.9.2(b) that requires dispatching assets based on establishing a reasonable search area alone. However, this policy does not preclude Districts from establishing the level of apprehension that will require a launch within their AOR; in fact they are encouraged to do so.

(b) **Auto-Distress Alarms.** Distress calls on 2182 kHz are often preceded by a radiotelephone alarm signal (a tone alternating between 1300 and 2200 Hz four times each second lasting for 30-60 seconds) that alerts listeners to the forthcoming distress message, and are no different from voice radio transmissions of "MAYDAY" or "Coast Guard, Coast Guard come in!"

(c) Auto alarms occur only on 2182 kHz. They are used to alert ship and coast stations that a distress call will follow. You should NOT attempt to answer an auto-alarm with a “unit calling” attempt. You should instead **WAIT AND LISTEN** for the distress call. Testing of an auto alarm is only allowed on 2670 kHz under dummy load conditions. If the Auto Alarm preamble is heard on 2182 kHz for other than the specified amount of time of 30-60 seconds, then it should be classified and treated as an Uncertainty type situation requiring no further action other than to wait and listen for additional details. If there is however the possibility of correlating information to the brief Auto alarm preamble all efforts should be made to correlate the information into a cogent theory of who or what the source of the signal is. If further investigative work is required or SAR Planning efforts are put in motion, then adherence to established case prosecution should be followed.

3.4.9.4 ***The principles of aggressive prosecution and full use of available investigative tools applied for VHF-FM, MF and HF uncorrelated distress broadcasts shall be applied to***

the receipt of all forms of distress signals (e.g., Cospas-Sarsat, cell phone, flares, etc.). The review process for case suspension or evaluation as a probable hoax should be equally rigorous.

3.4.9.5 Reasonable Search Area. In responding to uncorrelated distress broadcasts the SAR planner is faced with the decision to search or not search under the given circumstances. Search planners should keep in mind that the distress broadcast may be the only opportunity the mariner has to indicate a distress situation. A search for the source of the broadcast, if at all possible, should be the foremost objective. Coast Guard policy is to search if a reasonable search area can be determined. There are however, situations where a reasonable search area cannot be established. The following guidance is provided to assist in determining if an area is reasonable or not. As guidance, it does not relieve SMC's from making a decision, based on all the facts available, for each individual case. What may be a reasonable amount of time to devote to a search in one set of circumstances may not be true under another set of circumstances.

(a) **Search Resource:** SMC should select the resource most appropriate for searching in the general area of the uncorrelated distress signal (i.e. boat in bays/inlets, bounded or near coastal waters may be appropriate while a fixed-wing aircraft may be appropriate for open ocean area.).

(b) **Search Object:** First choice is the search object as included in the distress alert. If the distress alert does not mention a specific object, the second choice is an object selection based on local knowledge of craft, which typically operate in the general area of the alert. If no specific object can be selected based on local knowledge, the final choice is to use a 20-foot powerboat as the initial search object.

(c) **Search Area:** The SMC should determine from the transmission method of distress alert and any information contained in the alert, the probable area. Methods to do this are included in para. 3.4.9.2(b).

(d) **Search Time:** Calculate the time that would be required to complete a search with the chosen search resource, object and area.

(e) **Reasonable Decision:** If the search can be completed with 2 hours of on scene search time by a surface vessel or one hour by aircraft, it is reasonable to conduct the search. This equates to approximately a full sortie of search for an HH-65 being reasonable. Clearly the area that can be searched by other aircraft resources will not equal that of an HH-65, but the same amount of time should be applied, and based on choice of appropriate search resource will determine the area that will be covered in a reasonable search. The 2 hours should not be considered a hard cutoff for when to conduct a search or not, rather an indicator considered with all the other facts of the case in making the decision.

(f) **SAROPS Evaluation:** Evaluation within SAROPS provides an additional tool for making these decisions. If the SAROPS-estimated POS for the best practical search plan for 2 hours of on scene endurance for a boat or one hour for an aircraft (roughly one HH65 sortie equivalent) is at least 50% for an uncorrelated distress alert, the search is "reasonable." This does not mean that a "best search" POS of 49% is automatically "unreasonable." Likewise, this guidance does not preclude the possibility of increasing the on scene endurance beyond the guideline values listed above and planning the search accordingly, especially if such increase is within the SRU's capabilities for total endurance on the search sortie. SMCs are reminded that these guidelines do not relieve them from making a reasonable decision, based on all the information available, for each individual case.

3.4.9.6 First Light Search Consideration. As with flares, uncorrelated distress broadcasts and alerts that result in the first search effort occurring at night or during reduced visibility, will likely achieve only poor search effectiveness; producing a low POS. ***A first light search shall be conducted unless the SMC has sufficient information to either close or suspend the case.***

3.4.10 False Alerts, Hoaxes and Suspected Hoaxes.

False alerts and hoaxes waste valuable operational resource dollars, frustrate SAR response personnel, and may adversely affect the Coast Guard's ability to respond to real distress calls. The situation is complicated by the fact that it is often very difficult to determine if an incident is a false alert, hoax, or real distress due to sketchy and/or contradictory information. ***This does not change the policy that, until determined otherwise, Coast Guard units shall appropriately respond without delay to any notification of distress, even if suspected to be a false alert or hoax.***

3.4.10.1 The following definitions apply:

(a) **False Alert:** A case where the subject reported to be in distress is confirmed not to be in distress and not to be in need of assistance. In a false alert case, the reporting source either misjudged a situation or inadvertently activated a distress signal or beacon resulting in an erroneous request for help, but did not deliberately act to deceive.

(b) **Hoax:** A case where information is conveyed with the intent to deceive.

3.4.10.2 ***Distress broadcasts suspected to be hoaxes shall be thoroughly evaluated. The conclusion that a particular distress call is a probable hoax must be based on several articulable factors that would lead a reasonable person to conclude that the distress broadcast is false and there is no distress. Until that determination is made, the distress broadcast shall be responded to as a distress. At a minimum the following procedures shall be used in the evaluation to determine a probable hoax distress:***

(a) Locate and replay the suspected hoax distress broadcast on the unit's voice logging recorder and utilize the direction finding capability, if available, to determine the direction of the call. If the line of bearing (LOB) is over land, identify any major waterways that are in the area of the LOB and eliminate the possibility that the distress is originating from that area. Use of sound manipulation software, if available, is encouraged to enhance or clarify the distress call. ***If used, the original and enhanced versions must be documented and saved as per Section 2.10.2.***

(b) Analyze the call and consider all possible correlating SAR scenarios that could be associated with the event.

(c) If still deemed a probable hoax by the watchstander, replay the call to each level up the SAR chain of command. Each level should consider possible SAR scenarios. The final level of review is the District command center prior to final disposition by SMC.

(d) After all levels of review, if the consensus remains that the call is in fact a probable hoax, no other action will be required. If there is no consensus that the broadcast is a probable hoax, or if a recording was not made, the procedures for an uncorrelated distress broadcast will be followed.

3.4.10.3 Closing or Suspending a False Alert/Hoax Case. When the source of a hoax or false alert has been confirmed, SMC or the SC should close the case. However, when the source of a suspected false alert or hoax remains unknown, the case cannot be closed, but only suspended. Either the SC or SMC (with concurrence from the SC) may do this. In the event Coast Guard resources responded to a suspected hoax at the request of another agency, Coast Guard active involvement should only be withdrawn or reduced when the SC so directs.

3.4.10.4 Investigation/Follow-up. False alerts and hoaxes significantly drain our limited resources. All Coast Guard personnel are encouraged to find innovative ways to reduce the occurrence of these incidents. In the case of hoaxes, aggressive efforts to identify and prosecute offenders are important. ***To that end, all pertinent information relating to a suspected hoax shall be reported as soon as possible to the SC's RCC. The RCC shall evaluate the reports as they are received and determine the need for additional investigation.*** Early contact with their servicing legal office and coordination with CGIS will greatly enhance the likelihood of a successful criminal prosecution.

(a) **Federal Communications Commission (FCC) or other agency involvement.** The FCC can be an invaluable resource in efforts to identify a hoax caller. All RCCs should maintain a close relationship with the nearest FCC office and be familiar with its capabilities to assist in locating the source of a hoax call. ***The original recordings of a suspected hoax call shall be retained for use as part of the distress case evaluation and/or evidence for legal action.*** Legal action can result in penalties as discussed in Chapter 1 of this Addendum.

(b) **Coast Guard Investigative Services (CGIS).** CGIS is also a good source to relay information regarding hoax or suspected hoax cases. Often, they can follow-up with FCC and assist in the investigation.

NOTE: 14 U.S.C. §521 (c) makes it a class D federal felony, punishable by up to 10 years imprisonment and/or a monetary fine, for anyone to knowingly and willfully communicate a false distress message to the Coast Guard or cause the Coast Guard to attempt to save lives and property when no help is needed. The statute also provides for a civil penalty of not more than $10,000 and holds the individual liable for all costs the Coast Guard incurs as a result of the individual's actions.

3.4.10.5 This policy does not attempt to define what is or is not an appropriate response in any given case. ***Operational commanders on a case-by-case basis must make that determination.*** This policy should not be interpreted by the public as creating any duty or obligation of the Coast Guard to respond to false alert or hoax cases, and is intended only for internal agency administration, and is subject to change without notice. If public inquiry is received, the public may be informed of the policy. If informed, the public should be cautioned that it is solely for internal Coast Guard use, and that public reliance on the policy is not intended.

3.4.11 Mass Rescue Operations

Mass Rescue Operations (MROs) are civil SAR services characterized by the need to provide immediate assistance to large numbers of persons in distress, and doing so would exceed the capabilities normally available to SAR authorities. MRO planning, preparations and exercises are challenging and relatively complex. Effective arrangements for use of national and often international resources beyond those normally used for SAR are essential. MRO preparations require substantial commitments and partnerships among SAR authorities, regulatory authorities, transportation companies, military, commercial assistance and others.

MROs often need to be carried out and coordinated within a broader emergency response context that may involve hazards mitigation, damage control and salvage operations, pollution control, complex traffic management, large-scale logistics, medical and coroner functions, accident-incident investigation, and intense public and political attention, etc. Efforts often start immediately at an intense level and may need to be sustained for days or weeks.

The Coast Guard, as appropriate, should coordinate MRO plans with companies that operate aircraft and ships designed to carry large numbers of persons. Companies such as cruise ship or ferry operators should share in preparations to minimize the chances that MROs will be needed, and to ensure success if they are.

Planning for a contingency response to a MRO incident must be done before the fact in order to identify and engage resources and activities not normally used or called upon during normal Coast Guard operations. This may often include resources located hundreds of miles from the unit's area of responsibility to include inland and out-of-state assets. ***Therefore, each command with persons who may serve as SMC shall complete the forms provided in annexes two through six in Appendix G (or locally reproduced versions; and updated yearly) in anticipation of a mass rescue event to document potential suppliers of air and surface assets, to document potential staging areas for resources and survivors, and to identify areas of risk where point of contact information is essential to a successful response.***

What the media reports may matter more than what SAR services do for shaping of public opinion about MROs. There should be no unwarranted delays in providing information to the media. ***Information must be readily available, and freely exchanged among emergency service providers, shipping, airline or other primary companies involved***. Since opportunities to handle actual incidents involving mass rescues are rare and challenging, exercising MRO plans is particularly important.

3.4.11.1 Scenarios that could lead to an MRO include:

(a) Hurricanes;

(b) Heavy flooding;

(c) Tornados;

(d) Earthquakes;

(e) Avalanches;

(f) Weapons of mass destruction incident;

(g) Hazardous material incidents; and

(h) Passenger ship or large airliner disasters.

3.4.11.2 An MRO focuses on the lifesaving aspects (rescue phase) of an incident response.

(a) The National SAR Plan (NSP) and the National Response Framework (NRF) provide basic guidance for immediate multi-agency MRO response. However, response to an MRO under the NRF is in addition to the SAR response, not in lieu of it. More detailed information and interagency guidance on this topic will be developed in the U.S. National Search and Rescue Supplement (NSS). The International Maritime Organization has incorporated MRO input to the IAMSAR Manual (See Radio communications and Search and Rescue Circular 31, Guidance for Mass Rescue Operations).

(b) Whenever a situation may lead to an MRO and require a surge in response resources, the District or Area RCC, as determined by consultation, should normally handle SAR mission coordination. The SMC may be shifted to or from another RCC (e.g., the Area or Air Force Rescue Coordination Center (AFRCC)) as appropriate, based on either geographic responsibilities or who is in the best position to coordinate the response.

(c) When a Coast Guard RCC is responsible for response, it should immediately notify applicable federal, state or local resources in the area for assistance. DOD Directive 3025.1, *Military Support to Civil Authorities*, provides guidance to local military commanders for DOD response authority and procedures. ***The Coast Guard RCC shall also immediately contact the Coast Guard National Command Center and, if the RCC is at the District level, the Area command, with the available information on the incident.*** Faxing the initial SAR check sheet, Mass Rescue Operation Supplemental check sheet, and other relevant documentation should follow up the initial call. Timely initial notification is critical; the report should not be delayed simply to gather additional information. The Command Center Duty Officer will initiate a conference call between USCG (Commandant (CG-SAR)), DOD's Director of Military Support (DOMS), U.S. Joint Forces Command, the Federal Emergency Management Agency (FEMA), the National Guard Bureau and the Air Force Rescue Coordination Center (AFRCC). The purpose of this conference call is to consider the need for immediate response, initiate an immediate response by the appropriate parties, and/or expedite the Federal disaster declaration process.

(d) For overall coordination of lifesaving and other missions, an incident involving an MRO will often warrant designating an Incident Commander (IC) within or outside of the Coast Guard. In this case, until the rescue efforts are terminated or suspended, the RCC-designated SMC working under the organizational structure of the ICS should normally coordinate the MRO portion of the response.

(e) Coordination of SAR functions with other functions is usually achieved by assigning a representative of the SAR agency or of the SMC to the Operations Section of the ICS organization. This allows SAR services to be integrated into ICS and overall operations while still being able to function with relative independence in accordance with normal SAR procedures. ***ICS has an overall incident focus, while SAR services must remain focused on lifesaving.*** Except when functions other than SAR are relatively insignificant to the incident response, the IC should normally be someone other than the SMC. The priority mission will always be lifesaving, and the SMC should normally remain unencumbered by additional non-SAR duties. In some cases involving MROs, it may be better to locate the SMC near the incident site rather than at the RCC.

3.4.11.3 SAR Plan onboard Passenger Vessels. The International Convention for the Safety of Life At Sea (SOLAS) requires certain passenger ships to have onboard a plan for cooperation with the SAR services in event of an emergency. The plan is sometimes referred to as a "SAR Plan" and is developed in cooperation among the ship, its company and the SAR service (U.S. Coast Guard for the U.S.). ***Also, the plan must include***

provisions for periodic exercises to test its effectiveness. Passenger ships falling under this SOLAS requirement are typically passenger ships and ferries on international voyages.

(a) To meet this SOLAS requirement, Commandant (CG-SAR), in conjunction with cruise industry input, developed the "*Search and Rescue Information Form*" (Figure 3-10) based on guidelines developed by IMO. The intent was to have the essential information needed to make an initial SAR response while maximizing access to the more detailed information available elsewhere (e.g., ship engineering plans). The "Search and Rescue Information Form**"** serves as the SAR Plan for a cruise ship and will be incorporated into the Coast Guard's vessel inspection process for carriage of the plan by cruise ships and ferries under SOLAS. The form serves as a template but additional information may be included at the company's discretion. Other countries may require more extensive information as provided for in the IMO guidelines. Cruise ship companies will provide the completed form, and updated versions as needed, to Commandant (CG-SAR) for forwarding to all the RCCs. The RCC will distribute within its district, as deemed necessary. In turn, Commandant (CG-SAR) will provide any changes to the general Coast Guard information to a central point in the cruise industry for further distribution.

(b) SAR exercises will include passenger vessels. RCC and port-level contingency preparedness planning will incorporate the need for a passenger vessel SAR Plan into their exercise planning and their efforts with other emergency responders for SAR exercises.

SEARCH AND RESCUE INFORMATION FORM

- Ship's Name:
- Company's Name/Address:
- Ship Information:
  - Basic Details of Ship:
    - MMSI:
    - Call Sign:
    - Country of Registry:
    - Type of Ship:
    - Classification Society:
    - Gross Tonnage:
    - Length Overall (in meters):
    - Maximum Draft (in meters):
    - Service Speed:
    - Maximum Number of Persons allowed onboard:
    - Number of Crew normally carried:
  - Communications:
    - EPIRBs:
    - HF/MF Capabilities:
    - Inmarsat Capabilities:
      - SATCOM Numbers:
    - VHF capabilities:
    - Non-GMDSS communications capabilities:
  - Lifesaving Equipment and capacities of each:
    - Lifeboats:
    - Rescue Boats:
    - Tenders:
    - Life rafts:
  - Contact List:
    - 24-hour emergency contacts in order of precedence:
    - Name position phone number (As detailed as necessary, but should be multiple contacts)
    - Further Company Points of Contact: (Company public relations officer is recommended.)

Figure 3-10 Search and Rescue Information Form for SOLAS Requirement

3.4.12 Search Action Plans (SAP)

3.4.12.1 SAP Requirement. ***A SAP is required for all search efforts beyond initial response (immediate response to a distress call and formal search planning is not yet completed) and in all cases where two or more search facilities are conducting searches.*** SAPs are recommended for initial response when time permits. ***Where time does not permit and multiple resources are responding SMCs shall ensure that de-confliction is in place; this is particularly important for multiple aircraft. Complete SAPs shall be provided to all participating search facilities. Similarly, any changes to an existing SAP shall be provided to all participating search facilities.*** Every search facility on scene needs to be fully aware of all the other facilities' planned activities for reasons of safety and on scene coordination.

3.4.12.2 Standard SAP Format. A standard SAP allows the reader to quickly find critical information by knowing that it will always be in a certain place and to identify vital information that is missing. Equally as important, the drafter of the SAP only needs to learn the format once, since it is standardized throughout the Coast Guard. The standard SAP format is provided in Appendix C. Benefits of this standardized format include:

(a) time saved in preparing the message;

(b) fewer calls looking for missing information;

(c) time saved finding information critical to executing the mission.

3.4.12.3 Transmitting SAPs. The primary means of transmitting a SAP is record message traffic. Situations and communications availability for participating search facilities may dictate use of an alternative means for transmitting the SAP to ensure timely receipt. ***Search facility units must receive the SAP sufficiently in advance of the commence search time to conduct mission planning, facility preparation (fueling, engine warm-ups, etc.), and transit to arrive at CSP.*** Methods such as facsimile and email are acceptable. Use of an alternative transmission method still requires the full SAP content to be sent. SAPs transmitted by voice are discouraged as mix-up of planning details may occur. A SAP should only be passed by voice if no other means is available; hard copy should follow as soon as practical.

3.4.12.4 Passing Search Patterns to SRUs. In addition to including search pattern descriptors within the SAP, it is often necessary to pass the specific patterns via radio to underway SRUs. Standard Search Pattern Over the Radio Templates for Coast Guard resources are provided in Appendix C.

3.4.13 Automatic Identification System (AIS)

Automatic Identification System (AIS) is a mobile digital radio broadcast by a ship of its safety of navigation information. Though not designed specifically as a SAR tool, AIS can be useful in that role. AIS is mandated for carriage on a variety of ships on international voyages as well as certain U.S. domestic vessels. Many ships now carry AIS and this number will greatly expand as the requirement is phased-in. Many U. S. Coast Guard Cutters and some aircraft will have AIS capabilities; SMCs should consider this in planning search and rescue operations.

The U.S. is establishing nationwide AIS as an element of maritime domain awareness (MDA) to identify vessels approaching or near the coastline, within U.S. ports and inland regions. Present capability for terrestrial-based AIS, including placement at sea on NOAA data buoys, is limited but it is expected to grow quickly in the ports and then expand for the coastal waters. Studies are also underway to determine the feasibility of satellite-based detection of AIS transmissions. Currently, Coast Guard Vessel Traffic Service Centers have AIS receive and transmit capability, and all Sector Command Centers are to be outfitted with this AIS capability.

The AIS equipment capability to send text safety messages is primarily intended for exchange of navigation-related information between vessels and shore stations. Though AIS is not a distress alerting system, the AIS text message could be incorrectly used to broadcast a distress alert. An AIS text message is not the recommended or preferred method of distress communications, but persons in distress may use any means available to attract attention, make their positions known, and obtain help.

AIS equipment has an alarm, visual and audible, which will be activated upon receipt of an AIS text message regardless of the nature of the text message or its urgency. ***If a Coast Guard command center, vessel or aircraft receives an AIS text message it shall, if able, immediately determine the nature of the message and take action accordingly. If the AIS text message is a distress alert then it shall be assumed to be a distress incident and will be classified in the distress emergency phase.*** Since the AIS broadcast is line-of-sight and provides the vessel's name and position, attempt to establish VHF-FM communications with the vessel, if that is not successful then replying back with an AIS text message might be feasible.

Search planners can access live AIS graphical information from ships off the US coast. The nine digit AIS identity (MMSI) is identical to the ship's nine-digit identity used on its DSC equipped VHF or HF radio and therefore can be used as a means for contacting the vessel such as by Rescue 21 DSC or COMCOM HF DSC. The Coast Guard Operations System Center (OSC) maintains an archive of received AIS data, which makes it possible to determine ship location and movement at any specified past time period.

3.4.13.1 AIS is a line-of-sight VHF-FM radio data transmission designed to:

(a) Provide automatically to appropriately equipped shore stations, other ships and aircraft, information including the ship's identity, type, position, course, speed, navigational status, text messages and other safety-related information;

(b) Receive automatically such information from similarly fitted ships;

(c) Monitor and track ships; and,

(d) Exchange data with shore-based facilities.

3.4.13.2 AIS is not a distress alerting system but it does provide benefits for SAR such as:

(a) Locate and identify the distressed vessel;

(b) Identify vessels near the distress location or other vessels around the SAR facility;

(c) Identify vessels and aircraft involved in SAR;

(d) Communicate between vessels, CG vessels, CG aircraft and CG command centers;

(e) Vector potential assisting vessels to the scene;

(f) Serve as a means to crosscheck other reported information (radar, visual sighting, etc.);

(g) If carried on board the SAR response craft, serve as a means to track and monitor its safety;

(h) Depending on the shoreside data network, provide local or regional electronic display of ongoing SAR operations.

3.4.14 Vessel Monitoring System (VMS) Use for SAR

The Vessel Monitoring System (VMS) is a satellite-based tracking system which provides various data, including the vessel's name and position. Some VMS units are also capable of sending and receiving message communications between the vessel and shore. The National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries) is the lead federal agency and requires certain commercial fishing vessels to carry VMS. Though VMS was established for fisheries management and enforcement, NOAA allows use of VMS position information for SAR operations.

NOAA maintains a nationwide VMS (N-VMS) network which is linked to the Coast Guard's common operational picture. Various local procedures have been developed within the Coast Guard for command centers to gain access to this information. VMS data is confidential information as defined by the confidentiality provisions of the Magnuson-Stevens Fisheries Conservation and Management Act and NOAA maintains a control system to prohibit unauthorized use or disclosure of VMS data. While SAR operations and fisheries enforcement may use VMS data, other non-fisheries enforcement purposes have permission for limited use. Limited additional discussion is provided in reference (o), chapter 7 and appendix E.

VMS is another tool to assist the SAR controller in the prosecution of a case. VMS provides position data that may correlate with distress positions provided by other distress alerting systems such as lines of bearing from Rescue 21. When used in conjunction with other SAR tools a better search area may be developed.

3.4.15 Determining position using Direction Finding (DF) and Range calculations.

Positional information determined via DF shall be treated as any other positional information available in a SAR case. Direction Finding (DF) is a tool used to assist in identifying a possible position of the distress. Lines of Bearing (LOB) and any resulting position information may be used to establish, confirm, or refine the reported position of a distress.

For Rescue 21 only:

(a) Rescue 21 can transmit lines of bearing (LOB) and DF position fixes with associated error ellipses for import to SAROPS. See SAROPS help files for procedures. When Rescue 21 data transfer occurs, search planners will note a two degree error associated with each line of bearing. In the event that search planners need to manually enter LOB scenarios in SAROPS based on Rescue 21 data, the bearing error used shall be two degrees unless a greater error has been documented, based on either testing or operational experience, for a particular Remote Fixed Facility.

(b) The direction finding antenna is a separate unit located above the communications antenna and its receiver has a separate sensitivity adjustment which may result in LOBs with no audio signal. Normally, lines of bearing without an audio signal do not require investigation. However, if the DF is tuned to monitor 121.5 MHz (see Paragraph (c) below) and an LOB results from a 121.5 MHz transmission, the source of the signal should be investigated and a search may be required. The DF can also be tuned to VHF channel 70 (156.525 MHz) as a tool to locate a DSC caller with no GPS position by providing a possible LOB. Section 3.4.4 of reference (a) provides guidance for distress beacon incidents.

(c) ***For units equipped with Rescue 21, the secondary DF shall be tuned to VHF channel 70 (156.525MHz) per Chapter 11 of reference (p).*** If the SAR watchstander receives a report of an alert on 121.5 MHz, or 243 MHz, they may shift the secondary DF. This system capability is provided to assist the watchstander with a search if the Coast Guard determines through other sources that an alert on these frequencies is in progress.

3.4.15.1 Estimating Maximum Reception Distances. ***If a single LOB is the only available position information for a distress case, the maximum reception distance of the distress call from the Remote Fixed Facility (RFF) must be determined.*** The actual effective range of each RFF is dependent on transmission strength and the RFF audio antenna height among other factors. The best information available regarding maximum possible range will be used in analysis for possible positions of a distress call. In the absence of other information, the information below will be used to determine the maximum reception distance. All Sector personnel who deal with direction finding should be familiar with the information, procedures and equations needed to estimate the theoretical maximum detection ranges from their RFFs, as described below.

(a) **Determining the RFF Audio Antenna Heights.** The actual height needed for computing maximum reception range for a coastal station is the height of the audio antenna above mean sea-level. For the Great Lakes, inland rivers or other areas it is the average height above the bodies of water in the area from which a distress call might reasonably come. The following considerations need to be made when determining the appropriate antenna height for use in distance computations:

(1) The tower’s maximum height may be provided by the vendor, but the RFF audio antenna may be several feet below the top of the tower.

(2) The actual height above ground level for each RFF audio antenna may be provided by the vendor or owner of the tower but if the RFF is part of R21 the actual height above ground level will be provided by the vendor. It is important to ensure the height of the RFF audio antenna is used in distance calculations, not the height of the tower on which it is mounted.

(3) The height of the RFF audio antenna above mean sea level is found by adding the height of that antenna above ground level to the height of the tower’s base above mean sea level. The height of the RFF audio antenna above an inland body of water is found by computing the antenna height above mean sea level and then subtracting the height of the surface of the body of water above mean sea level. When calculating the maximum reception range for a RFF, make sure that the correct height above mean sea-level or inland body of water is used.

(4) If a search for a 121.5/243 MHz beacon is conducted with the R21 system, then the height of the DF antenna will be used in the calculations for determining the maximum reception range for the RFF.

(b) **Estimating Search Object Antenna Heights.** The first choice is to use the probable antenna height for the distressed craft as included in the distress broadcast. For example, a sailing vessel may have an antenna mounted on the top of its mast, a commercial fishing vessel may have an antenna mounted on the top of the pilot house, etc. If the actual height is not known, then an estimate of antenna height based on type of craft should be used. If the distress alert does not mention a specific type of craft, the second choice is an antenna height for an object selection based on local knowledge of craft that typically operate in the general area of the alert. If no specific object can be selected based on local knowledge, the final choice is to use a default antenna height of 30-feet. This provides a reasonably safe estimate for the types of vessels that most often transmit VHF-FM distress calls in waters within range of Coast Guard RFFs.

(c) **Computing Theoretical Maximum Reception Ranges.** The maximum range between sending and receiving antennas is estimated using the sum of the horizon (line of "sight" for VHF-FM) distances for each of the two antennas.

(1) The horizon distance for each antenna is estimated using the following equation:

$$d = 1.23 \times \sqrt{h}$$

Where ***h*** is the antenna height above the water (e.g., mean sea level) in feet, and

d is the VHF-FM horizon distance in Nautical Miles

The total *distance* between the two antennas is therefore:

$$d_{total} = d_{sending} + d_{receiving}$$

Example: A RFF audio antenna near the ocean is 400 feet above mean sea level and the distressed craft's antenna is estimated to be 30 feet above the water. The square root of 400 is 20; when multiplied by 1.23 the resulting horizon distance is 24.6 NM. The square root of 30 is 5.48; when multiplied by 1.23 the computed horizon distance is 6.7 NM. Adding the two together and rounding up to the nearest whole nautical mile, the estimated maximum range from the receiving RFF to the distressed craft would be 32 NM.

(2) Once the calculations are completed, each SCC should develop a table of base ranges for each RFF within that region. For example, the horizon range for each RFF would remain constant. Adding the horizon range of a distressed craft antenna that is 6-feet, 10-feet, 15-feet, etc. above the water would create a quick reference for watchstanders to use when the height of the transmitting antenna can be determined.

(3) The formula the Coast Guard uses for RFF range is for radio line of sight. The distances calculated will not correspond exactly with those produced by table H-41; the distances produced by this source are based on the visual line of sight formula which uses a constant of 1.17 instead of 1.23. Values from this visual line of sight sources may be multiplied by 1.05 to find the radio line of sight. The range and bearing tool provided with SAROPS will compute either visual or radio line of sight distances based on observer (RFF antenna) height and object (transmitting antenna) height. Ensure that the correct options (Radio) and (Great Circle) are selected when computing radio reception ranges.

3.4.15.2 Uncorrelated Distress Broadcasts & Alerts. ***For uncorrelated distress broadcasts the provisions of Section 3.4.9 shall be followed and in particular the direction given in***

Section 3.4.9.5 in regards to reasonable search area. Methods for determining the search area to be considered for both correlated and uncorrelated distress alerts are described in the following paragraphs.

3.4.15.3 Search Planning. There may be insufficient information available to determine the position of a distress transmission within close limits. It is also prudent to have a search plan available for situations where the SRU arrives on scene but cannot immediately locate the distressed craft or persons. The following paragraphs provide guidance on how to plan an initial search, based on the type and amount of information available for estimating the position of the distress call. Guidance is provided below for both manual search planning and for planning searches using SAROPS/SAR Tools. ***SAROPS/SAR Tools shall be used whenever practicable***. The manual techniques are provided only as a backup in case SAROPS/SAR Tools is unavailable.

(a) **Distress Alerts with no LOB.** If a distress alert is received but a LOB cannot be accurately determined, it will be necessary to estimate the general location based on an estimate of the maximum range of the distressed craft from the receiving RFF antenna(s). Once the distance from a receiving RFF to the distressed craft has been computed, an arc of that radius, centered on the RFF position, may be drawn. Generally, the area defined by the arc and the shoreline adjacent to the intended coverage area is the potential search area when only one RFF receives the signal. However, if there are other bodies of water within the computed radius (i.e. inshore bays, rivers, etc.), the possibility of the distressed craft being in one of those locations should be considered.

(1) If it can be confirmed that the distress alert was received on more than one RFF, the maximum range to the distressed craft from each RFF should be computed and appropriate arcs should be plotted. Either SAR Tools or paper charts and compasses may be used to plot the arcs. The overlap area common to all of the plotted arcs should contain the distressed craft. A rectangle enclosing this overlap area should be plotted and searched with coverage of not less than 1.0. If the SRU cannot arrive on scene before drift becomes a significant factor (i.e. when the combination of drift factors would move the search object outside the area effectively searched), the search should be planned using an “Area” scenario in SAROPS.

(2) If the search object type cannot be otherwise determined, use the default type (20-foot power boat) for estimating sweep width and coverage factor. Choose one or more appropriate objects of this size for use in estimating leeway.

(3) **Manual Computations:**

a. **Compute Maximum Reception Distance:** Use the procedure for computing $\boldsymbol{d_{total}}$ given in Section 3.4.15.1(c) (1) above and use this as the radius of the arc centered on the RFF location. Repeat for each RFF for which reception of the distress alert can be confirmed.

b. **Plot Area:** For each RFF that received the distress alert, draw an arc or circle of the computed radius on an appropriate chart. Note the possible regions where the distressed craft might be. These form the initial search area(s).

c. **Elimination of Regions:** Generally speaking, land areas may be eliminated, although it may be appropriate to consider inland lakes within the maximum reception distance and work with local authorities as appropriate. ***When the alert was received by multiple RFFs, only the area where all intersect must be***

considered, although an additional buffer around it may be appropriate. The fact that the distress alert was ***not*** heard on adjacent RFFs may be used, with caution, to eliminate some regions. In this case, arcs representing the **distance of the horizon** (i.e., transmitter antenna height of zero above the water) from adjacent RFFs should be used rather than the assumed transmitter antenna height used to estimate maximum distance from the receiving RFF. In addition, an aggressive investigative effort and careful analysis of all available data should be pursued to further define the area where the distressed craft could have been at the time of the alert.

(4) **SAROPS/SAR Tools (Preferred Method):** (Note: It is usually easier to do steps 1 and 2 below for each RFF in turn, rather than do step 1 for all RFFs followed by step 2 for all RFFs.)

a. **Compute Maximum Reception Distance:** Use the New Range/Bearing tool to compute the maximum reception distance from a receiving RFF. It is accessed via the button on the tool bar or via the menu "Edit – Quick Overlays – New – Range/Bearing Lines." Data entries are as follows:

1. **Mode:** Direction/Range.
2. **Connect Type:** Great Circle.
3. **Start Position:** Enter the latitude/longitude of the RFF or use the selection tool.
4. **Bearing:** Input bearing of R21 LOB.
5. **Bearing Error:** For R21 use 4 DEG, unless otherwise stated for a particular RFF or region.
6. **Observer Height:** Enter height of RFF audio antenna.
7. **Object Height:** Enter height of distress craft antenna per Section 3.4.15.1(b) above.
8. **Geographic Ranges:** Select "Radio."
9. Note the value of the computed Range.

b. **Plot Range Rings:** For each RFF that received the distress alert, use the Range Ring tool to plot a circle of the appropriate radius centered on the RFF. It is accessed via the button on the tool bar or via the menu "Edit – Quick Overlays – New – Range Rings". Data entries are as follows:

1. **DTG:** Enter the time of the distress alert.
2. **Center:** Enter the position of the receiving antenna.
3. **Radius:** Enter the computed range from the New Range/Bearing tool.

c. **Define Area Scenario(s):** Start a SAROPS "Run." Select the search object type(s) and enter the required information. Regions may be eliminated as in the manual method above. Create "Area" scenario(s) by "tracing" the boundaries of the region(s) where the search object may be to create polygon(s) that approximate(s) the desired region(s). The "Auto" feature of the "Area" scenario definition screen is very useful for this purpose. Figure 3-11 on the next page shows a SAROPS "Area" scenario formed by two intersecting range rings with land areas eliminated.

d. **Run SAROPS Simulator:** Continue with the SAROPS data entry process. Skip the "Hazards" screen and the "Previous Searches" screen (unless some searching has already been done). Enter a "Simulation End Time" equal to the estimated commence search time. Edit the environmental data "Area of Interest" if and as appropriate. Select and retrieve the desired wind and current products from the Environmental Data Server (EDS). Run Simulator to compute a probability grid.

e. **Run SAROPS Planner:** Enter the on scene conditions and SRU information and run the Planner. Edit/Create Search Pattern to view the recommended search plan. Refresh and note the estimated POS. Modify or replace this plan if and as needed. Refresh and note the estimated POS after the desired modifications have been made. Figure 3-12 shows a SAROPS recommended search plan for the Area scenario of Figure 3-11. It shows the SAROPS probability grid and SAROPS' recommended search plan for a situation where the vessel SRU arrives on scene two hours after the incident, has two hours search endurance, and searches at 15 knots under good daylight visual conditions. The search object is assumed to be a 20-foot power boat. This plan probably needs some modification due to the shoreward portion of the pattern being in shoaling water, but otherwise it is a very good plan with an estimated POS of more than 96% for a 20-foot power boat.

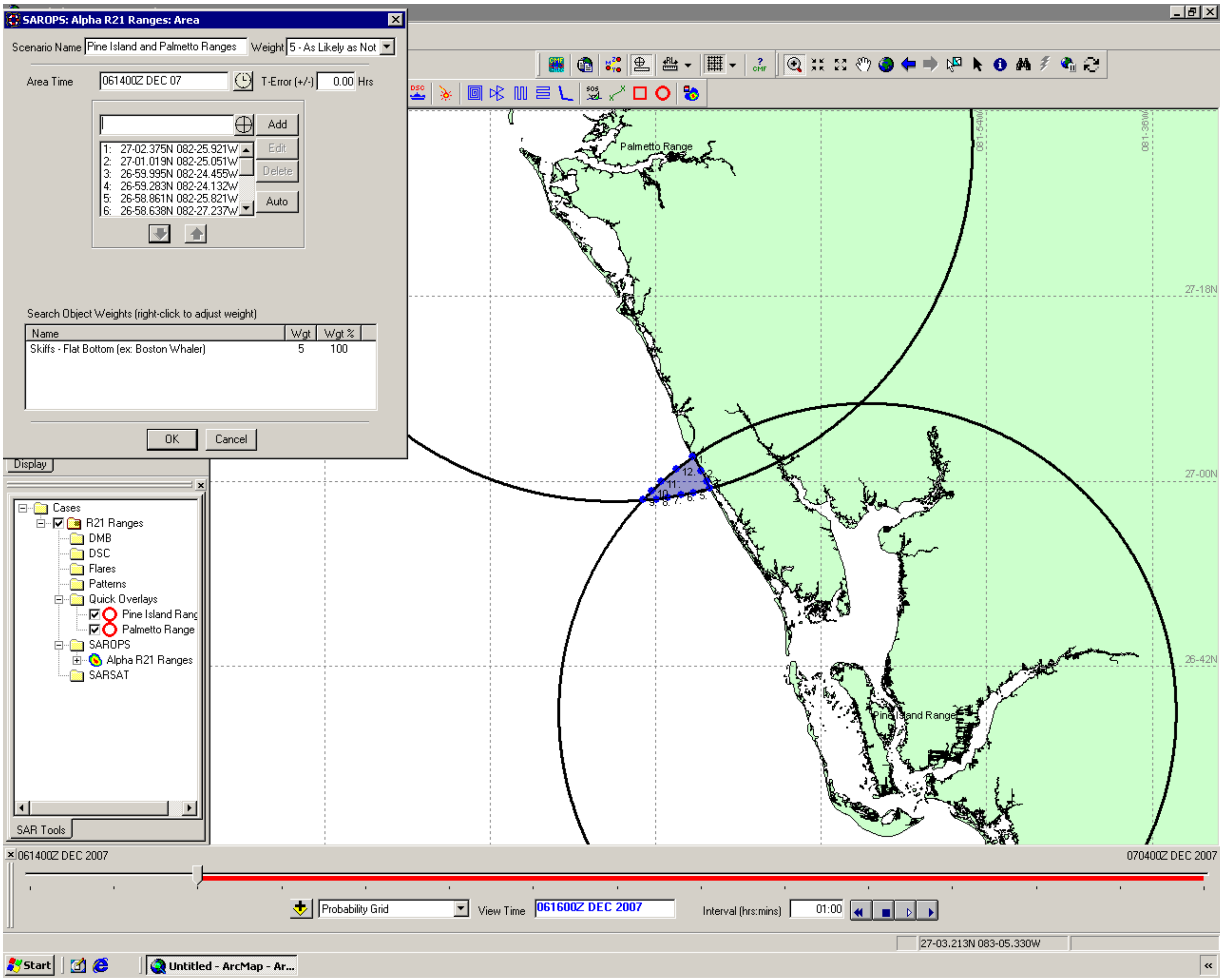

Figure 3-11 — SAR Tools Range Rings Plot with SAROPS Area Scenario

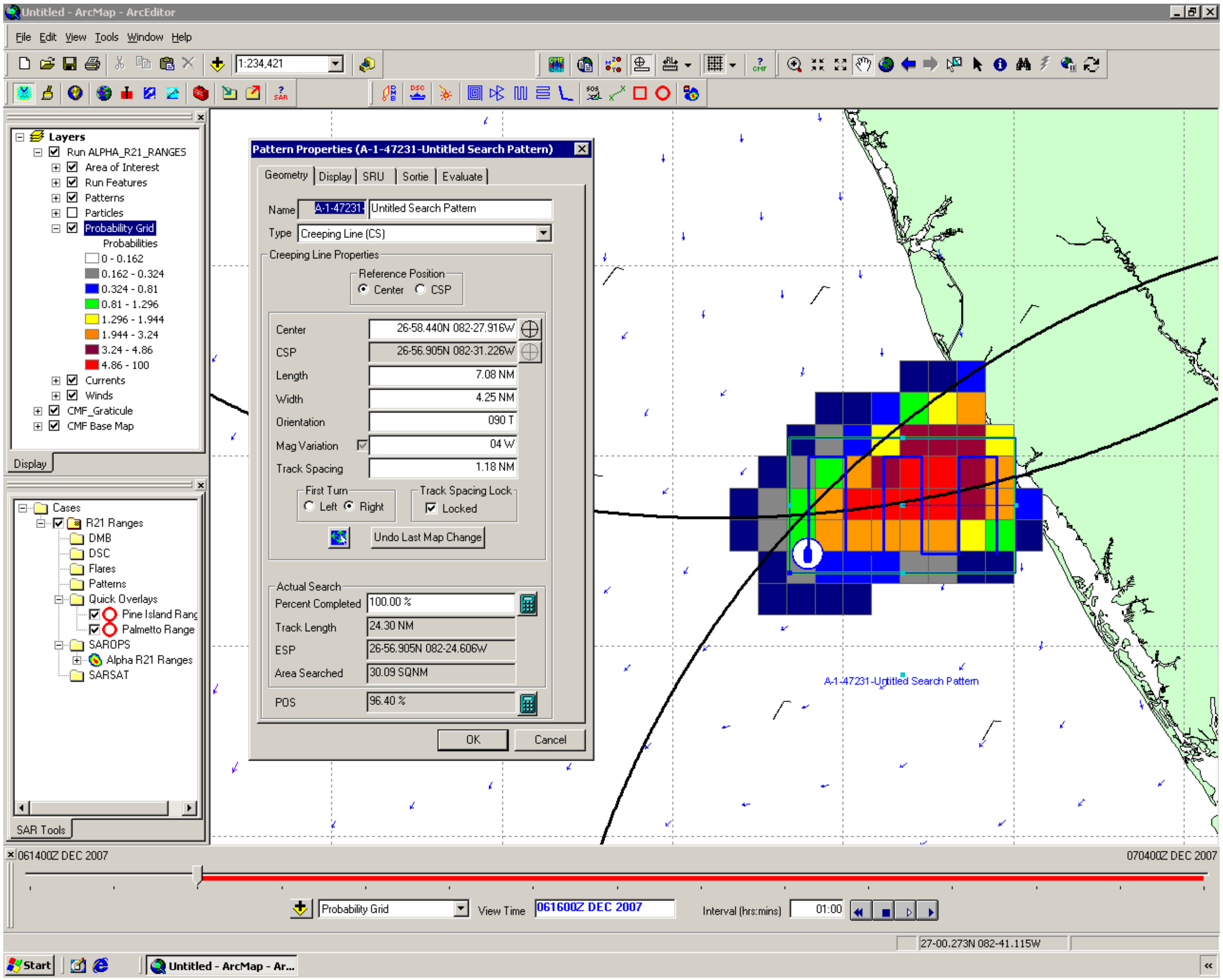

Figure 3-12 SAROPS Search Plan for 15-knot Vessel SRU Arriving two hours after Distress Broadcast with two hours On Scene Endurance Searching for a 20-foot Power Boat.

(b) **Determining Search Areas for a Single LOB.** A single LOB from a VHF-FM transmission will generally provide sufficient information to plan and carry out a search. In this situation, the search area is determined by one or two factors: the estimated maximum distance to the distressed craft, which is used for the length of the area, and, if appropriate, the application of the bearing error for the RFF to either side of the LOB, which is used to find the width. These may be calculated either using SAR Tools or manually.

(1) **Manual Calculations:**

a. **Determining Search Area Length.** Calculate the distance from the receiving RFF to the distressed craft by using the procedure and equations in Paragraph 3.4.15.1(c)(1) above for estimating maximum reception ranges.

b. **Determining Search Area Width.** The width of the area to be searched is calculated using simple geometry for triangles.

1. Using the line of sight distance calculated above and applying the DF error angle (if known), the equation below produces the width of the initial search area. For R21, the error is ± 4 degrees or as otherwise stated for a particular RFF.

$$w = 2 \times d \times \tan(\theta)$$

Where ***w*** is the width of the search area in Nautical Miles,

d is the line of sight distance in Nautical Miles, and

θ is the DF error angle; for R21 this is 4^{o}, unless otherwise stated for a particular RFF.

Example: For the R21 system, if the line of sight distance is the 32 NM (from example above); then the width of the search area would be 2 x 32 NM x tan(4^{o}) (approx. 0.07) or 4.5 NM.

2. The small DF error angle for R21 significantly limits the width of the search area. For example, the distance from a distress craft transmitting from a 50-foot high antenna to a receiving RFF antenna of 1000-feet is only 47 NM, and the resulting width of the area is about 6.6 NM. These antenna heights are close to the high end of what will exist for the R21 RFF's and most distress craft.

3. Radio waves follow great circles, not rhumb lines. Rhumb lines plot as straight lines on charts that use the Mercator projection. The SAROPS/SAR Tools display and virtually all nautical charts use the Mercator projection. Long great circles plot as curves on these charts but short ones can hardly be distinguished from straight rhumb lines.

   (a) The range and bearing tool provided with SAROPS will compute either Rhumbline or Great Circle routes. Ensure that the correct option (Great Circle) is selected when computing radio reception bearings and ranges; this will preclude any need to apply corrections.

   (b) The difference between the great circle bearing shown by R21 and the rhumb line connecting the distressed craft with the RFF on a Mercator chart is usually negligible within the maximum reception range of most R21 RFFs. The higher the latitude and the larger the difference in the longitudes of the distressed craft and the RFF, the larger the difference between these bearings.

   (c) Plotting the R21 LOB as a rhumb line on a Mercator chart may place it slightly north (in the northern hemisphere) of the great circle on which the distressed craft is positioned. If the LOB extended to the maximum theoretical reception range spans more than one degree of longitude, consideration should be given to increasing the width of the search area by one or two tracks to the right or left of the LOB (whichever is in a southward direction) in order to compensate for the difference between great circle and rhumb line bearings.

c. **Positioning the Initial Search Area.** The triangular area just calculated is centered on the LOB and oriented in the same direction so that it extends from the RFF to the estimated maximum range. (NOTE: ***If visual horizon distances were used to calculate and plot the LOB, then a correction for distance must be made; the LOB should be extended so that its length is 1.05 times (5% greater than) the visual range***). The rectangle enclosing this triangle is the initial search area unless portions have been eliminated. Regions subject to possible elimination may include land, areas where the RFF is known to be "blind," if any, etc. If regions have been eliminated, then the initial search area is the rectangle enclosing the resulting polygon.

d. **Searching.** ***The initial search area computed in accordance with the manual steps given above shall be searched with a coverage factor of no less than 1.0. At a minimum, the initial search effort for this area shall consist of at least two search legs with a track spacing equal to one-half of the search area width, provided this will meet the coverage requirement of 1.0 or greater.*** In this case, the two legs will be parallel to the LOB and offset from it on either side by one-fourth of the search area's width. ***If a search object type cannot be otherwise determined, the default search object type (20-foot power boat) shall be used for sweep width and coverage factor determinations.***

e. **Search Pattern.** Because the widths of the resulting single LOB areas are relatively narrow, many searches for a single LOB can be conducted using a Trackline Single-unit Return (TSR) (two search legs) or a PS pattern having two search legs. For example, the daylight visual sweep width for the default search object for an uncorrelated distress (20-foot powerboat) is 4.3 NM for a helicopter searching at 500-feet with a 10 NM visibility, while it is 3.3 NM for a small boat SRU under the same conditions. With these sweep width values, two search legs will easily meet the coverage requirement for either SRU type.

(2) **SAROPS/SAR Tools (Preferred Method):**

a. SAROPS/SAR Tools provides an easy means to plot a line of bearing based on height of eye of observer (RFF audio antenna height) and search object (distress craft antenna height) with associated bearing error, create an "Area" scenario, compute a probability grid for the commence search time, and develop a near-optimal search plan. SAROPS/SAR Tools also allows the user to choose to plot the great circle bearing and radio line of sight range, which eliminates the need to apply any of the corrections detailed above for manual computations.

b. In SAROPS/SAR Tools the Range/Bearing Line tool is used. It is accessed via the button on the tool bar or via the menu "Edit – Quick Overlays – New – Range/Bearing Lines." The entries are the same information used in the manual method above with the addition of choosing the type of line. Data entries are as follows:

1. **Mode:** Direction/Range.

2. **Connect Type:** Great Circle.

3. **Start Position:** Enter the latitude/longitude of the RFF or use the selection tool.

4. **Bearing:** Input bearing of LOB.

5. **Bearing Error:** For R21 use 4 DEG unless otherwise stated for a particular RFF or region.

6. **Observer Height:** Enter height of RFF audio antenna.

7. **Object Height: Enter** height of distress craft antenna per Paragraph 3.4.15.1(b) above.

8. **Geographic Range:** Select "Radio."

c. An example of the appropriate entries and the resulting plot is shown in Figure 3-13 on the next page. Note the distance shown is the radio line of sight.

d. Start a SAROPS "run," select the appropriate search object types, and create an appropriate "Area" scenario. Figure 3-14 shows the SAROPS triangular "Area" scenario that corresponds to the LOB data plotted in Figure 3-13. The "Auto" feature for defining the corner points of an "Area" scenario allows the user to "trace" the LOB triangle very easily and quickly.

e. Figure 3-15 shows the SAROPS probability grid and recommended search plan for a single helicopter sortie with one hour of on scene endurance. The commence search time was assumed to be one hour after the distress call. The search object was assumed to be a 20-foot power boat. On scene conditions were assumed to be good for a daylight visual search. This is a very good search plan with an estimated 97% probability of success.

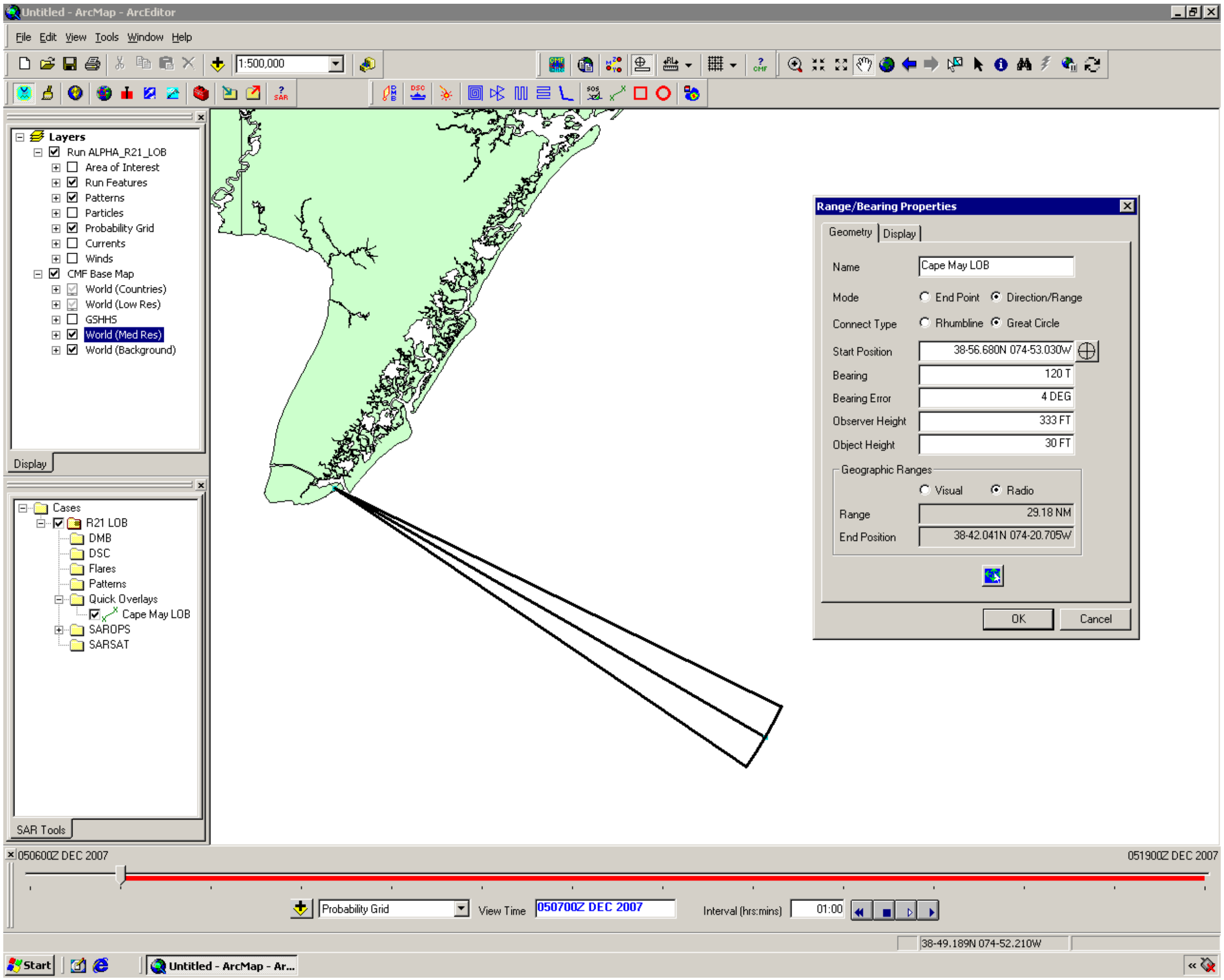

Figure 3-13 – SAROPS/SAR Tools Single LOB Range and Bearing Plot

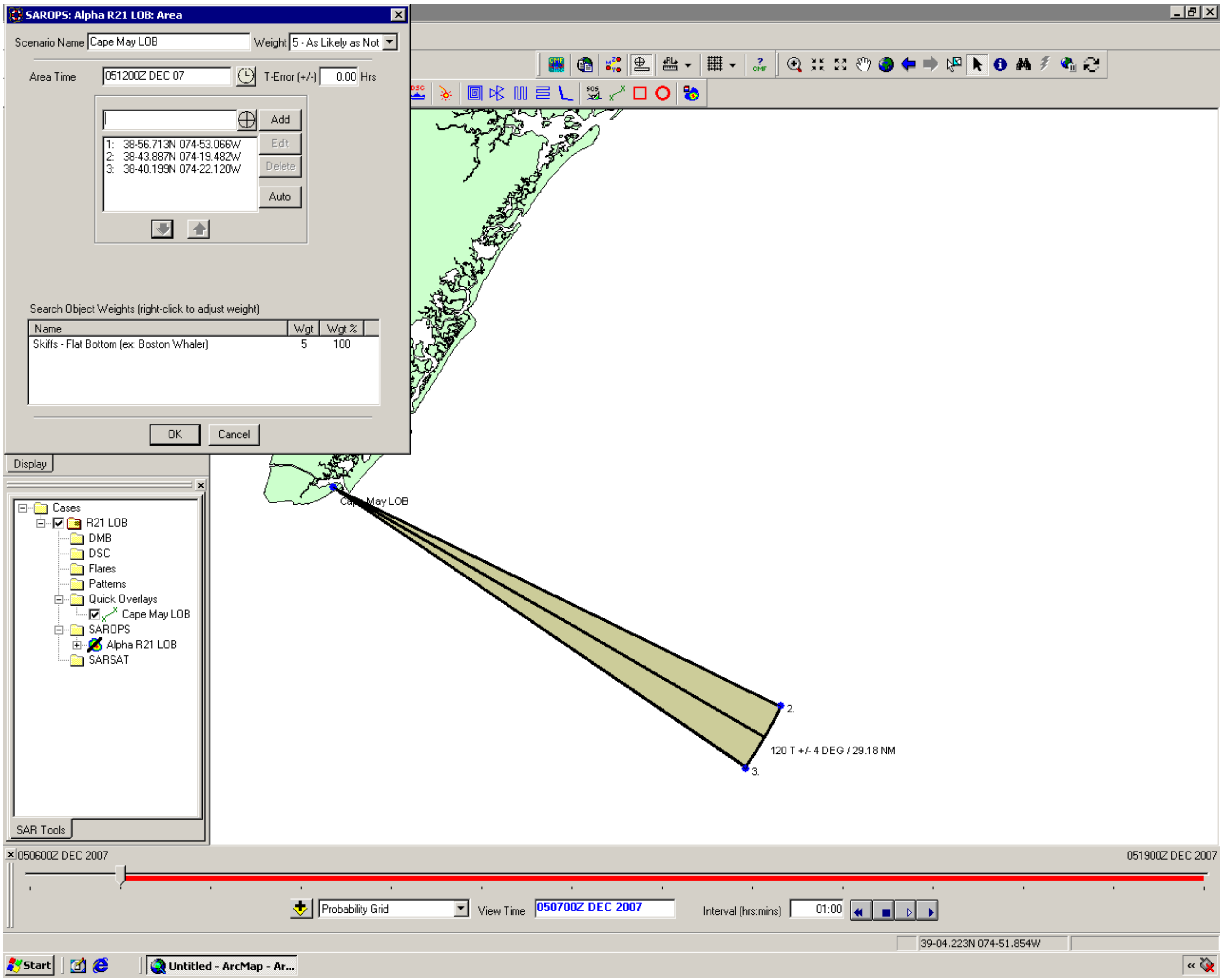

Figure 3-14 — SAROPS Area Scenario for a Single LOB

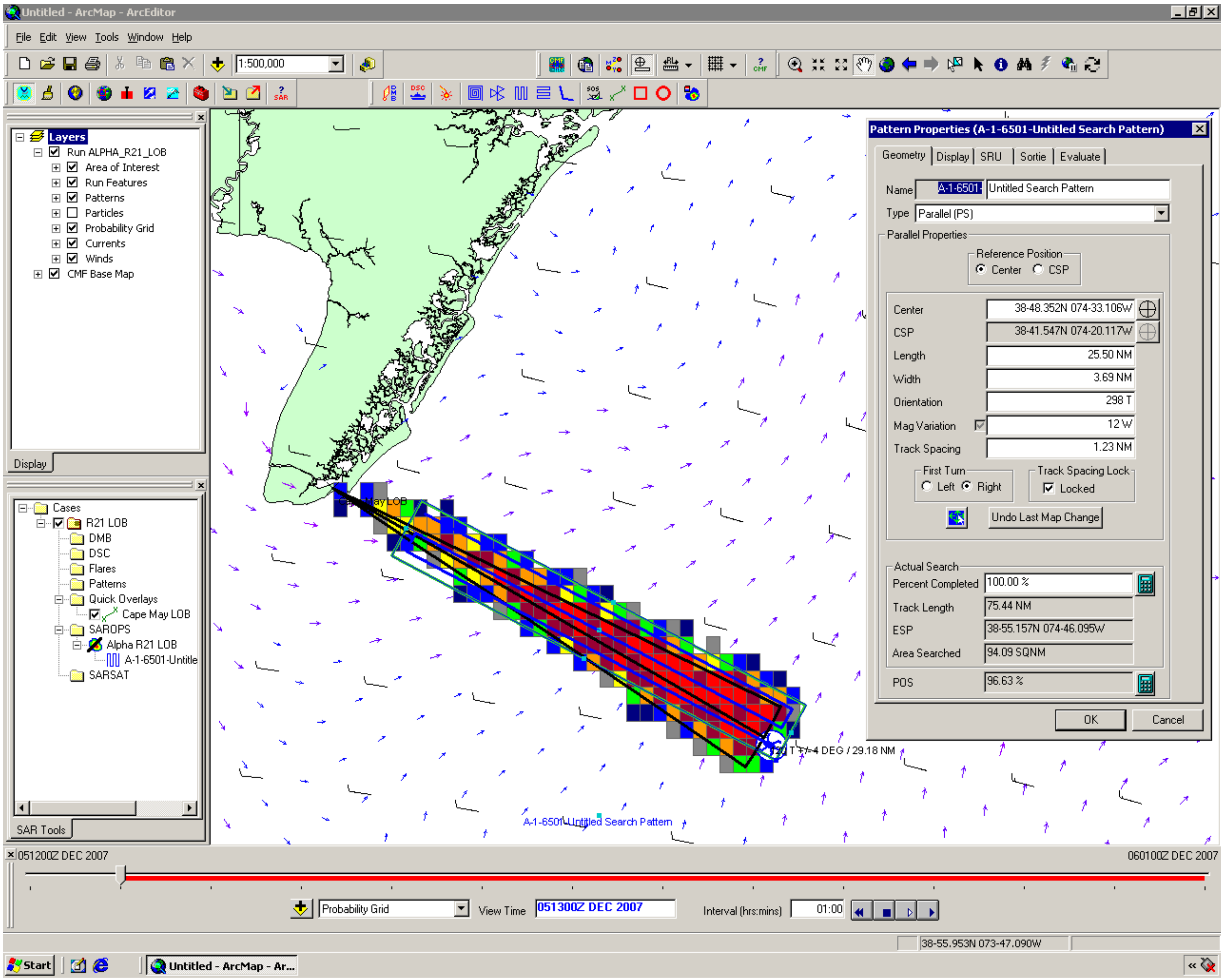

Figure 3-15 — SAROPS Search Plan for Helicopter Arriving one hour after Distress Broadcast with one hour On Scene Endurance Searching for a 20-foot Power Boat

(c) **Determining Search Areas for Multiple LOBs.** When it can be confirmed that simultaneous or nearly simultaneous LOBs from multiple RFFs are based on signals from the same transmitter that is broadcasting a distress alert, a fix on the transmitter's location can be obtained, within the bearing error of an RFF. This generally results in a small search area.

(1) Manual Calculations:

a. Plot each LOB and the lines that represent the bearing error of each RFF. The area enclosed by the intersecting bearing error lines is the area that should contain the search object as of the time of the distress broadcast.

b. Center a square or circle on this area that is sufficiently large to contain it. This is the initial search area. Plan an expanding square (SS) or sector (VS) search pattern that achieves a coverage factor of at least 1.0. If a single VS search does not provide a coverage factor of 1.0, a second search should be conducted as described in Section 2.4.2.6(b)(1). If the search area size and/or dimensions are such that a different search pattern would be more appropriate, e.g. a parallel (PS) search pattern, then the other pattern should be employed for the initial search.

c. The coverage (C) for a six-sector VS pattern of radius (and leg length) R may be estimated by:

$$C = \frac{2.86 \times W}{R}$$

where ***W*** is the sweep width.

(2) SAROPS/SAR Tools (Preferred Method):

a. Use the Range/Bearing Line tool as described in 3.4.15.3(b)(2)b above. The tool is used as many times as needed to plot all LOBs associated with the distress transmission. If any of the LOBs fall short of crossing the others, the transmitter's antenna height may be increased to obtain a crossing. An example of crossing LOBs is shown in Figure 3-16.

b. Start a SAROPS "run," select the appropriate search objects, and create an "Area" scenario by defining a polygon that approximates the area formed by the crossing LOBs and their associated bearing error lines. Figure 3-16 shows an example involving two intersecting LOBs.

c. Figure 3-17 shows the SAROPS probability grid and recommended search plan for a single helicopter sortie with one hour of on scene endurance, searching for a 20-foot power boat with NVGs and illumination under good search conditions. The commence search time was assumed to be one hour after the distress call. This is a very good search plan with an estimated 98% probability of success.

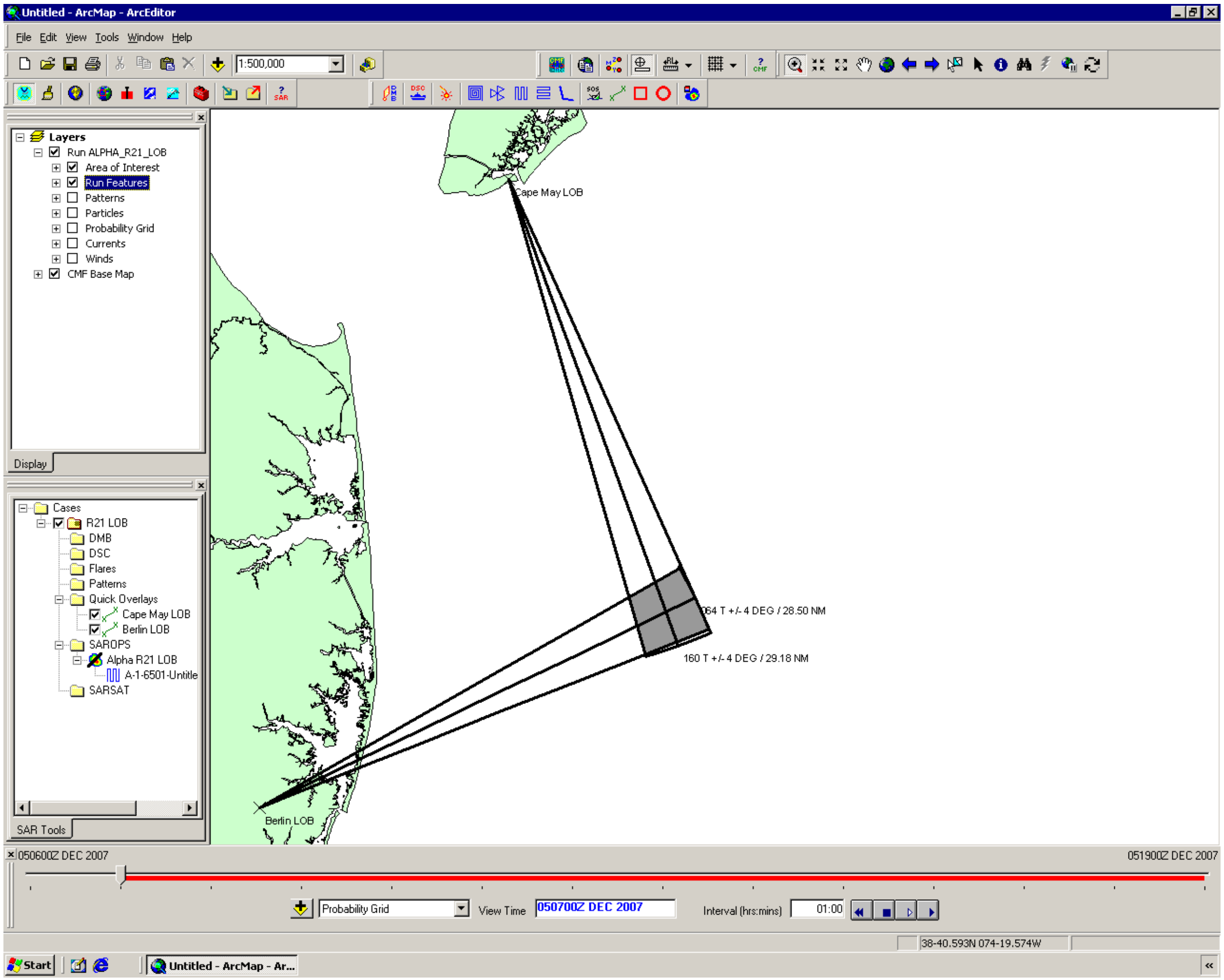

Figure 3-16 — SAROPS Area Scenario for Crossing LOBs

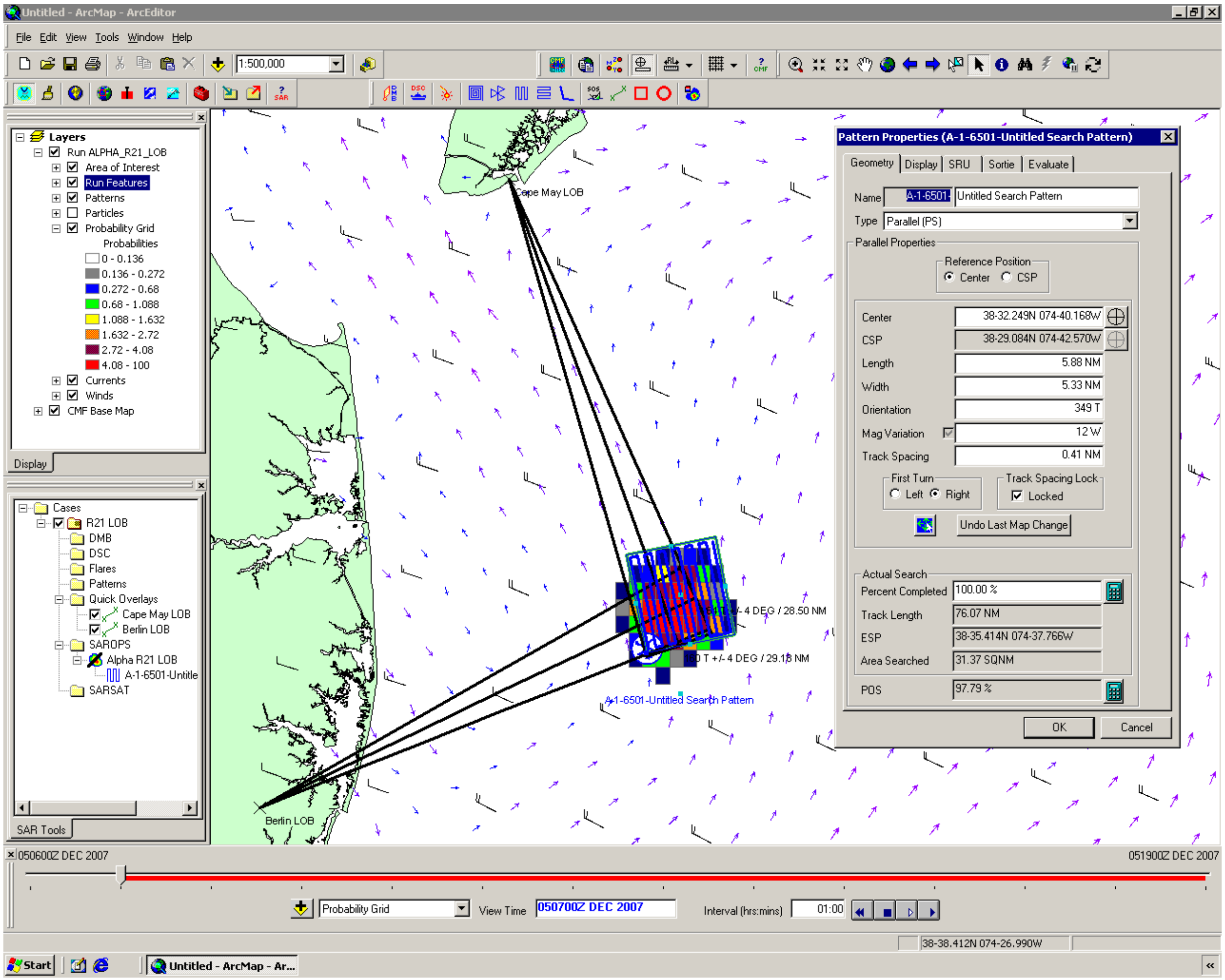

Figure 3-17—SAROPS Search Plan for Helicopter Arriving one hour after Distress Alert with one hour On Scene Endurance Searching for 20-foot Power Boat; Night Search with NVGs and Illumination.

(d) **Multiple non-crossing LOB's with nearly reciprocal or parallel bearings.** The distress incident areas for each LOB should be calculated separately. The maximum calculated distance for each LOB should provide the minimum for the other LOB. (See Figure 3-18 below) These separate areas should be enclosed by a single rectangle to form the area to be searched.

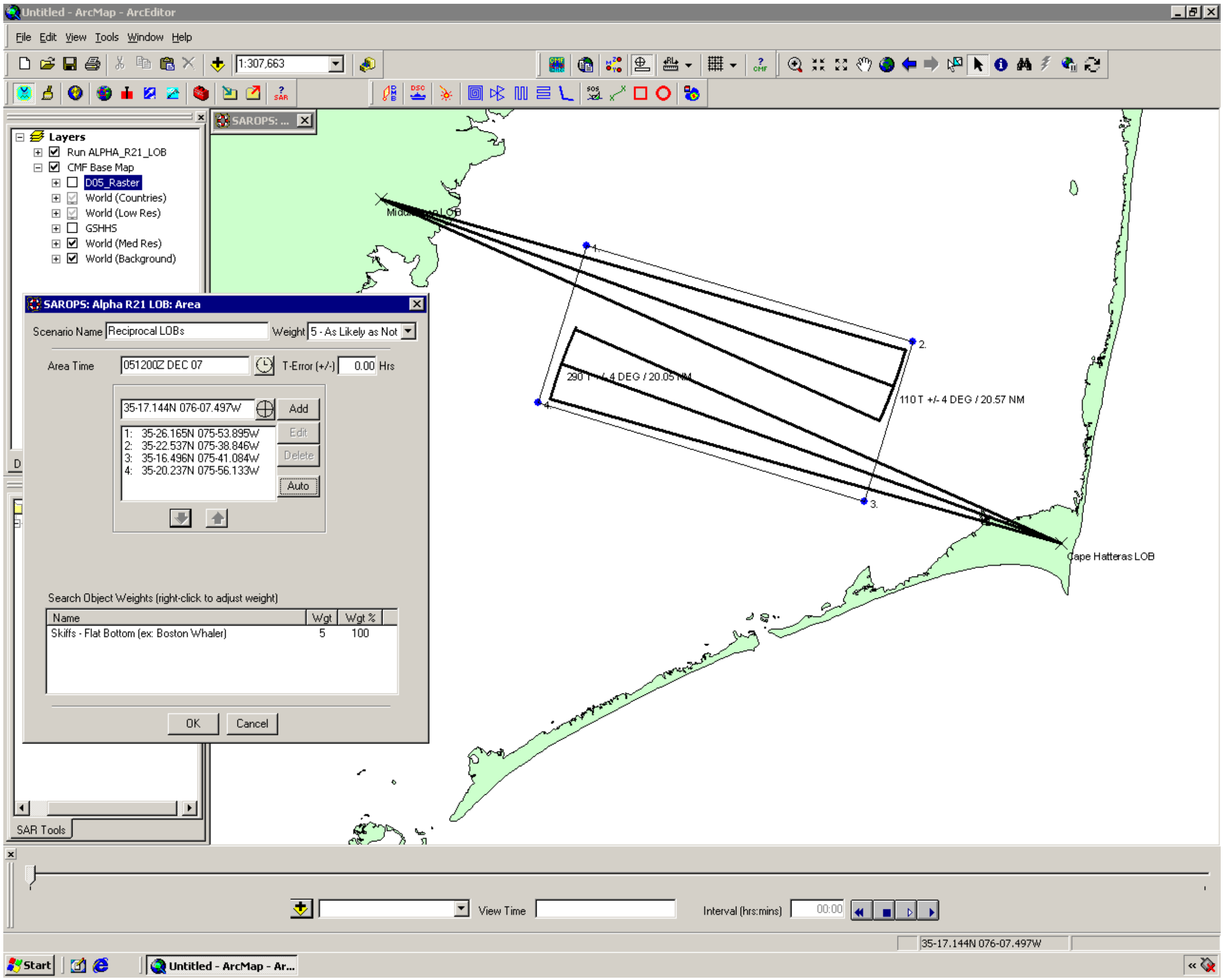

Figure 3-18 — Determining the Distress Alert Area for Nearly Reciprocal Bearings.

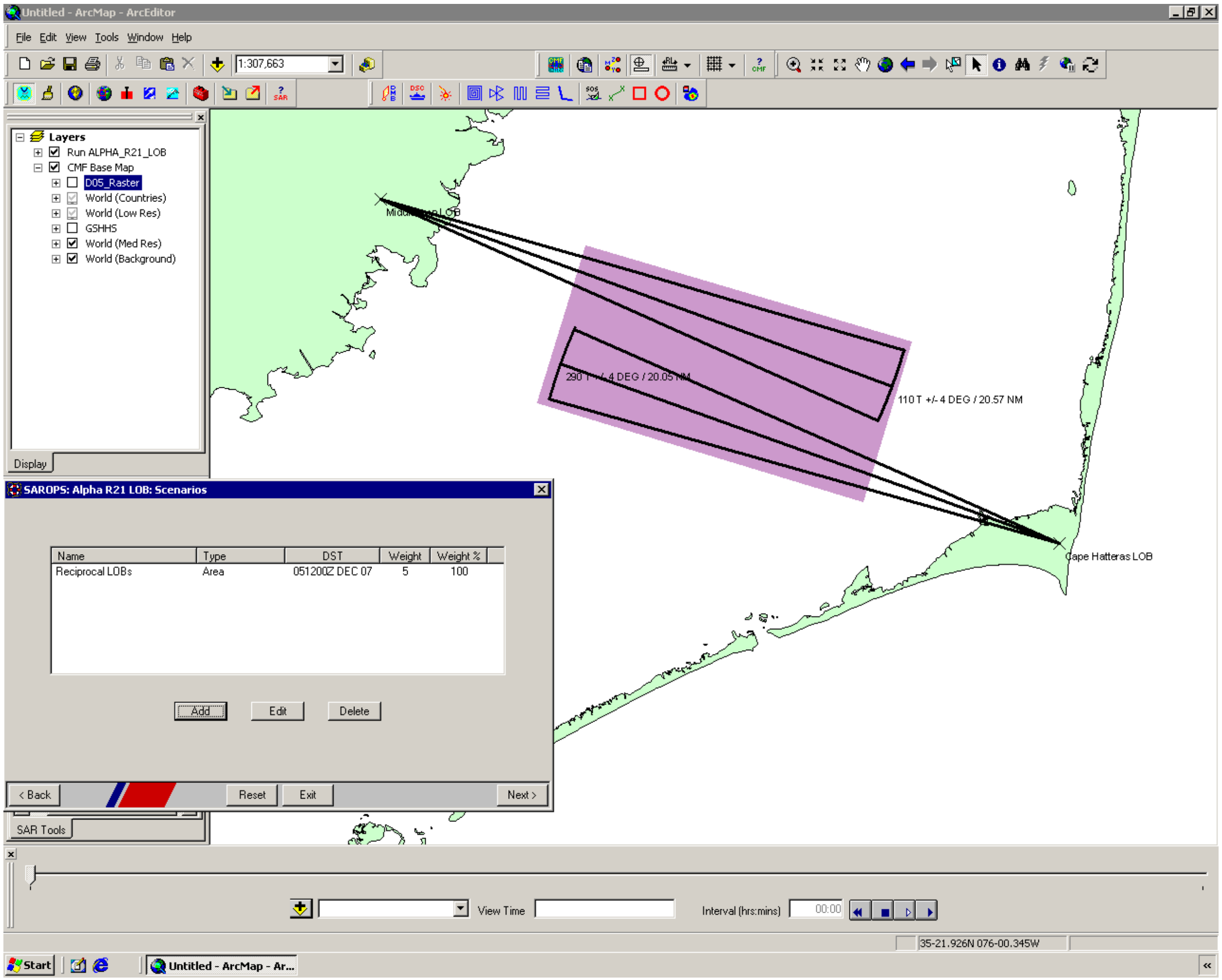

Figure 3-19 — SAROPS Area Scenario for Nearly Reciprocal Bearings

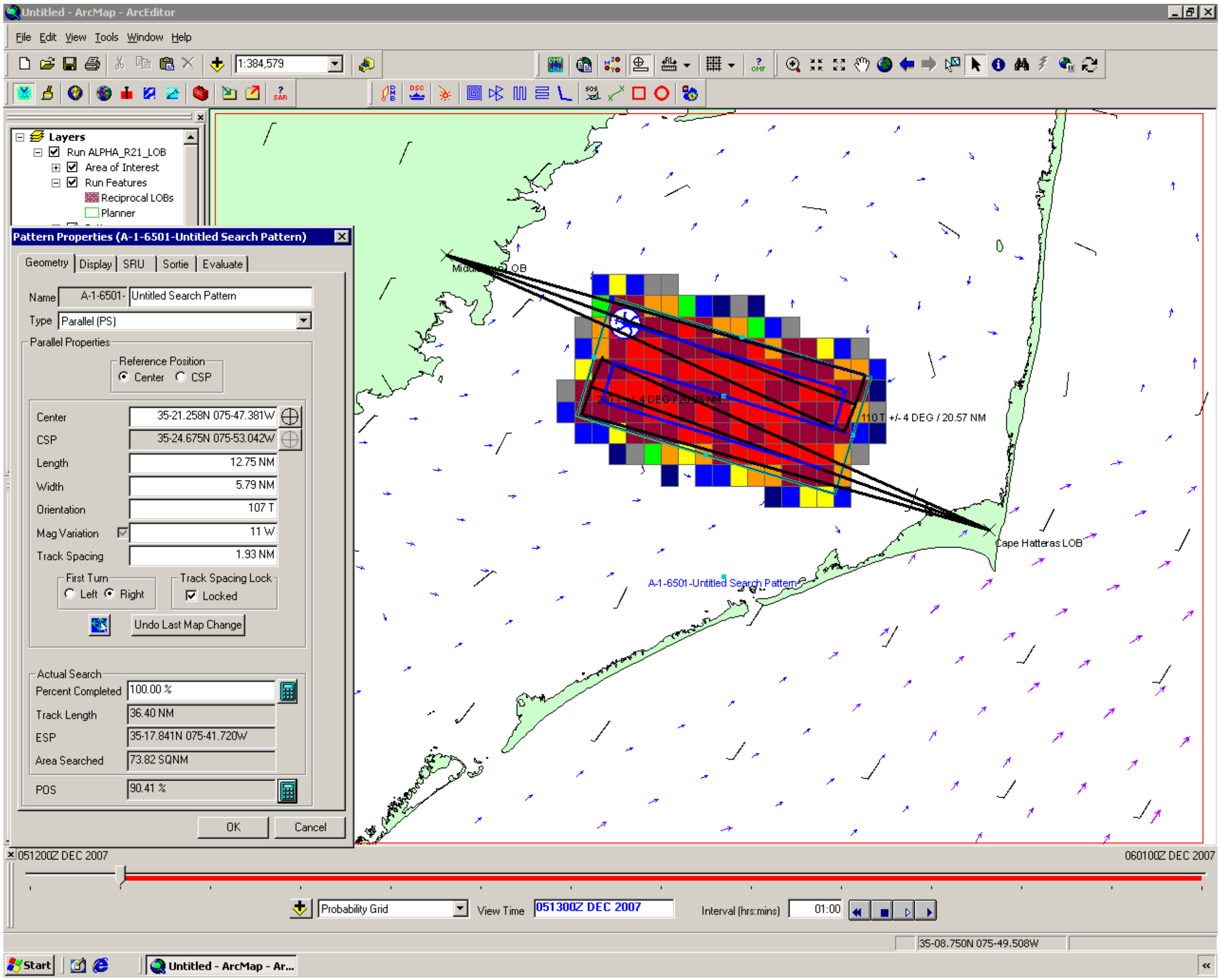

Figure 3-20—SAROPS Recommended Search Plan for Nearly Reciprocal Bearings

(e) **Multiple divergent LOB's to a single RFF.** There may be incidents where an RFF picks up a bounce or skip transmission that provides an erroneous LOB while another picks up the actual signal with and accurate LOB coming from significantly different directions. Each LOB should be considered individually. Emphasis should be given to the most logical LOB first. Local knowledge may provide clues as to potential for bounce or other anomalies.

(f) **Other Factors Affecting Estimation of a Distressed Craft's Location.**

(1) Both maximum reception range arcs and LOBs may be used together to estimate the location of a distress transmission, provided it can be confirmed that all are correlated with the same distress alert.

(2) ***If the initial search area cannot be covered before drift becomes a significant factor, a new search area that accounts for drift between the time of the distress alert and the time at which the SRU can be on scene must be computed in accordance with standard search planning procedures***. This generally means using SAROPS with one or more "Area" scenarios, and possibly other scenarios depending on what is known from other sources. Also see the *International Aeronautical Search and Rescue (IAMSAR) Manual*, the *National Search and*

Rescue Supplement (NSS) thereto, and Appendix H.

(3) Occasionally, atmospheric conditions cause "ducting" of VHF-FM signals. When this happens, the range at which these signals can be received becomes greatly extended. "Ducting" is often detected by hearing normal, non-distress traffic with information content indicating the transmitting craft are far away. For example, an RFF near Tampa, Florida, might "hear" traffic between a merchant vessel and a Mississippi River pilot-a distance of several hundred nautical miles. Refer to Section 2.5.6.2 for additional information.

(4) Because of its high frequency, VHF-FM is more susceptible to reflection or bounce from large tall structures than MF or HF signals. In some cases, this could affect the DF results such that the indicated direction points toward a structure rather than toward the distressed craft. Refer to Section 2.5.6.2 for additional information.

(5) As with all distress incidents, efforts to synthesize all of the available data from all sources to form one or a few self-consistent pictures ("scenarios") of the situation should be aggressively pursued. Although R21's capabilities will be very helpful, it is but one of potentially many sources of information bearing on a given case.

Section 3.5
Rescue Planning and Operations

3.5.1 Overview

The majority of Search and Rescue incidents reported to the Coast Guard do not involve a search. Most often the location of the vessel or person involved in the incident is known and the action required is a rescue or assistance.

3.5.2 Rescue Planning

Chapter 6 of reference (a) and Chapter 6 of Volume II of reference (b), provide most of the information required for rescue planning. As with a search effort, rescues should be carefully planned and action directed through a Rescue Action Plan. The format for a Rescue Action Plan is provided in reference (a). Operations Risk Management (ORM) should be integrated into all SAR plans. (Refer to Section 1.2.3)

3.5.3 Rescue and the Maritime SAR Assistance Policy (MSAP)

Rescues encompass the full range of needs from distress to non-emergency incidents and should be evaluated and responded to in accordance with the provisions of Section 4.1 of this Addendum.

3.5.4 Disposition of Lifesaving Devices

3.5.4.1 Emergency Position-Indicating Radio Beacons (EPIRBs) should be recovered and/or the signal secured whenever possible at the time of a rescue.

(a) EPIRBs should not be left afloat as a DMB. If additional persons remain missing or there is a need to mark the position of a vessel or floating debris a DMB should be used. (See 2.6.4.5)

(b) EPIRBs left adrift at the conclusion of a SAR incident, continue to transmit. The signal produced may prevent another distress beacon from being properly tracked or heard.

(c) EPIRBs used in SAR incidents that operated improperly or failed should be recovered for analysis.

3.5.4.2 Lifesaving vessels (life rafts, lifeboats and lifesaving float devices). A number of SAR cases involve recovering persons from life rafts, lifeboats or a variety of lifesaving float devices. These lifesaving vessels are made of wood, metal, fiberglass, rubber, and other materials, which, if left adrift, pose a hazard to navigation, contribute to environmental pollution and create the possibility of future false alerts. Additionally, the lifesaving vessel may be carrying petroleum products (if motorized) or other materials hazardous to the environment.

(a) The preferred action is to recover and deliver lifesaving vessels ashore. This may be accomplished by the on scene rescue units, a Good Samaritan vessel, the owner, or if arranged by the owner, via commercial salvage.

(b) If conditions and circumstances do not permit a safe recovery by on scene rescue units, rescue personnel should make every effort to mark the lifesaving vessel. ***The marking shall clearly indicate that the Coast Guard has investigated the lifesaving vessel.*** Markings should be made to be visible and recognizable from the air and sea at a distance of 300 feet. A broadcast notice to mariners should be made appropriate to location, type of hazard and future disposition.

(c) ***For lifesaving vessels left adrift which pose a hazard to navigation, the owner shall be advised of the responsibility for marking and recovering the vessel including appropriate lighting for night.***

(d) ***For lifesaving vessels left adrift that are pollution hazards, the owner and/or responsible party shall be advised of responsibilities under the appropriate laws/regulations.*** Notify the cognizant Coast Guard Marine Safety Office.

(e) Destroying lifesaving vessels should only be carried out when there is no other reasonable option. Generally, destruction should only be done if the lifesaving vessel cannot be recovered or marked due to on scene circumstances, and its condition or it poses a particular hazard if left afloat.

Section 3.6
Measures of Search Effectiveness

Despite past reliance upon POD as a measure of search effectiveness, POS is a far more effective measure and the method of choice in the *IAMSAR Manual* and the *National SAR Supplement*.

3.6.1 Probability of Success (POS)

Although POD has been in the search planning vocabulary and used with the manual search planning method for many years, POS provides a much greater measure of search quality. POS is a statistically generated measure of search effectiveness and is the probability that a given search will succeed in locating the search object. POS depends on two factors: (1) the probability that the object is in the area searched (POC) and (2) the probability of detecting that object (POD) if it were there. In manual computations, probability of success is the product of the Probability of Containment and the Probability of Detection: POS = POC x POD. For a particular search, POS answers the question, "If the scenarios, POC, and POD values are an accurate reflection of the available information and data, what is/was the probability of finding the search object?" Cumulative POS is a measure of search effectiveness to date and answers the question, "If the scenarios, POC, and POD values are an accurate reflection of the available information and data, what is the probability that the search object would have been found by now?" Achieving a high cumulative POS value without locating the search object is an indication that either the object cannot be detected (e.g., because it is on the bottom in deep water) or that the scenarios, POC values, and/or POD values are suspect and a thorough review of all the available information is needed to determine whether it has been interpreted, computed, and used correctly.

3.6.1.1 POS in SAROPS. In SAROPS POS and cumulative POS are computed differently but have the same properties and uses. Each particle (simulated search object) in SAROPS carries a value called "Pfail." This is the probability that all searching to date would have failed to detect that particular particle. Pfail values are initially 1.0 prior to any searching, which indicates that no detection is possible and non-detection is certain when no searching has been done. Pfails are adjusted based on the distance between the search facility and the particle at the closest point of approach (CPA) using a lateral range curve. A lateral range curve is a graph of the POD for a single SRU pass by a search object as a function of the distance between them at CPA. Lateral range curves depend on all of the same factors as effective sweep width. In fact, the area under the graph of the lateral range curve equals the effective sweep width. This is the mathematical definition of sweep width using integral calculus. Lateral range curves are used for several reasons:

(a) They provide a more accurate model of the detection process. Instead of assigning the same average POD value to each particle in a search area as CASP did, or assuming a perfectly uniform POD over the search area as the manual method does, each particle's Pfail is adjusted based on the SRU's CPA from every track in the pattern. In other words, SAROPS performs a much more detailed assessment of detection probabilities than any previous method.

(b) Because the CPAs are computed based on the SRU's motion *and* the particle's motion during the search, the effects of the relative motion between search objects and SRUs are taken into account. In all previous methods, motion during the search was not considered and the effect was the same as covering the entire search area in an instant at the datum time. Whenever the creep rate and average drift rate have about the same order of magnitude, relative motion can have a significant effect on POS.

SAROPS computes POS by finding the sum of all Pfail values, dividing that sum by the total number of particles, and then subtracting the result from 1.0. No POD or POC values for fixed search areas are required, or even computable. Note: This method of computing POS is used when all scenario and search object type weights are the same. Assigning different weights to scenarios or search object types will affect POS computations in SAROPS appropriately, but the added mathematics is not necessary for understanding the basics.

3.6.1.2 **POD (Probability of Detection)** is, traditionally, the statistical measure of average detection performance over a searched area. It is a function of sweep width, level of effort and size of the area searched. POD is a "conditional probability." The "condition" is an assumption that the search object is definitely in the area searched. POD answers the question, "If the search object was in the searched area at the time of the search, what was the probability of detecting it?"

POD has two other forms. One of these is the instantaneous or "one glimpse" POD. In addition to all the factors that affect sweep width, the instantaneous or one-glimpse visual POD is primarily a function of the true range from the searcher to the search object at the moment of the glimpse in the search object's direction. The other form is the lateral range POD. As the name implies, in addition to all the factors affecting sweep width, it is primarily a function of the lateral range, or distance at CPA, from the searcher to the search object. It is a result of the cumulative effects of all the one-glimpse POD values as the SRU approaches the search object from some distance beyond the maximum detection range, passes it, and continues on to some distance beyond the maximum detection range. The traditional average POD over a searched area is a result of the cumulative effects of all the one-glimpse PODs, or, equivalently, the cumulative effects of all the lateral range PODs from each search leg, while the SRU was in the search area.

SAROPS does not report POD values for search areas. Since it works by using lateral range PODs at the individual SRU/search leg/particle CPA level that accounts for time and relative motion, the average POD for a geographically fixed search area is no longer as useful a concept. Lateral range curves may extend beyond search area boundaries thereby adjusting Pfail values on particles that are never in the search area. This is realistic since in actual operations search objects are sometimes detected outside a search area from within the search area. During the search, particles will be drifting into the search area while other particles drift out of it. Some particles that cross search area boundaries during the search will be approached closely enough by the SRU for detection to be possible while this will not be the case for others. It is even possible for some particles that stay in the search area the entire time to escape any possibility of detection due to the effects of relative motion. These effects have been known ever since formal search planning methods were first developed, but until now there was no way to account for them so simpler computations based on static situations were used as the best available approximation.

3.6.1.3 **POC (Probability of Containment)** is described as the probability that the search object(s) are contained in a particular area. Using computer simulation (SAROPS) we can develop containment probabilities (POC) for a particular instant in time based upon drift and scenario assumptions. For example, POC values for each cell in a probability grid may be viewed for each recorded time step.

SAROPS does not report POC values for search areas for the same reasons it does not report POD values for search areas. Nevertheless, Coverage, POD, and POC are still useful concepts for discussing POS and area versus coverage tradeoffs in general terms.

3.6.2 The Value of Using POS

POS calculates search effectiveness by incorporating POC with the POD. POD only measures detection effectiveness; that is, it is used to estimate how well a search area was searched, but it does not incorporate the likelihood that the object will actually be in the particular area searched, or, in SAROPS terms, the chances that the search facility will approach the object closely enough to make detection possible. POS does.

3.6.2.1 The following examples will clarify this discussion:

(a) Searching an area that has no chance of containing the search object (POC = 0) will not be successful no matter how high the POD. Even if POD was 100% (which is not realistic) the POS is still zero (0 x 1 = 0).

(b) To give a more realistic example, if there is a 50% chance of the search object being in an area, then searching that area with a coverage factor of 1.0 (POD of 78%) produces a POS of 39% (.5 x .78 = .39). Even if POD was 100% (again unrealistic), the POS for this search rises to only 50% (.5 x 1 = .5) and no further because there is still a 50% chance that the search object was not in the search area.

3.6.2.2 POS balances options of looking very carefully in a small area for the object(s) against looking less thoroughly over a larger area for the same object(s). As an analogy, think of looking for a misplaced set of keys. One could meticulously look for the keys in the sofa; moving pillows, pulling apart cushions, putting one's hands under the sofa and in the joints of the furniture (high POD but low POC). Or, the same time could be used searching for the keys by scanning the tops of the sofa, mantel, bookcase and the rest of the family room and kitchen, concentrating on the most likely spots (lower POD but high POC). If it were known that the keys were lost in the sofa, option one would yield a higher POS. If there was uncertainty about where the keys were last seen or lost, then option two would probably yield a higher POS.

3.6.3 Determining POS

3.6.3.1 **Manual Solution.** The manual solution always incorporated POC and POS. However, for many years it did so in a way that was hidden from the search planner. Search planners, prior to the advent of CASP, the *IAMSAR Manual*, and now SAROPS, did not use POC and POS because there was no practical way to compute them manually. Unfortunately, this left an incorrect impression that POD was the sole statistic of interest in terms of measuring search effectiveness. It is not. As previously stated, POS is the measure of overall search quality/effectiveness.

3.6.3.2 SAROPS Solution. SAROPS is designed to provide a near-optimal search plan that maximizes POS while still de-conflicting search areas to prevent inappropriate overlaps and imposing minimum track space restrictions according to SRU type. The SAROPS Planner is essentially an infinite loop that keeps trying to improve its search plan solution by finding a new search plan that produces a higher POS than any previous plan it has computed. However, Planner is stopped after 90 seconds and returns the best plan it has found up to that point. Planner works well for small numbers of SRUs. When larger numbers of SRUs are introduced, the Planner may be unable to find a fully de-conflicted near-optimal search plan in 90 seconds. ***The usual result is that inappropriately overlapping areas are returned and must be straightened by human hands or Planner must be given more time.*** The user may go "Back" to the SRU screen and select "Run Planner" again, without changing anything, and Planner will use the previous solution as its new starting point and work for another 90 seconds. Usually a few repetitions will be enough.

Section 3.7
Aspects of Survival

3.7.1 The Probability of Survival Decision Aid (PSDA)

3.7.1.1 Use of the Probability of Survival Decision Aid. ***The PSDA application shall be used for all cases involving persons in the water (PIW) and where persons are at risk of hypothermia or dehydration when not immersed.*** PSDA is also useful in determining how environmental factors may affect Coast Guard personnel during operations and training evolutions.

(a) All Areas, Districts, Sectors, Air Stations, National SAR School, and the National Motor Lifeboat School are authorized to use the PSDA hypothermia and dehydration software.

(b) ***Electronic or hard copies of the inputs and results of running the model shall be included in all SAR cases files in which PSDA is used as part of the case suspension decision.***

(c) PSDA is a reliable means for the prediction of survival times from the effects of hypothermia or dehydration. Times provided are not considered as absolute values, but rather as guidelines for search planning and case suspension. PSDA should be used in conjunction with the existing hypothermia graph (Figure N-14) in reference (b). SAR planners should ensure alternate means of determining hypothermia effects, such as Figure N-14 in reference (b), are available in the event the PSDA is unavailable.

(d) PSDA software can be accessed through any of the SAROPS servers via a Common Access Card (CAC) and PIN. Once CMF-L has been launched, the PSDA hot button can be found in the USCG SAR Tools tool bar. The PSDA button is a red and white life ring that is titled 'Survivability Tool'. It also resides on SAROPS servers as a desktop link.

(e) PSDA has a built in HELP function that will answer most user questions. Questions about the entry of values in the PSDA application can be addressed by contacting the National Search and Rescue School.

3.7.1.2 Understanding Probability of Survival Decision Aid Results. The U.S. Army Research Institute for Environmental Medicine (USARIEM) developed the PSDA to predict survival times for cold-water immersion along with and cold and warm air exposure. PSDA predicts functional time and survival time based upon the cooling of the body's core and water lost by sweating, respiration, and urine production. These times are based upon an individual's physical characteristics, clothing, weather, and sea conditions. The functional time predicted by PSDA is the time elapsed after initial exposure when a person's body core temperature decreases to the end of mild hypothermia at 34°C (93.2°F). At the functional time, the person is assumed to have lost the cognitive capacity to prolong their life. Depending on the water temperature, this may be well past the time at which the person's extremities have been incapacitated by lowered muscle temperatures. Survival time is the time after immersion when the person's core body temperature falls to the end of moderate hypothermia 28°C (82.4°F). A person with a core temperature of 28°C (82.4°F) is expected to lose consciousness. An immersed unconscious person is unable to maintain an airway, which quickly results in drowning. PSDA also calculates total dehydration (water loss) by sweat production, loss of water to air in the lungs (respiratory loss) and a constant daily urine production of 0.5 liters per day. Dehydration Survival Time is reached when a person has lost 20% of their body weight.

3.7.1.3 Limitations of the PSDA. PSDA is a mathematical model that simulates the heat and water balances (gains versus losses) of a person based on current scientific understanding of human physiology. PSDA assumes that a personal flotation device is used that allows a passive person to maintain an open airway. A person-in-the-water is normally considered to be immersed to the neck, however SAR planners should consider that the person may be able to reduce his/her rate of heat loss by climbing aboard flotsam. The person is also assumed to have a normal cooling response to cold (i.e., not suffering from trauma or compromising medical conditions). PSDA also does not account for the effects of cold shock, cold incapacitation, and circum-rescue collapse, medications, drugs, alcohol, sleeplessness, and circadian hormonal cycles. These factors all have a negative effect on survival.

(a) The thermal physiological model includes six interconnected body segments (head, torso, arms, hands, legs and feet, modeled as cylinders. Each segment consists of a core, surrounded by muscle, fat, skin and clothing layers. PSDA balances heat production due to metabolism (which assumes a passive person who is shivering) against heat loss due to heat conduction through the fat, skin, clothing layers, convective heat loss to the surrounding air, and water environment. The model also simulates the transport of heat from the body core to the extremities through blood circulation and the loss of heat transport due to blood vessel constriction as the limbs become colder. Heat loss will overwhelm heat production in a cold environment, so cold survival time is largely determined by the rate of net heat loss. If the environment is somewhat warmer, heat produced by the person may balance heat loss (for example, if the person is wearing heavy clothing) and survival time is governed by the person’s ability to maintain a high rate of metabolism. The factors affecting the onset of exhaustion are poorly understood by the physiological community, so the hypothermic survival time has been limited to 120 hours or less. The 120 hour threshold was set by the PSDA developer, based upon the maximum observed immersed survival time (90 hours) from existing CG records, with a 33% added margin of safety.

(b) In warm air conditions (land or boat) a second physiological model in PSDA predicts the net water loss from the body through the skin (sweat loss), lungs (respiratory loss) and basal metabolic (urine) production. The data available for confirmation of the water loss model was confined to laboratory experiments, and the documentation of survival at high dehydration levels is poor. The PSDA developer set a maximum expectation of survival at ten days (240 hours) based on recommendations of earlier researchers. When the dehydration survival time is given as 240 hours, it means that the expected dehydration level is not expected to reach 20% of body weight, and that other factors should be considered by the SAR planners. The prediction of long-term sweat or water loss is complicated by changes in sweating rate over time (due to day / night / cloud cover / temperatures / rain / fatigue), the possibility that the person may be able to find supplemental water sources (such as fish or rain fall), and the near-absence of long-term physiological data under realistic conditions. Near its limits, PSDA accuracy is expected to be low.

(c) The input ranges of weight, height, and percent body fat of the individual account for 95% of the US population: 110-267 pounds, 59 –74 inches, and 5 to 50% body fat. PSDA inputs are sex, weight, height, body fat and clothing insulations, since these are the significant factors for survival.

3.7.2 The Four Stages of Cold Water Immersion

There are four stages of immersion in which death can occur in cold waters. (1) The initial Cold Shock Response can kill within 1-3 minutes of immersion by respiratory or cardiac problems leading to drowning or sudden death. (2) Cold Incapacitation can kill with 5-30 minutes of immersion by impairing physical performance, thus leading to the inability to self-help, swimming failure, and then drowning. (3) Hypothermia occurs after 20-30 minutes of immersion and will progress until shivering stops and unconsciousness occurs. This will lead to drowning if the head is not held above water, or eventual cardiac standstill if the head is held above water. (4) Circum-Rescue Collapse can occur just prior to, or during, rescue. It can also occur minutes to several hours post-rescue. Symptoms ranging from syncope (fainting) to death, due to cardiac standstill, occur due to loss of arterial blood pressure or the rapid and uncontrolled return of cold blood from the limbs through the unstable heart leading to cardiac arrest during circum-rescue collapse.

3.7.2.1 **Stage 1: Initial Immersion Cold Shock**. Sudden immersion into cold water stimulates a large aspiratory gasp response (involving one to several breaths) that may be followed by hyperventilation plus substantial increase in blood pressure and heart rate. If entry into the water involves complete head-under submersion, the gasp reflex could result in immediate drowning. Subsequent hyperventilation will normally diminish within seconds to minutes but could be increased and exaggerated due to emotional stress and panic. Uncontrolled hyperventilation can cause numbness, muscle weakness or even fainting, leading to drowning. Either of these respiratory responses can lead to aspiration of water into the lungs; panic, with subsequent drowning. Cold shock can occur in water colder than 20 ^{o}C (68^{o}F) with symptoms increasing as water temperature decrease to freezing. Healthy individuals may succumb to cold shock through uncontrolled respiratory responses, while those with underlying cardiac disease may experience sudden death due to cardiac arrest or ventricular fibrillation (uncoordinated heart beats). To counteract this phenomenon, control the entry into cold water by slowly entering and keep the head from being submersed; followed by focusing on surviving the first minute by not panicking and consciously getting breathing under control.

3.7.2.2 **Stage 2: Cold Incapacitation**. In addition to the short-term Cold Shock response, the body attempts to preserve the normal core temperature of 37°C (98.6°F) by decreasing heat loss and increasing heat production. Vasoconstriction in the limbs shunts blood from the extremities to the core in order to decrease body core heat loss through the limbs; this allows limb tissue to cool rapidly. Due to intense cooling of muscle and nerve tissues, the victim experiences muscular failure and is no longer able to swim, maintain posture or position in the water, or use the hands meaningfully. In water near 0°C (32°F), incapacitation can occur within 5-15 minutes. Approximately a third of all cold immersion deaths in 5 to15°C waters occur during Cold Shock and Cold Incapacitation stages.

3.7.2.3 **Stage 3: Hypothermia**. Continued excess of heat loss versus heat production will eventually result in decrease of core temperature (primarily the heart, lungs and brain) to clinically hypothermic levels of 35°C. Core cooling can occur when a person is immersed in waters of temperatures below 22^{o}C (72^{o}F). The rate of cooling depends on water temperature, body metabolism and fatness, as well as external insulation provided by clothing and survival gear.

(a) Hypothermia is divided by body core temperature into three sub stages of mild, moderate and severe hypothermia. These stages are defined by the State of Alaska State Cold Injuries Guidelines, which also provide guidelines for basic to advance treatment of hypothermia.

(b) During **Mild Hypothermia** (35°C to 32°C, 95°F to 90°F) the body's thermoregulatory system functions normally, thus shivering will normally increase in intensity as core temperature drops (unless a limited energy supply inhibits muscular activity). Physical disabilities will be seen first with fine motor movements followed by gross motor movement failure. Mental impairment will also be noted as core temperature approaches 32°C. Thus the victim is experiencing lost of coordination and judgment and is nearing the limits of self-help. The person would have significant problems with: climbing into a life raft, climbing a ladder, lighting a flare, or performing manual tasks.

(c) During **Moderate Hypothermia** the core temperature drops from 32^{o}C to 28^{o}C (82.4^{o}F) and thermoregulatory responses are waning or absent. In this stage, shivering will decrease in intensity and eventually stop, and consciousness will be lost (at about 30°C). Possible cardiac arrhythmia (irregular heartbeats) and sensitivity to ventricular fibrillation deceased consciousness or loss of consciousness occurs.

(d) **Severe Hypothermia** occurs when the core temperature drops below 28^{o}C (82.4^{o}F); at this stage death is imminent. Acid-base abnormalities occur in the blood, and the cold heart will eventually go into ventricular fibrillation and subsequent full cardiac arrest. This cardiac standstill can occur spontaneously (at heart temperatures approaching 25°C) or can be prematurely induced by mechanical stimulation at higher temperatures (up to 28°C). Thus it is important to be as gentle as possible when handling a moderate-to-severely hypothermic patient. During this stage of hypothermia, metabolism is minimal and cardio respiratory activity may be difficult to document, and a patient in full arrest may survive for an extended period due to the protective effect of brain cooling. Thus, unless there are obvious signs of fatal injury, victims are not declared dead until they are re-warmed to a core temperature of at least 32°C and further resuscitation efforts fail.

3.7.2.4 Stage 4: Circum-Rescue Collapse. The hypothermic victim may experience symptoms ranging from fainting to cardiac arrest during the period just prior to rescue, during rescue or within minutes to hours post-rescue. Prior to imminent rescue, mental relaxation and decreased output of stress hormones may result in a drop of blood pressure resulting in fainting and drowning. The act of rescue itself may also cause sudden collapse. Pulling a victim out of the water in a vertical position removes the hydrostatic squeeze around the lower limbs and may cause blood pooling in the these extremities and subsequent decreased blood pressure. This extra cardiac work or rough handling may induce a reflex cardiac arrest of the cold heart. Finally, death may occur within minutes to hours post-rescue. A rescued victim may be severely compromised with cold alkaline or acidic blood in the extremities, a heart extremely prone to failure, decrease or loss of consciousness, low blood volume (hypovolemia). Sudden redistribution of blood to the extremities (especially the lower extremities) may cause collapse through decreased blood pressure and cardiovascular instability, sudden return of metabolic byproducts to the irritable heart, or continued decrease in temperature (afterdrop) of an irritable heart. Core temperature will continue to drop and the heart reacts by tachycardia (extremely high heart rate) or fibrillation. Up to twenty percent of those recovered alive, die during due to circum-rescue complications, either before and during rescue or within hours after rescue.

3.7.2.5 Notes on Ice Water Immersion. Even in ice water, a victim may not become unconscious due to hypothermia if a PFD is worn or some other factor prevents the need for vigorous exercise to keep from drowning. If the head is kept above water at this point, the victim could still survive for up to one hour more before the heart stops, as long as the sea is relatively calm and waves do not wash over the mouth. The following slogan can be used to educate the public that they are not necessarily going to die if suddenly immersed in cold water:

"If you fall into ice cold water you have **1 Minute – 10 Minutes – 1 Hour.**"

(a) **1 Minute to get your breathing under control**, don't panic.

(b) **10 Minutes of meaningful movement** to get out of the water or attain a stable situation.

(c) **Up to 1 Hour until you become unconscious from hypothermia**, if you don't panic and struggle unnecessarily. And if you are wearing a PFD, it may take another 1 Hour until the heart stops due to hypothermia.

3.7.3 Near Drowning

3.7.3.1 Medical Considerations: Any person who has been submerged and unconscious is considered to be in a near drowning incident. ***All persons who were submerged and unconscious should be transported to a hospital, even if he or she has regained consciousness. Accumulation of fluids in the lungs (pulmonary edema) may develop 6 - 24 hours after submersion.*** If a person has been under water for **less** than one hour, full resuscitative effort should be employed. If a person has been under water for **more** than one hour, resuscitative efforts are usually unsuccessful. There is generally little differences between fresh and salt water near drowning regarding outcome or treatment, however aspiration of even moderate amounts of salt water (and slightly larger amounts of fresh water) into the lungs may result in severe pulmonary complications within a few hours. These manifest with an increasing breathing and heart rate. Neck injuries and their associated risk of spinal cord injuries are common after diving into shallow water or when a boat strikes an object, therefore it is best to maintain the survivor's body in a horizontal position during removal from the water, if it does not delay rescue.

3.7.3.2 Submersions: Submersions greater than 6 minutes in waters colder than 70^{o}F (21^{o}C) have a better chance of survival than those submerged in warmer waters; the colder the water the better the chance of survival.

3.7.3.3 Dehydration: After the urgency of air and thermal balance the survivor needs to replenish its body's water needs. A person in normal, neutral conditions loses about 1 pint of water per day through the skin (insensible water lost), another pint is lost by saturating the inhaled air by the lungs, another pint of water is lost as urine due the waste products of metabolism. Thus the total base loss of water per day is about 3 pints or 1.5 liters. Factors that will increase water loss include: 1) increased sweating due to exercise, fever, high air temperature and humidly; 2) increased respiratory loss due to exercise, low humidity, high wind speed; 3) increased urine loss due to diabetes, hypothermia, immersion, alcohol and sea water ingestion; 4) and other water losses (e.g., diarrhea, or blood loss). A person can offset these losses by drinking fresh water and to lesser extend from the metabolism of non-protein rich food. The accepted minimum daily requirement if additional water losses are not inquired is about 1 quart; with water conservation (keeping cool, resting, and remaining in the shade) this can be reduced to about 1 pint.

3.7.3.4 Consequences of Body Water Loss: When the water loss exceeds about 5% of body weight, the person may experience headaches, irritability and feeling of light-headedness. The skin loses some of its elasticity, when pinched is slow to return to its previous position. With water loss in the 8-10% range, performance deteriorates significantly, with dizziness, faintness, and rapid pulse and shallow breathing. Beyond 10% body loss of water, deterioration increases and hallucination and delirium become common. Death occurs with acute losses in the range of 15 to 20% of body weight.

3.7.3.5 Drinking Seawater: “There is an immediate slaking of the thirst, followed quite soon by an exacerbation of thirst that requires more copious draughts of seawater, and then still more. The victim then becomes silent and apathetic ‘with a peculiar fixed and glassy staring expression in the eyes.’ The condition of the lips, mouth and tongue worsens, and a peculiarly offensive odor of the breath has been described. Within an hour or two delirium sets in, quiet at first, but later violent, and if unrestrained the victim may jump overboard. If restrained, consciousness is gradually lost; the color of the face changes, and froth appears at the corner of the mouth. Death follows shortly after.”

3.7.4 Will to Live

The will to live is defined as the desire to live despite seemly insurmountable mental and/or physical obstacles and varies from one individual to another. The attributes that have the greatest effect on a person’s will to live are their attitude and physical condition at the time of the incident. The will to live is one of the greatest intangibles for SAR planners to consider when planning or suspending a search. Survival times are calculated minimums based on an average person, and the data does not take into consideration the will to live, which will differ, for every person depending on their situation. The will to live is extremely hard to define under any circumstances, but it is a part of the “Art of Search and Rescue versus science” and should be considered throughout the case

3.7.4.1 Controllers should do their detective work by talking with family members, friends and/or co-workers. Questions should be posed tactfully about any significant emotional events (i.e. death in family, divorce, birth of child, newlywed) that may have occurred recently. This can provide a gauge of the victim’s mental and physical state when he or she was last seen.

3.7.4.2 ***Case suspensions should not be solely based on PSDA.*** Times of possible case suspensions should be an optimistic guess that a person has a strong ‘will to live’. Conversations with family members, friends, and/or co-workers will provide the best indication of this. Again, every case is different and every person’s will to live is different and should be an educated guess weighing all internal and external factors.

3.7.4.3 With the proper attitude, people can exhibit exceptional physical and mental strength not normally thought possible.

Section 3.8
Conclusion of SAR Operations

There are three terms used to indicate the status of search and rescue cases; *Case Closed*, *Case Pends*, and *Active Search Suspended Pending Further Developments*. Each status has particular criterion associated with its use. The definitions and criterion for each status are described in the following sections.

3.8.1 Case Closed

When the search object(s) is located, assistance to the object is completed, and no other SAR issues arise, the search and rescue case is considered closed. No further SAR related action by the Coast Guard is necessary or contemplated.

3.8.1.1 ***Persons who are the object of a search must all be accounted for in order for a case to be closed.*** When persons remain missing at the conclusion of SAR efforts, the case cannot be closed.

3.8.1.2 ***Personnel in MEDEVAC cases must either be transferred to other medical authorities or no longer require medical assistance once delivered ashore for the case to be closed***.

3.8.1.3 When the object of a SAR case is property, the case may be closed when the object no longer requires SAR assistance. For vessels aground, sunk or in other condition requiring what is determined to be purely salvage assistance, the case may be closed.

3.8.2 Case Pends

This term refers to an open case in which the search object has not yet been located and not all search efforts have been completed, or the search object is located, but rescue or assistance efforts have not yet been undertaken or concluded. Further action by the Coast Guard is necessary and planned. (Action may include coordination of other agency assets.)

3.8.3 Active Search Suspended (ACTSUS) Pending Further Developments

When a SAR case cannot be closed and further search efforts appear futile, the search may be discontinued. The SAR case will remain open until the object of the search is located. If new information is received indicating the object of the search may not have been in the areas searched, or pertinent details of the search object were other than those previously reported, the search may be resumed.

3.8.3.1 ***The decision to grant ACTSUS is a judgment call. It must be based on a careful analysis of the factors of the particular case.*** The authority to grant ACTSUS carries with it the responsibility for final review of the SAR efforts, requiring knowledge of search planning and a clear understanding of the measures of search effectiveness (see Section 3.6.). ***ACTSUS authority inherently rests with the SAR Coordinator. At the discretion of the SAR Coordinator, ACTSUS authority may be delegated in writing as detailed below. Such delegation shall take into account that in general the level for ACTSUS authority should reside in the SAR chain of command one level above the SMC.***

(a) ***ACTSUS authority may be delegated to Sector Commanders. Sector Commanders may further delegate authority to the Deputy Sector Commander or the Sector Chief of Response. District Chief of Incident Management shall be advised if this delegation is made.***

(b) ***Delegation of each individual with ACTSUS authority within the District or Sector***

remains in effect unless specifically cancelled or superseded.

(c) Consideration should be given to limiting delegated authority based on scope and severity of cases. ***Prior to ACTSUS being granted for cases involving persons known to be missing, the District (drm) at a minimum shall be briefed***.

(d) ***In the absence of the most junior delegated ACTSUS authority recognized by the SAR Coordinator (Sector Response Chief/Commander in most cases), ACTSUS authority shall revert to the next most senior authorized ACTSUS authority in the chain of command***.

3.8.3.2 A sample SAR Case Suspension Checklist is included in Appendix G. This checklist or a locally produced checklist is recommended as an integral part of the suspension decision process.

3.8.4 Case Status Actions by Other SAR Authorities when Coast Guard Units are Assisting

When a person from another agency is the SMC for a search and Coast Guard units are participating in the effort, the Coast Guard will normally cease all efforts when the SMC either closes or suspends the case.

3.8.4.1 Typical Other Agency SMC Situations. Most search operations performed by Coast Guard units will be for situations where the Coast Guard is SMC. There will however be times when others will be SMC:

(a) **Other Nations**. Along our borders with other nations, where our SRR bounds that of other nations we often get asked to assist in searches; the RCC for the bordering SRR most often will be SMC. This commonly occurs where our assets are in close proximity such as the Pacific, Great Lakes and Atlantic borders with Canada and Pacific, Gulf of Mexico borders with Mexico and multiple borders with island nations in the Caribbean and western Pacific for example. This can also happen when we have deployed resources (Coast Guard Cutters, C-130's) operating near or in other nation's SRRs.

(b) **Department of Defense.** In SAR response to DOD assets or personnel, DOD commanders may assume SMC regardless of location. In those instances Coast Guard assets may have responded independently or following a request for assistance. ***For all incidents occurring within a Coast Guard SRR, the cognizant RCC shall confer with the DOD SMC to confirm SMC assignment and coordinate CG assistance.*** The SMC for the Coast Guard may reside in these cases at the sector level when appropriate for the location, scope and type of incident.

(c) **State/Local Agencies.** Many incidents happen right along shorelines. Local officials are normally the primary responder and coordinator of response activities, by default filling the role of SMC. Incidents such as persons falling from docks, swimmers missing and vehicles driving into the water often are reported to local officials who handle the initial response and may notify the Coast Guard only after failing to immediately resolve the incident. In many instances local agencies may report that they are in the "body recovery" or "recovery ops" mode. In these situations Coast Guard response may not be required or appropriate. Sector commands should monitor the incident and consider on a case by case basis the need for Coast Guard involvement.

(d) **Land SAR and Inland Waters**. Coast Guard assets are often requested to assist other federal, state and local agencies to respond to incidents within the inland areas; for both land and water incidents.

3.8.4.2 Actions in response to questionable suspension by other SAR authorities. There may arise cases in which the Coast Guard is involved, when the other SAR authority, according to Coast Guard standards, makes a questionable suspension decision. Under these circumstances the following actions should be taken:

(a) The involved unit(s) should first convey their concern to the other agency SMC.

(b) If the nature of the concerns is not adequately addressed by the other agency SMC, the unit should brief up their SAR chain of command to the Coast Guard SAR Coordinator (RCC).

(c) The SAR Coordinator (or representative RCC) should contact the other agency to discuss the concerns.

(d) ***If the concerns are not answered at this level, the SC shall make a decision either to proceed independently to conduct further searches or accept the decision of the other agency***.

Section 3.9
Case Documentation

Case documentation occurs both during and after an incident. During an incident, it serves to keep other involved parties informed and also to assist planning of subsequent operational effort. The SAR case file provides invaluable documentation for record purposes, determination of potential lessons learned and data for the Marine Information for Safety and Law Enforcement (MISLE).

3.9.1 SAR Case Claiming

Coast Guard units shall claim credit for situations in which resources coordinate or render assistance, regardless of position or location of the incident. The intent is to ensure Coast Guard resource activity is properly documented to support analysis of SAR operating needs, management and budgetary decisions. Accordingly, this policy should be interpreted using common sense and reasonableness. Case claiming is documented by means of MISLE discussed later in this section and more extensively in Appendix B.

3.9.1.1 Requirements for Claiming a Case. Units may claim a case whenever a response is made no matter the time or effort expended. ***However, units shall claim a case and submit MISLE data when notification of distress has been received or a Search Rescue Unit (SRU) is launched***. This applies to cases initiated by ELT/EPIRB, DSC and INMARSAT distress alerts. There is no need to claim every ELT/EPIRB case that expends less than 30 minutes of effort, as the RCCs are already required to submit an Incident History Feedback Sheet to the NOAA MCC, who enters the data into their database. For further DSC reporting requirements, see Section 2.2.2.12.

3.9.1.2 Claiming a Case When Another Agency is SMC. ***Coast Guard units carrying out SAR missions for other agency SMCs shall claim a case under the same guidance as when a CG person is SMC and required MISLE data entries shall be made as detailed in Appendix B to document the Coast Guard units participation.***

3.9.2 SAR Case Documentation and Records

3.9.2.1 Case Documentation. This may include, but is not limited to, the following examples.

(a) Logs and Diaries;

(e) SAR Forms/Checksheets;

(f) SAR Charts and Overlays;

(d) SITREPs, UMIBs, etc.; and

(e) Audio/video files.

NOTE: ***If recorded radio transmissions and telephone calls must be retained then the audio files shall include sufficient information to completely re-create the case and show the rationale for all decisions made.***

3.9.2.2 Logs and Diaries ***may be either electronic or paper documentation created and collected from start to finish of an active case and shall be entered into the MISLE system***.

3.9.2.3 SAR Forms/Checksheets. SAR Forms/Checksheets serve many purposes; documenting information from the distressed craft; facilitating communications between responding units; briefing crews; search planning, etc. ***This data shall be entered into the MISLE***

system. Some examples are listed below:

(a) **Emergency Medical Treatment Report.** ***As directed by reference (v), the Emergency Medical Treatment Report Form (CG-5214) shall be used for all SAR cases involving injured or ill persons.*** The form provides patient clinical information for the receiving medical facility, serves as a treatment guide for administering medical care, and allows data collection and evaluation. A sample Form is in Appendix D.

(b) SAR Checksheet; and

(c) Flare Checksheets, etc.

3.9.2.4 SAR Charts and Overlays. ***At present this is electronic information and shall be attached to the proper case file within the MISLE system.***

3.9.2.5 Messages, Broadcasts, etc.

(a) **SAR Situation Reports (SITREPs)**. Passing key operational information in a timely manner, both up and down the SAR organization, is critically important to effective SAR case prosecution and documentation of completed efforts.

(1) **Internal CG Requirement.** Where MISLE data entry is complete (meets the entry standards provided in Appendix B), accurate and timely, the requirement for internal Coast Guard SITREPS may be removed by SAR Coordinators for their subordinate units.

(2) **Requirement When Working with Other Agencies.** When other U.S. (federal, state, local, volunteer, commercial, etc.) or international agencies are supporting or participating in SAR operations with the Coast Guard, and when the Coast Guard is providing resources to other national or international agencies SMCs for SAR operations, SITREPS should be provided to meet interchange of data needs.

a. This is important feedback in particular to ensure there is a clear understanding of search efforts expended, areas covered and effectiveness of searches.

b. Requiring SITREPS from others agencies when a CG member is the SMC is appropriate to aid in CG documentation of the case.

c. Providing a SITREP of CG unit support to other agency SMC should the other agency's reporting requirements. In general, use of the CG SAR SITREP format will provide all the information necessary to meet other agency needs.

(3) **Standard Coast Guard SAR SITREP format.** ***The standard format shall be used***. Other formats are not allowed except as detailed in Paragraph 3.9.2.5(a)(6); operational commanders may require additional information. Information included that may be subject to privacy, medical or other information protection should be limited to that information necessary for conduct and documentation of the response. The standard SAR SITREP format for Coast Guard use has been developed based on references (a) and (b), and the United States Message Text Format (USMTF), with consideration of field unit requirements and desires. The Coast Guard standard SAR SITREP format and an example are provided in Appendix C.

(4) **Transmission methods.** Timely dissemination of information is more critical than the method of transmission. Voice communications, followed later with written record traffic, may be substituted for initial SITREPs between the On Scene Commander (OSC) and SMC. Facsimile, e-mail and other methods that provide a

retainable record are also acceptable substitutes in all cases at the discretion of the SMC. Information required does not change with transmission method and should be provided to the fullest extent possible.

(5) **Frequency of reports.** ***Frequency of SITREPs for individual SAR cases shall be set by the SMC and subject to the following conditions:***

a. The period covered will normally coincide with each search effort (efforts of each individual search plan).

b. ***The minimum frequency shall be daily***.

c. Initial SITREPs should be submitted as soon as significant information is available but should not be delayed unnecessarily for confirmation of all details. Amplifying information can be provided in subsequent reports.

These are the minimum requirements. SAR Coordinators may establish a higher frequency for operations within their search and rescue region.

(6) **SITREPs for DOD operations.** ***The USMTF format shall be used for SITREPs when the SAR operation is DOD directed or if otherwise instructed.***

(7) **Rapid reporting via Critical Incident Communications Procedures**. Specific SAR incidents may also be Critical Incidents (Incidents of National Interest as detailed in reference (w)). When this is the situation, normal SITREP reporting procedures at the onset of the incident may not apply. ***Units shall follow the established streamlined notification system procedures to rapidly report initial, limited information about critical incidents throughout the Coast Guard and to interagency partners***.

(b) **SAR Action Plan.** ***Before a search operation takes place, the search planner shall provide a detailed search action plan to all involved facilities, specifying when, where and how individual search facilities are to conduct their search operations. Coordination instructions, communications frequency assignments, reporting requirements, and any other details required for the safe, efficient and effective conduct of the search must also be included in the search action plan***. See Section C.2 for an example of the search action plan message.

(c) **Broadcast messages** may include BNMs, UMIBs, etc. These messages should be unclassified and in plain language**.** ***Copies of the broadcast shall be included as attachments in the case file in MISLE (attachment to the Incident Management Activity).***

3.9.2.6 Audio Files.

(a) ***Audio files consist of radio transmissions and telephone calls and shall be retained for up to 30 days***. On the Rescue 21 system all audio files are stored on the hard drive for at least 30 days. After 30 days the SAR Program does not require units to retain audio information. Note: The majority of audio information is normally recorded in checksheets or forms within MISLE; therefore, it is not necessary to retain audio files. Audio recordings are meant to be used as an operational tool. For instance, the immediate playback of a recording may assist the operator in clarifying information from an incoming call that was garbled, distorted or misunderstood. Additionally, significant portions of audio calls may be retained for case review with the chain of command to determine the significance or determination of a case, i.e. hoax. Typically the playback of a recording(s) is done within the time span of an open case.

(b) Audio File Retention.

(1) There are circumstances where it may be desirable to retain original audio files or copied portions of audio files. They are:

a. Historically significant cases;

b. Litigation cases; and

c. Liability cases.

(2) Case Determination Responsibility.

a. Historically significant cases. ***The SAR Coordinator is responsible for determining if a case is historically significant and shall follow the guidelines in reference (x) for submission into permanent records.*** The SC should consult with the Coast Guard Historian if there are any questions as to whether or not the case is historically significant. Historically significant cases are those cases identified as having historical significance due to the scope or nature of the cases. Examples include:

1. Cases receiving national or regional media attention;

2. Cases used in Congressional or other oversight investigations; and

3. Cases involving a great number of persons seeking rescue or involved with a large scale disaster such as a terrorist attack or natural disaster.

b. Litigation cases. The Operational Commander is responsible for determining if a case could be involved in litigation. If there is any personal injury or property damage as a result of Coast Guard involvement, the unit involved should immediately consult the Coast Guard Claims and Litigation Manual, COMDINST M5890.9 (series), Chapter 2, and its servicing legal office to determine if the audio case files need to be retained beyond 30 days as well as the requirement for retention of other specific case documentation.

c. Liability cases. The Operational Commander is responsible for determining if the Coast Guard may be liable in a case due to Coast Guard involvement. ***The Operational Commander shall consult with the legal office if there is any question as to whether or not the Coast Guard may be liable***.

3.9.3 Marine Information for Safety and Law Enforcement (MISLE) Reports

3.9.3.1 MISLE is the primary means of collecting and storing information relative to all Coast Guard SAR operations. This information is essential in order to have a true picture of the effort expended by the Coast Guard in support of SAR operations and a clear understanding of SAR incident trends. Additionally, the MISLE database is a measurement tool for determining the Coast Guard's effectiveness in the SAR aspect of its Maritime Safety Mission. MISLE information can also be used to:

(a) Measure unit workload and effectiveness;

(b) Determine resource utilization and needs;

(c) Justify budget requests to meet projected requirements;

(d) Analyze system operations for potential improvement and savings; and

(e) Justify policies and procedures to manage the overall SAR Program more effectively.

3.9.3.2 MISLE data is entered at the unit level directly into a web-based database. Use, access and training information is provided on-line at the Operations System Center MISLE intranet site. Appendix B specifies the data collection and reporting procedures for Coast Guard units.

3.9.3.3 ***Units shall enter SAR data for every case they claim***.

3.9.4 Coast Guard SAR Case Studies

(a) **Overview.** The effectiveness and continuous improvement of the Coast Guard's Search and Rescue (SAR) system is predicated in part on the continued analysis of significant SAR cases executed within a Rescue Coordination Center (RCC)/Command Center (CC). The lessons learned that stem from a SAR case study have the potential to highlight both positive and negative attributes in order to provide corresponding recommendations to reaffirm or mitigate specific actions, assumptions, or capabilities. (A SAR case study is non-punitive in nature and is not considered an Administrative Action). In addition, the ability to leverage SAR case study outcomes to support SAR system improvements can be compromised when information gleaned is not shared or adjudicated by an appropriate Final Action Authority. (Final Action Authority is defined as the command entity which has the authority to adjudicate recommendations made within a SAR case study). The policy and guidance provided below outlines when SAR case studies are to be conducted and the process for the routing and adjudication of lessons learned.

(b) **Application.** A SAR case study is an objective analysis of the SAR system that stems from the execution of a specific SAR case. Case studies may require an analysis of the entire SAR case, or can be limited to addressing only certain aspects of a case that are of particular interest to Commandant (CG-SAR), SAR Coordinators (SCs), and/or Sector Commanders. For example, a SAR case may experience challenges associated with communications equipment, computer-based SAR tools (i.e. SAROPS, AM ER, etc.), Search and Rescue Units (SRUs), or the coordination with international, Federal, State, Tribal, Territorial/Insular Area or local SAR authorities, volunteers, or industry stakeholders. Likewise, a SAR case study may highlight unique circumstances that greatly improve the effectiveness of the SAR system to save lives. Appendix M provides specific procedures for the conduct and overall formatting of SAR case studies. This includes a format for SAR case studies triggered by paragraphs 3.9.4(c)(1)a-c and a simplified format that may be used for all other SAR case reviews initiated by Area/District SCs, and Sector Commanders.

(1) Although Commandant (CG-SAR) is responsible for developing policy concerning the conduct of SAR case studies, recommendations that stem from a SAR case study may fall outside of Commandant (CG-SAR)'s purview and require adjudication from another cognizant Final Action Authority. For example, given a SAR case study recommendation concerning policy within an Area or District SAR Plan, the Final Action Authority may fall within the respective Area or District SCs responsibility. At Coast Guard Headquarters (HQ) , Final Action Authority may reside within Commandant (CG-SAR) or another HQ program or policy office. Complex SAR case studies may include

recommendations that require adjudication from multiple Final Action Authorities throughout various levels of the organization. Regardless of whom or where the Final Action Authority resides, a deliberate and organized routing process is necessary to ensure overarching transparency and the continued improvement of the Coast Guard's SAR system.

(2) In the event other fact-finding bodies have been convened for the purpose of investigating a particular SAR incident (i.e. Administrative Investigation), SAR case study reviewers should coordinate with those bodies to ensure consistent findings of fact. While the purpose and goals of separate investigations may differ, each should be able to meet its objectives based on the same set of facts. A Mishap Analysis Board (MAB) may be conducted in lieu of a SAR case study when investigating a mishap associated with the activation of the SAR system. A SAR case study may still be initiated if the scope of the MAB does not address specific concerns within the SAR system.

(3) An accurate and objective SAR case analysis requires personnel to have prerequisite SAR training and experience. The completion of relevant SAR courses along with attainment of associated qualifications and experience is required. Likewise, personnel assigned to lead a SAR case study should be billeted outside of the RCC/CC and not associated with the SAR watch team that prosecuted the case. SC's or Sector Commanders should strongly consider requesting personnel support from an external command in order to ensure an objective analysis. For complex SAR cases, more than one person may be assigned to conduct the study. Commandant (CG-SAR), National SAR School, or other Area-35/District Drm staff's may provide specific technical and subject matter expertise in support of a units SAR case study.

(4) It is highly recommended that personnel likely to conduct a SAR case study attend the Advanced Mishap Analysis and Reporting Course (AMARC) hosted by Commandant (CG-113). AMARC provides training on the use of the Human Factors Analysis and Classification System (HFACS) which assist investigators in identifying active and latent organizational failures that lead to a mishap. Completion of AMARC by SAR professionals would also broaden the pool of candidates with SAR expertise to support Mishap Analysis Board (MAB) investigations with a SAR nexus

(5) Public Disclosure of SAR case studies:

a. A SAR case study is a deliberative, pre-decisional document because it contains summarized facts and individual opinions, which may not have been approved by the SAR chain of command or Final Action Authority. In order to ensure a full, frank, and open discussion of issues within a SAR case study process, it is imperative that the Coast Guard be able to withhold deliberative, pre-decisional portions of the study from public release. Premature release of SAR case study information may compromise future case studies and may cause public confusion resulting from disclosure of findings and recommendations that are not in fact the final agency action. A SAR case study may be withheld-in-full or in part from public disclosure under the Freedom of Information Act (FOIA).

b. The Final Action Memo (FAM), which is approved and released by the Final Action Authority, describes the finding of facts and specifically adopts certain opinions and recommendations from the SAR case study– rendering the FAM a final agency action. FAMs should be drafted for public disclosure as much as possible, written, for example, to protect personal privacy (i.e., using ranks or position titles instead of names). The FAM addresses all aspects of a SAR case study and should not be limited or tailored specifically with FOIA in mind. If a FOIA request for a SAR case study or FAM is received, draft case studies will be withheld-in-full as deliberative and pre-decisional, finalized case studies and the FAM will be reviewed to redact or partially withhold information that falls within FOIA exemptions to public disclosure.

c. Reference (k) provides detailed FOIA guidance. For additional guidance on FOIA disclosure and the applicability of FOIA exemptions, contact your respective servicing legal office.

(c) SAR Case Study Policy:

(1) ***Area and District SCs and Sector Commanders shall ensure a SAR case study is completed when:***

a. ***A search object (person, vessel, aircraft, or other craft) is located after a search was suspended.*** Note: There may be SAR cases that fall within this policy in which a case study is not warranted (e.g., a confirmed bridge jumper and the victim is discovered several hours or days after suspension, search object is discovered after a prolonged period, etc.). The important distinction is whether a case study is warranted to improve the SAR system. SCs and Sector Commanders must consider whether the SAR operational chain of command and the Coast Guard in general can benefit from the evaluation of a particular SAR case. This important distinction must guide SCs and Sector Commanders in making a SAR case study determination.

b. ***A search object (person, vessel, aircraft or other craft) is located outside of the search area.*** Note: For the purposes of SAR case studies, search area is defined as the area, determined by the SAR Mission Coordinator (SMC), which is searched by an assigned SRU. Per paragraph 3.9.4.(c)(1)a., SCs and Sector Commanders must be guided by the circumstances of a SAR case to determine whether a SAR case study is warranted to improve the SAR system. For example, a SAR case study would be warranted to improve search planning techniques and assumptions, or how a SAR unit is conducting a search can be improved. However, if the search object is discovered after an extended period of time after the case is suspended and there is limited ability to evaluate improvements to the SAR system, then the SCs and Sector Commanders do have the discretion to articulate why a case study was not completed. Again, this important distinction must guide SCs and Sector Commanders in making a SAR case study determination.

c. ***As directed by the Office of Search and Rescue, Commandant (CG SAR), Area or District SCs, or Sector Commanders*.**

(2) ***Area and District SCs and Sector Commanders shall document within MISLE the rationale used not to conduct a SAR case study despite the above triggers being met.***

(3) ***Area and District SCs and Sector Commanders shall ensure those assigned to lead a SAR case study possess the Search and Rescue Officer Specialty Code (CG-OAR11). Coast Guard civilian employees and enlisted members with equivalent SAR training and experience (e.g., OU/CDO competency with two years of experience) may also be assigned. District and Area SCs and Sector Commanders shall ensure those assigned to lead a SAR case study are billeted outside of the RCC/CC and not associated with the SAR watch team that prosecuted the case.***

(4) ***Commandant (CG-SAR) shall be notified immediately, through the SAR chain of command, of any pending SAR case study involving Cospas-Sarsat, AMVER, or SAROPS so that historical data, voyage files, environmental data, system status, etc., as appropriate, can be captured and retained for later analysis.***

(5) ***Area and District SCs, Sector Commanders, and Final Action Authorities shall ensure a SAR case study is initiated, completed, routed, adjudicated and archived using the following timelines.*** Note: Initiated SAR case studies that identify a significant safety or lifesaving concern may require immediate visibility throughout the SAR system. In these circumstances, the SAR chain of command (Area SC, District SC, and Commandant (CG-SAR)) should be briefed prior to completion of a SAR case study**:**

a. **Sector Commanders:**

1. ***Assign a SAR case study lead within five days of the conclusion of a SAR case for those cases where the SMC was assigned at the Sector level.***

2. ***Complete the SAR case analysis within 30 days of the conclusion of a SAR case. Route to the District SC through the SAR administrative chain of command.***

b. ***District SCs:***

1. ***Assign a SAR case study lead within five days of the conclusion of a SAR case for those cases where the SMC was assigned at the District level.***

2. ***Complete the SAR case analysis within 30 days of the conclusion of a SAR case.***

3. ***Within 20 days of receiving a SAR case study from a subordinate unit, endorse and/or adjudicate any recommendations within your purview as Final Action Authority; Route to the Area SC.***

4. ***Track the disposition of all SAR case studies forwarded within your specific Search and Rescue Region (SRR).***

c. ***Area SCs:***

1. ***Assign a SAR case study lead within five days of the conclusion of a SAR case for those cases where the SMC was assigned at the Area level.***

2. ***Complete the SAR case analysis within 30 days of the conclusion of a SAR case. Route to Commandant (CG-SAR).***

3. ***Within 20 days of receiving a SAR case study from a subordinate unit, endorse and/or adjudicate any recommendations within your purview as Final Action Authority; route to Commandant (CG-SAR).***

4. ***Track the disposition of all SAR case studies forwarded within your specific SRR.***

d. ***Commandant (CG-SAR):***

1. ***Shall be responsible for relevant policy associated with the Coast Guard's SAR case study program.***

2. ***Shall, upon receipt of a SAR case study (from an Area SC), route to other appropriate Commandant HQ office(s) with Final Action Authority responsibilities.***

3. ***Shall, if required, facilitate a unified SAR case study response between multiple Coast Guard HQ Final Action Authorities.***

4. ***Shall within 45 days of receipt of a SAR case study, provide a consolidated Final Action Memo that endorses and/or adjudicates recommendations from all HQ Final Action Authorities. The final action report shall be routed to the SAR case study originator through the SAR administrative chain of command.***

5. ***Shall establish a repository and archive the final action report and any relevant enclosures to ensure transparency and continued dialogue on the issues addressed throughout the Coast Guard SAR System. This repository can be found on the Commandant (CG-SAR) USCG Portal Page.***

6. ***Shall, in consultation with the FOIA office, evaluate and approve any decision to waive a FOIA exemption and release an underlying SAR case study to the public.***

e. ***Except in unusual or extenuating circumstances, the above timelines may be extended with approval from the next organizational level in the SAR chain of command***

f. ***Units that complete a SAR case study shall ensure that the final report and any accompanying enclosures be attached to the SAR case file within the Coast Guard's prescribed data management system.***

3.9.5. Survivor Immersion Data

(a) Survivor immersion data is important to scientists and engineers developing upgrades for the PSDA tool. To support these efforts, survivor immersion data should be collected for cases where a survivor has experienced immersion in water for a duration of one hour or longer.

(b) Collection of this information should be done using the checksheet contained in Appendix G and uploaded into MISLE for the corresponding SAR case as well as delivered via e-mail to Commandant (CG-SAR).

CHAPTER 4
GENERAL SAR POLICIES

Section 4.1
Maritime SAR Assistance Policy (MSAP)

This section sets forth policy and procedures for handling requests for any type of Search and Rescue (SAR) assistance from the Coast Guard and defines Coast Guard relationships with other possible sources of assistance. It establishes internal Coast Guard policy guidance only and is not intended to confer any right or benefit nor create any obligation or duty to the general public.

4.1.1 Preamble

The MSAP is the result of an effort enacted by Congress in 1982. It directed the Commandant to "review Coast Guard policies and procedures for towing and salvage of disabled vessels in order to further minimize the possibility of Coast Guard competition or interference with...commercial enterprise." The review was directed because of congressional concern that Coast Guard resources were being used unnecessarily to provide non-emergency assistance to disabled vessels that could be adequately performed by the private sector.

The MSAP represents more than a decade of development of relationships among the Coast Guard, Congress, the commercial towing industry, and the Coast Guard Auxiliary. Each iterative revision of the MSAP has received close scrutiny. It has been a give-and-take process culminating in a policy that is equitable to all stakeholders.

Problems have often arisen when individuals or groups have interpreted the MSAP to fit their own particular situation or personal agenda. This contradicts the aim of the policy and creates unnecessary conflict amongst those for whom it was intended to serve. The key is to follow the policy as it is intended, to seek clarification where necessary, and to collectively ensure that the disabled and/or endangered mariner gets fair, reasonable, and consistent service throughout the United States. However, in order to clarify some of the more often misinterpreted aspects of the MSAP, notes have been added.

4.1.2 Definitions

4.1.2.1 **Coast Guard Resources:** Includes active duty personnel; reserve personnel when serving under any form of active or inactive duty orders; auxiliary personnel when serving under orders; cutters; boats; aircraft; and equipment of active duty, reserve, and auxiliary Coast Guard units.

4.1.2.2 **Emergency Phase:** Classification made by the SAR Mission Coordinator (SMC) upon receiving a request for assistance. The three emergency phases; i.e., UNCERTAINTY, ALERT, and DISTRESS, are described in reference (a). A shortened definition of each is:

(a) An UNCERTAINTY phase exists when there is knowledge of a situation that may need to be monitored, or to have more information gathered, but that does not require moving resources.

(b) An ALERT phase exists when a craft or person is experiencing some difficulty and may need assistance, but is not in immediate danger or in need of immediate response. Apprehension is usually associated with the ALERT phase.

(c) The DISTRESS phase exists when grave or imminent danger requiring immediate response to the distress scene threatens a craft or person.

4.1.2.3 On Scene: When the assisting resource has completed any necessary transit to the vessel requiring assistance.

4.1.2.4 Safe Haven: A Safe Haven is considered a place that can accommodate and will accept the safe mooring of the vessel.

4.1.3 Background

4.1.3.1 Coast Guard Mission. The Coast Guard promotes safety on, over, and under the high seas and navigable waters subject to the jurisdiction of the United States. The Coast Guard is authorized by law to develop, establish, maintain, and operate search and rescue facilities. The Coast Guard is authorized to perform any and all acts necessary to rescue and aid persons; and to protect and save property at any time and at any place where its facilities and personnel are available and can be effectively used. However, there is no legal obligation for the Coast Guard to undertake any particular rescue mission.

4.1.3.2 Coast Guard Auxiliary Mission. The Coast Guard Auxiliary is a volunteer, non-military organization of civilians under the direction and administration of the Coast Guard. The functions of the Auxiliary include promoting safety and effecting rescues on the high seas and U.S. navigable waters. Auxiliary operational facilities are excellent resources that can, within their capabilities, enhance the Coast Guard's ability to respond to maritime emergencies. The Auxiliary has a proud tradition of support to the Coast Guard and help to mariners who need assistance on the water.

4.1.3.3 Other Assistance Available. The Coast Guard has often been the only source of readily available assistance to recreational boaters. However, commercial and additional volunteer sources of assistance exist and are capable and willing to provide various services to mariners. Additionally, other federal agencies and many state, county, and local governments have resources which may be capable and willing to assist the Coast Guard or otherwise provide assistance to mariners.

4.1.3.4 Commercial Operator's License Required. 46 U.S.C. § 8904 requires the operator of any vessel that tows a disabled vessel for compensation to have a valid license to operate that type of vessel in that particular geographic area.

4.1.4 Discussion

4.1.4.1 Prevention. The Coast Guard emphasizes that the best deterrent to needing assistance is a prepared and knowledgeable mariner. Before departing, the prepared operator ensures that all safety equipment, sufficient fuel, and necessary charts are onboard; the vessel is in good operating condition; the radio is operating properly; and someone knows the sailing plan of the operator, and will notify the Coast Guard if the vessel fails to return when expected.

4.1.4.2 Primary Concern. The Coast Guard's primary concern in a search and rescue situation is to provide timely and effective assistance.

4.1.4.3 Responsibility for Action. In search and rescue, the SMC is usually in the best position to assess the circumstances of a particular case, and to take whatever steps are necessary to promote the safety of life and property.

4.1.4.4 Safety Concerns When Disabled. Inherent danger is associated with being disabled on the water. Although a specific situation may not be classified as DISTRESS emergency phase by the SMC, there may still be a real concern for safety either in the mind of the SMC or the mariner, i.e., the incident is in the ALERT emergency phase. ***The SMC must be sensitive to the level of apprehension caused in the mind of the mariner when having a problem in a small recreational vessel, particularly when concern is specifically expressed***. The policy herein permits more expeditious response in those cases where the mariner expresses apprehension for the near-term safety of vessel's occupants.

4.1.5 Policy

4.1.5.1 Distress. ***Immediate response shall be initiated, if feasible, to any known situation in which the mariner is in imminent danger.*** This response may be provided by regular Coast Guard; Coast Guard Auxiliary; or other federal, private, state, local, or commercial entity resources. The SMC may use all sources of assistance in a distress situation without concern for conflict with private enterprise.

4.1.5.2 No Conflict Concern--Any Situation. Private organizations (non-commercial), state and local organizations, and Good Samaritans are acceptable sources of SAR assistance. When volunteered or available, their help can be used without any concern for conflict with commercial providers. ***However, if their expertise is unknown, the SMC shall more closely monitor the assistance provided.*** This is especially true in the case of Good Samaritans.

4.1.5.3 Guiding Principles in Non-Distress Cases. When specifically requested assistance, such as a commercial firm, marina, or friend, is not available, a request for assistance will be broadcasted. If a commercial provider is available and can be on scene within a reasonable time (usually one hour or less) or an offer to assist is made by a responder listed in the previous paragraph, no further action by the Coast Guard, beyond monitoring the incident, will be taken. Otherwise, a Coast Guard Auxiliary facility, if available, or a Coast Guard resource may be used.

> **NOTE:** "Monitoring" of a non-distress incident need not necessarily constitute a radio communications schedule.

Three principles that guide assistance to vessels not in distress are:

(a) The first responder on scene with the vessel requesting assistance normally will provide assistance,

(b) If a Coast Guard resource or Auxiliary facility takes a disabled vessel in tow, the tow will normally terminate at the nearest safe haven, and

(c) Once undertaken, there is no requirement to break the tow except as described below in Paragraph 4.1.6.6, "Relief of Tow".

4.1.5.4 Non-Distress Use of Coast Guard. The Coast Guard supports and encourages efforts of private enterprise and volunteerism to assist mariners. Coast Guard resources will not unnecessarily interfere with private enterprise. Coast Guard resources normally do not provide immediate assistance in non-distress cases **if alternative assistance is available.** A Coast Guard resource may assist in a non-distress situation when no higher priority missions exist and no other capable resource is reasonably available.

> **NOTE:** "Reasonably available" means that the resources should be able to respond before the situation deteriorates.

4.1.5.5 Acceptable Auxiliary Employment. When on routine safety patrol under orders, Auxiliary operational facilities may be deployed to minimize response time to requests for assistance. ***Every effort shall be made to provide maximum SAR coverage in the assigned area of responsibility by using all available resources effectively***. Auxiliary facilities may also be available for callout when not on routine patrol. Auxiliary facilities will be used to the extent of their capabilities and availability.

4.1.5.6 Inspection of Alternate Resources Not Required. There is no requirement for the operational commander to inspect, certify, or otherwise categorize the capabilities of commercial providers or any organization that responds to requests for assistance by mariners. Accepting or rejecting an offer of assistance is a function of the vessel operator. However, the operational commander should be familiar with the availability, capabilities, and operating practices of these alternate assistance providers, as they may form a significant element in the overall assistance network.

4.1.5.7 Conflict of Interest for Coast Guard and Auxiliary Personnel. Because of the possibility of conflict of interest, active duty Coast Guard personnel, Reservists under active duty or inactive duty orders, and Auxiliarists under orders must comply with the requirements of COMDTINST M5370.8(series), Standards of Ethical Conduct, if they intend to participate in commercial salvage activities external to their Coast Guard duties.

4.1.5.8 Assistance to Auxiliary Facilities. Coast Guard resources or Auxiliary facilities may be used to help Auxiliary facilities in need of assistance at any time.

4.1.5.9 Use of Government Frequencies. Government frequencies are reserved for authorized use by government agencies. ***Commercial enterprise must use designated commercial frequencies. Commercial enterprise shall NOT interfere with the Coast Guard's gathering of information or communicating with a vessel requesting assistance***. They may, upon hearing of a request for assistance on a government channel, hail the vessel desiring assistance on an authorized calling frequency and switch them to a commercial channel to conduct business when Coast Guard communications are completed. They may also proceed to the location of the vessel requesting assistance, based on information overheard on the government channels. ***As net control, the Coast Guard MAY permit nongovernmental entities to conduct short business transactions on a government channel on a not-to-interfere basis, but any unit so doing must continue to monitor the communications***.

> **NOTE:** There is no requirement that the commercial channel be a frequency normally

monitored by the Coast Guard.

4.1.6 Procedures

4.1.6.1 **Obtain Information and Classify Case.** ***When the Coast Guard receives a call for assistance, the SMC shall evaluate the circumstances to determine the severity of the case using information obtained from the mariner***. It is the **initial** determination that will govern how a case is to be initially treated. Later developments may cause the SMC to reclassify the case and modify the response. If there is any question as to the degree of danger to persons or property, the case should be classified as being in the DISTRESS phase. ***A SAR event is dynamic. Information must be obtained and evaluated as the case progresses. The SMC shall take action appropriate to the situation.*** In determining the appropriate emergency phase, the SMC may consider a variety of factors, such as, but not limited to, the following:

(a) Nature of the situation;

(b) Position or lack of known location;

(c) Type, size, reported condition of vessel, food, water, emergency signaling devices, and survival/life saving equipment onboard;

(d) Visibility, including daylight or darkness conditions;

NOTE: A lack of visibility, in-and-of-itself, does not necessarily constitute a distress situation. ***Other factors, such as equipment limitations, proximity to shipping lanes, etc., must be considered prior to case classification***.

(e) Tide and current conditions, and the ability of the vessel to anchor;

(f) Present and forecasted weather including wind and sea conditions, air and sea temperature;

(g) Special considerations such as number of personnel onboard, age, health, and special medical problems;

NOTE: "Special medical problem" requires use of common sense, e.g. an otherwise healthy person, who simply has a limb in a cast, does not necessarily constitute a special medical problem.

(h) Ability of the vessel to maintain reliable communications with a source of assistance. CB radio communications should be considered only under ideal conditions. They are not authorized on Coast Guard vessels for communication and Coast Guard shore units have no requirement to have CB capability;

NOTE: Another on scene vessel can act as the communications platform for a disabled boater. Although the Coast Guard discourages boaters from using cellular telephones for emergency purposes, they ***may*** be considered a reliable form of communication. If the cellular telephone connection is good, and there is no danger of losing the connection, then, in the absence of any other factors listed that would raise SMC's level of apprehension, the case should be classified as non-distress and treated as such. In such cases, the Command Center should act as a communications intermediary and should closely monitor the case to ensure the disabled boater does, in fact, receive the assistance required. It is acceptable for the SMC to dispatch a resource while broadcasting a MARB, but it is the intent of the policy to allow commercial providers the opportunity to respond.

(i) Degree of concern of the mariner for the safety of the occupants of the vessel - ask the questions, "Do you have safety concerns?" and if so, "What are they?"; and

(j) The potential for the situation to deteriorate after evaluating the relevant factors,.

4.1.6.2 Distress. For cases determined to be in the DISTRESS emergency phase:

(a) **Respond Immediately If Able.** Immediate response may be by either Coast Guard or Coast Guard Auxiliary resources. The SMC might be aware that other resources, such as private, local/state-operated vessels, or commercial providers, might be responding. That fact, however, normally should not delay or preclude a Coast Guard response. If Coast Guard resources cannot or are not responding, the caller should be notified.

NOTE: ***As mentioned in 4.1.6.1, if a case is classified as distress, the Coast Guard shall respond immediately if able, to include broadcasting a UMIB and dispatching appropriate resources***.

(b) **First On Scene Assists.** The first assisting resource on scene capable of stabilizing and handling the situation, whether Coast Guard or other resource, should render appropriate assistance and complete the case if it desires. If a Coast Guard resource arrives on scene and another responder has the situation under control, the SMC should determine whether or not the other responder is able to fully execute the case. If it appears that it can, the Coast Guard resource may be withdrawn.

NOTES: If a Coast Guard resource arrives on scene first in a distress situation and renders the situation non-distress, it may elect to complete the case, i.e., it may tow the disabled boat to the nearest safe haven if there is no higher need for the resource.

(c) **Intervene If Required.** If a Coast Guard resource finds another responder on scene whose assistance is not adequate, the Coast Guard resource should immediately attempt to stabilize the emergency. Once the situation is stabilized, the Coast Guard resource may be withdrawn if the first responder appears capable and is willing to conclude the case. The Coast Guard resource should not normally be withdrawn if continued stability of the situation is dependent on Coast Guard equipment or expertise.

NOTE: The Coast Guard may direct a responding resource to drop tow or cease operations if it is determined that the resource or equipment is not adequate to perform the job at hand, e.g., a 23' boat cannot be expected to adequately tow a 70 ton fishing vessel.

(d) **Treat As Non-Distress If Appropriate.** If the Coast Guard responds to a request for assistance and, once on scene, determines that there is no emergency, the case will be handled as a non-distress, following the procedures outlined below.

4.1.6.3 Non-Distress. For cases determined NOT to be in the DISTRESS emergency phase:

(a) **Advise and Seek Desires.** The requester should be advised that:

(1) It appears there is no imminent danger;

(2) It is Coast Guard policy to defer to an alternate responder; and

(3) The Coast Guard will assist in contacting any specifically requested alternate assistance, such as a commercial provider or friend.

NOTE: The issue of what constitutes a "specific request for alternate assistance" has led to confusion. Clearly, if a requester names a specific individual, company, or network, that is a specific request. In the case of generic requests for a specific network organization, contact general dispatch at the parent organization. However, if the mariner is unable to clearly articulate the name of the desired source of assistance, the SMC should ask for clarification. If unable to get clarification, a MARB should be issued.

(b) **Offer a Marine Assistance Request Broadcast (MARB).** When specific alternate assistance is not requested or available, mariners will be informed that a broadcast can be made to determine if someone in the area can come to their assistance.

(1) If the mariner requesting assistance states that a MARB is not desired or specifically requests that a Coast Guard resource or an Auxiliary facility be dispatched, outline the policy again. ***Notify the mariner that unless a specific request is made for alternate assistance, the mariner must accept either the alternative of letting the Coast Guard make a MARB, or the mariner can arrange for assistance***.

(2) If a MARB is declined, the SMC may monitor the condition, but need take no further action unless requested or the situation deteriorates.

NOTE: If MARBs are declined in a non-distress situation, the Coast Guard has no further obligation to monitor or respond unless boaters change their mind or the situation deteriorates. The burden lies solely with boaters.

(3) When a MARB is requested, proceed as described below.

(c) **Make a MARB.** A MARB will be made to solicit the voluntary response of anyone who can assist the mariner, and the MARB will include a general location of the vessel. (See sample MARB at the end of this section). ***The MARB must be worded carefully in order not to create an obligation by the vessel operator to accept or pay for the services of any and all responders***. It is used to invite persons, such as commercial providers or Good Samaritans, interested in responding to do so **if they desire.** If no intent to respond to the MARB is heard within a reasonable period of time, Coast Guard resources or Auxiliary vessels may be directed to respond. A guideline of 10 minutes is recommended for the SMC to await an answer to a MARB before the SMC directs Coast Guard or Auxiliary resources to respond. Once the MARB is answered, the SMC will determine what a reasonable period of time is for a response time on scene, based on the SMC's experience with responders in the area and the circumstances of the case. Coast Guard resources or Auxiliary vessels may also be directed to respond if no alternate responder can do so within a reasonable period of elapsed time. Factors governing the elapse of a reasonable period of time for assistance to arrive on scene are discussed below, but such a period should not normally exceed one hour from first awareness of the case.

(d) **Monitor Response.** As part of the MARB, any resource that is responding should be requested to notify the Coast Guard of the estimated time of arrival (ETA) on scene. This notifies the Coast Guard of the responder's actions. It also notifies the vessel requesting assistance of the ETA of the assisting resource. Moreover, it notifies other potential responders of the need for further assistance or whether they should proceed with any expectation that they will arrive on scene first. The SMC may repeat the identity and ETA of potential responders so that the mariner requesting assistance and others will know who has responded.

NOTE: Although it is encouraged that the MARB include Coast Guard notification of ETAs, it is not mandated. Neither is it mandated that the SMC repeat the identity and ETA of responders. It is, however, advised.

(e) **Maintain Communications.** A communications schedule between the Coast Guard and the requestor should be established until direct communication is achieved between the requester and responder to ensure that the situation does not deteriorate and that assistance has arrived.

(f) **Reasonable Time Determination.** Following the initial MARB, the SMC may wait a reasonable period of time before taking further action, during which additional MARBs may be made if desired by the SMC***. The "reasonable period of time" decision must be made by the SMC based upon the information collected at the outset of the communication with the mariner requesting assistance (see listing in Paragraph 4.B.6.a. above), as updated by subsequent communications checks.*** Loss of or lack of effective direct communications may increase the level of apprehension. The definition of the ALERT emergency phase is again referred to, with its key word "apprehension." It should be considered that the situation may be causing apprehension in the mind of the mariner, especially if the mariner so indicates. Any action to alleviate that stress may be instrumental in preventing the situation from deteriorating. The greater the level of apprehension, the shorter the "reasonable period of time."

(g) **Simultaneous Arrival.** ***To minimize conflict, if an Auxiliary facility under orders or a Coast Guard resource arrives on scene nearly simultaneously with a commercial provider, it shall report to the SMC, remain on scene until it is confirmed the provider is capable of providing the required assistance and safely completing the case, then clear the area, and take no further part in the incident***.

(h) **Mariner May Decline Offered Assistance.** To a limited extent, the mariner requesting assistance has the option to refuse offered assistance. If the requester refuses offers of assistance from a Good Samaritan or an Auxiliarist, another MARB may be issued or the SMC may decide to intervene and dispatch a different Auxiliary facility or a Coast Guard resource. The mariner may also elect to contact a commercial provider on a commercial channel.

(i) **Commercial Assistance Declined.** A more difficult situation may arise if the mariner requesting assistance rejects the first arriving commercial assistance. Coast Guard Auxiliary or Coast Guard units should not assist in these cases so long as the situation remains classified below the DISTRESS phase. Nevertheless, the mariner may be assisted in finding alternatives. Upon notification that the mariner does not desire the assistance offered by the commercial provider, the Coast Guard may, upon the mariner's request, broadcast one additional MARB. The Coast Guard may also provide the telephone numbers of other commercial providers in the area so that the mariner can call them through the Marine Operator. If this is successful, it is the responsibility of the mariner, not the Coast Guard, to negotiate who provides the service. ***If unsuccessful, and so long as the original commercial provider is on scene, the SMC may maintain a listening watch for the vessel, but must make it clear that neither Coast Guard nor Auxiliary units will be dispatched***. Should the commercial provider abandon the case, the SMC may dispatch a Coast Guard or Auxiliary unit or issue an additional MARB, as appropriate. The principle that governs further action by the SMC is that once a responder has arrived on scene, the level of apprehension regarding the case is probably significantly reduced. Further dealings between the requester and the responder are not Coast Guard responsibility. Additional services provided to the mariner requesting assistance would be provided only on a not-to-interfere basis so long as the level of apprehension remains low.

(j) **If Situation Deteriorates.** The SMC should normally dispatch Coast Guard resources at any time the circumstances in a case threaten to deteriorate into a DISTRESS situation that exceeds the capability of the assisting resource.

4.1.6.4 Cases Discovered By Auxiliary Facility. When an Auxiliary vessel on routine safety patrol or otherwise on orders discovers a vessel requesting assistance, but not in radio contact with the Coast Guard, the Auxiliarist will relay the request for assistance to the Coast Guard operational commander and may undertake to provide assistance, if capable. If a tow is undertaken, the Auxiliary vessel is required to notify the operational commander of the identity of the vessel, the location of the vessel, and the destination to which the vessel is being towed. No Auxiliary vessel may undertake the tow of another vessel unless the Auxiliarist is reasonably assured of the safety of both vessels and the persons onboard. If the Auxiliary vessel cannot safely tow a disabled vessel that is standing into danger, it may endeavor to remove the persons from the threatened vessel and stand by until a more capable resource arrives on scene.

NOTE: Cases discovered by the Auxiliary are a particularly sensitive section of the policy. How the situation is dealt with is the end product of sustained negotiations and compromise effort on the part of all concerned parties. It intends that the Auxiliarist, not the SMC, will make the judgment as to whether the Auxiliarist can safely assist. When Auxiliarists notify the SMC that they intend to assist the vessel, they are not “asking for permission”. They have already determined they can safely provide assistance. The notification to the SMC is a courtesy. This policy does not reduce the operational commander's authority and responsibility to exercise command and control over all assigned forces, including Auxiliary vessels on ordered patrols. The operational commander may override the Auxiliarist’s decision if warranted by an evaluation of the circumstances. However, unless there is a specific reason to do so, such as an indication of unusual risk or hazard, or an operational need to assign the Auxiliary vessel to a higher priority mission, the decision to assist should be left to the Auxiliarist.

4.1.6.5 Safe Haven Considerations. In cases involving towing by the Coast Guard or Coast Guard Auxiliary, the vessel being assisted will normally be taken to the **nearest** safe haven that has an available means of communication, normally a telephone. Coast Guard or Auxiliary resources should not tow the vessel beyond the nearest safe haven when there are commercial resources that could perform this function. Exceptions to this policy may be made in specific cases if, in the judgment of the SMC, they are warranted by humanitarian or other concerns. When determining the suitability of a potential safe haven, the SMC should be sensitive to the reluctance of some private firms and yacht clubs to accept a disabled or damaged vessel and the attendant potential liability.

4.1.6.6 Relief of Tow. In cases involving towing by the Coast Guard or Coast Guard Auxiliary where no emergency exists, the assisted vessel **may** be released to another provider who appears capable, provided that:

(a) The SMC and coxswain of the assisting vessel determine that a hand-off can be carried out safely; and either

(b) Alternative assistance is desired and arranged by the operator of the vessel being assisted; or

(c) The operational commander has a higher need for the Coast Guard resource or Auxiliary facility.

4.1.6.7 Alternative to MARB. When no response to a MARB is evident, such as late at night or during an off-peak period, the SMC may dispatch Coast Guard resources or Auxiliary vessels. As an alternative, the SMC may pursue by telephone or other communication means any other SAR resource that can provide expeditious response, and ask if the resource desires to respond. Again, unless the responder is an Auxiliary facility that will be under orders, the offer should be made in terms of an invitation to provide assistance rather than in terms of "request you proceed and assist." An estimated time of arrival should be obtained and passed to the mariner requesting assistance. Continue to monitor the situation. Direct contact with the vessel requesting assistance as soon as possible should be encouraged.

4.1.6.8 Communications Interference. If someone interferes with government communications, issue the command "SEELONCE MAYDAY." If interference continues, then follow with "SEELONCE MAYDAY, this is (unit name), cease transmission <u>or</u> silence on this frequency, out." If there is still further transmissions then document the incident and process as an FCC violation. For further details regarding how to initiate a violation, refer to title, Radio Frequency Plan, COMDTINST M2400.1 (series) (reference (q)).

4.1.7 SAR Coordinator and SMC Responsibilities

4.1.7.1 Responsibilities

(a) ***SAR Coordinators shall direct SMCs within their region to follow the policy and procedures established in this section of the Coast Guard Addendum to the National SAR Plan insofar as practicable***. SAR Coordinators are authorized to vary procedures where local conditions require it in order to achieve the overall intent discussed. Variances should be documented.

(b) ***SMCs must remain familiar with all SAR assistance resources within the SMC's unit's AOR, including those of the Auxiliary, and shall direct those resources that the SMC believes are needed to the scene of a vessel in distress.***

(c) Operational commanders are urged to work with all who can provide assistance to mariners requesting assistance, including volunteers, state and local organizations, the Auxiliary, and commercial providers, to promote the most effective use of all resources available to the SAR system.

(d) ***Sector commands shall conduct regional public meetings with commercial assistance providers in their AOR no less than semi-annually, preferably prior to and at the conclusion of the local recreational boating season.***

(1) ***At a minimum, one of the semi-annual meetings shall be held collectively for the Sector's entire AOR***. Alternatively, one meeting may be held at each of the Sector's stations for commercial assistance providers within each station's AOR in lieu of the second collective semi-annual meeting.

(2) Sector Commanders and Deputies should attend the meetings when possible. ***At a minimum the Sector Chief of Response and the Command Center Chief shall attend each collective meeting***.

(3) ***At a minimum either the Sector Chief of Response or the Command Center Chief shall attend each station level meeting if held in lieu of one of the semi-annual Sector meetings***.

(4) If meetings at the station AOR level are held in addition to the semi-annual meetings, a Sector representative should be invited to attend. Attendance is recommended but not mandatory.

(5) ***In addition to the commercial assistance providers, local agency responders from fire/rescue, law enforcement, CG Auxiliary and other members of the maritime response community shall be invited to participate in the meetings.***

(6) Meetings should cover the full range of maritime response topics of interest to the attendees, including at a minimum the following topics:

a. Review of CG operational response policies and procedures, and any changes;

b. Review of each invited participant's (commercial, local, volunteer, etc.) response capabilities and operational areas;

c. Review and discussion of several relevant cases involving multiple segments of the response community; and,

d. Open forum discussion.

(e) Sectors and Stations will also maintain regular liaison with all known commercial assistance providers in their AOR in order to discuss policies, build cooperation, and air any Coast Guard or industry concerns. Within each command a specific person should be designated as liaison officer and primary point of contact for commercial assistance providers.

(f) It is highly recommended that commercial providers be invited to participate in training and exercises held with other (state, local, volunteer organization) SAR assistance providers.

4.1.7.2 Maritime Assistance Decision Flow Chart. The Maritime Assistance Decision Flow Chart, Figure 4-1, is provided to assist the SMC on MSAP decision-making. The flow chart is a tool to implement the policy, not the policy itself.

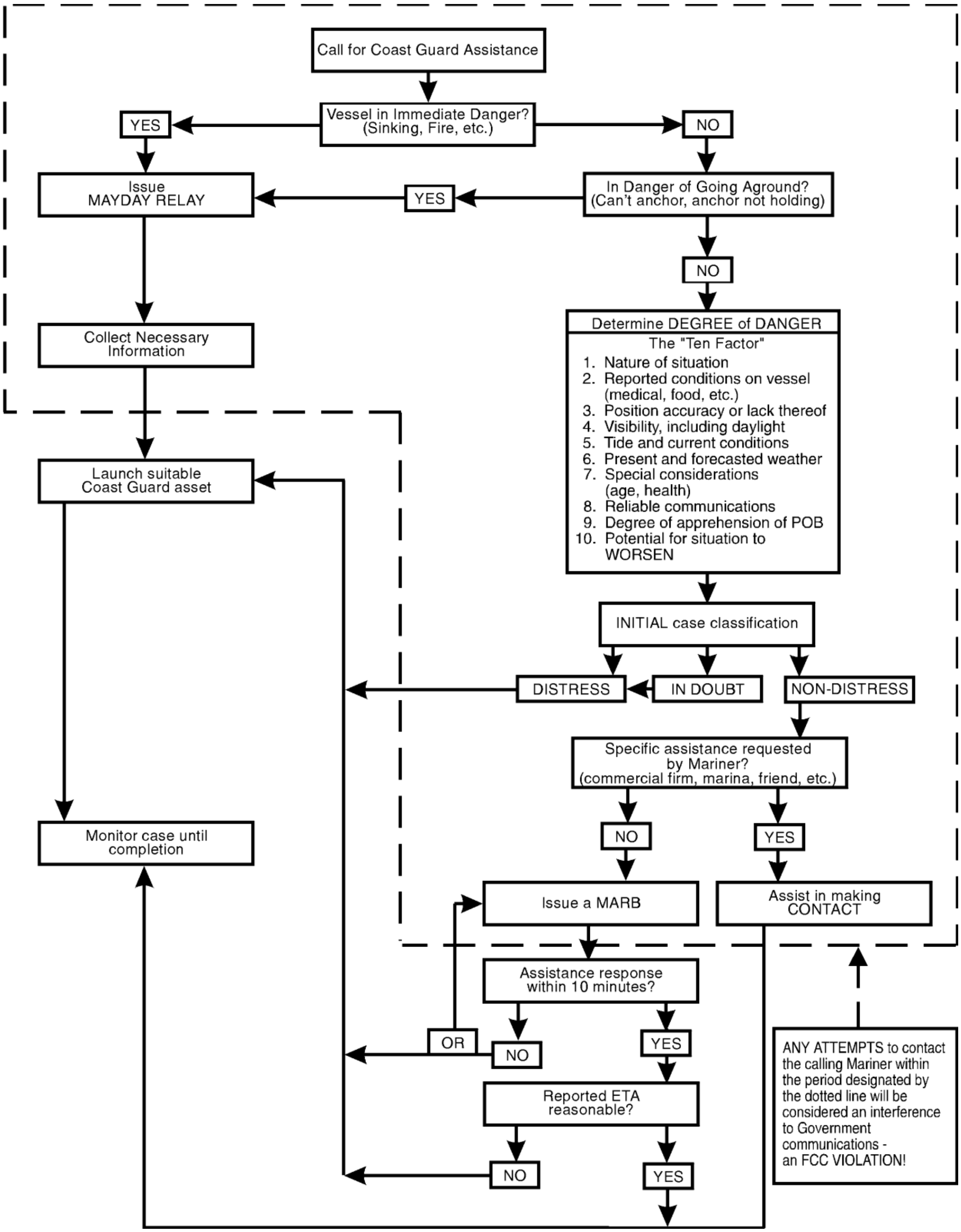

Figure 4-1 USCG SAR Mission Coordinator (SMC) Maritime Assistance Decision Flow Chart

4.1.8 Marine Assistance Request Broadcast Format for Radiotelephone Transmission

4.1.8.1 Format

(a) Channel 16 (156.8MHz)

(b) HELLO ALL STATIONS (3 times) THIS IS (unit identification) RELAYING A MARINE ASSISTANCE REQUEST BROADCAST FOR (type of vessel) (nature of problem) IN THE VICINITY OF (location). LISTEN CHANNEL 22A, OUT.

(c) Channel 22A (157.1MHz)

(d) HELLO ALL STATIONS (3 times) THIS IS (unit identification) RELAYING A MARINE ASSISTANCE REQUEST BROADCAST (text) OUT.

4.1.8.2 Example of Text

(a) Channel 16 (156.8MHz)

HELLO ALL STATIONS. HELLO ALL STATIONS. HELLO ALL STATIONS. THIS IS COAST GUARD SECTOR HAMPTON ROADS RELAYING A MARINE ASSISTANCE REQUEST BROADCAST FOR A DISABLED PLEASURE CRAFT IN THE VICINITY OF THE FOURTH ISLAND OF THE CHESAPEAKE BAY BRIDGE TUNNEL, LISTEN CHANNEL 22A, OUT.

(b) Channel 22A (157.1MHz)

HELLO ALL STATIONS. HELLO ALL STATIONS. HELLO ALL STATIONS. THIS IS COAST GUARD SECTOR HAMPTON ROADS RELAYING A MARINE ASSISTANCE REQUEST BROADCAST FOR PLEASURE CRAFT MOONSHINE WYT5138. PLEASURE CRAFT MOONSHINE IS A SEVENTEEN-FOOT FIBERGLASS OUTBOARD DISABLED DUE TO LACK OF FUEL IN VICINITY OF THE FOURTH ISLAND OF THE CHESAPEAKE BAY BRIDGE TUNNEL LATITUDE 37-03N LONGITUDE 76-04W. ANY VESSEL DESIRING TO ASSIST THE MOONSHINE IS INVITED TO PROCEED TO THAT LOCATION OR CONTACT HIM BY RADIO. PLEASURE CRAFT MOONSHINE IS STANDING BY CHANNEL (an appropriate intership frequency). IF YOU ARE OFFERING TO ASSIST THE MOONSHINE, PLEASE RESPOND AND PROVIDE AN ESTIMATED TIME OF ARRIVAL. OUT.

(c) Channel 22A (optional acknowledgment of replies)

VESSEL SEA DOG RESPONDING, ETA 15 MINUTES--ROGER, OUT. VESSEL HELPER RESPONDING, ETA 35 MINUTES--ROGER, OUT.

Section 4.2
Forcible Evacuation of Vessels

4.2.1 Authority

The Coast Guard is authorized to rescue and aid persons and protect and save property at any time and any place where its facilities and personnel are available and can be effectively used. This may include forcing or compelling mariners to abandon their vessels when a life-threatening emergency exists, and there is an immediate need for assistance or aid.

4.2.2 Voluntary Evacuation a Preferred Alternative

Although the Coast Guard does have the authority to compel a mariner to abandon their vessel in a life threatening situation, it is always preferable that a mariner voluntarily evacuate when necessary. Coast Guard personnel should endeavor to use all means, including powers of persuasion, to encourage a mariner to evacuate, when appropriate. Forcible and/or compelled evacuations should only be conducted when a life-threatening emergency exists, and there is an immediate need for assistance or aid.

4.2.3 Risk Considerations

The decision to order a compelled or forcible evacuation for the purpose of saving lives will be based on the myriad of factors that combine to make each SAR mission unique. Therefore, when considering whether or not to take this action, the factors that are considered in Operational Risk Management for SAR planning should serve as a model for evaluating the risk to the civilian mariner and the necessity for ordering such a compelled evacuation. These factors include the on scene environmental conditions, the presence of a hazardous bar, shoals or other hazardous obstruction, the condition of the mariner’s vessel, available Coast Guard resources, the fitness and experience of the Coast Guard personnel on scene and the expertise of the authority ordering the evacuation.

4.2.4 Decision Authority

The decision to force or compel mariners to abandon their vessels should normally be made by the cognizant SAR Coordinator (SC). If time does not permit consultation with the SMC and cognizant SC, and if in the On Scene Coordinator’s (OSC) objective judgment a life-threatening emergency exists affecting the subject vessel, and there is an immediate need for assistance or aid, the OSC may authorize this action. ***In this case, the SMC and SC shall be notified immediately.***

4.2.5 Use of Force Considerations

Properly trained, qualified, and supervised Coast Guard law enforcement personnel may use force in accordance with the Coast Guard Use of Force policy found in reference (o), when necessary, to compel compliance with an evacuation order issued under the aforementioned conditions with regard to a vessel subject to the jurisdiction of the United States.

4.2.6 Distressed Vessel Master's Authority Limitation in Regards to Crew Evacuation

Once the Coast Guard issues an evacuation order, masters of vessels have no authority to prevent their crews from complying with evacuation instructions. Any use or attempted use of force by the master to prevent a crew from complying with evacuation instructions may constitute a criminal offense.

4.2.7 Documentation

All forced evacuations and circumstances leading to such an order shall be fully documented in unit logs by all involved units and reported in Situation Reports to Commandant (CG-SAR-1) and Commandant (CG-0941) via the chain of command. Use of force required to compel compliance with an ordered evacuation shall be reported in accordance with Appendix E of Reference (o). The responsible Flag Officer shall consult his or her servicing legal office regarding the need to initiate a claims investigation, and, where appropriate, an administrative investigation in all forcible evacuation cases.

Section 4.3
General Salvage Policy (Other than Towing)

The MSAP and General Salvage Policies were developed separately and remain distinct from one another.

4.3.1 General

When commercial salvors are on scene performing salvage, Coast Guard units may assist them within the unit's capabilities, if the salvor requests. When no commercial salvage facilities are on scene, Coast Guard units should only engage in salvage other than towing when limited salvage operations (e.g., ungrounding, pumping, damage control measures, etc.) can prevent a worsening situation or complete loss of the vessel. ***Any salvage operations shall be performed at the discretion of the unit CO/OIC.***

NOTE: ***Coast Guard units and personnel shall not be unduly hazarded in performing salvage***.

4.3.2 Small Craft

4.3.2.1 This policy applies to small craft that need salvage other than towing. However, when no commercial salvage companies are available within a reasonable time or distance, the District commander may modify the policy to provide for refloating a grounded boat which is not in peril of further damage or loss if:

(a) the Coast Guard units are capable of rendering the assistance,

(b) the owner requests the assistance and agrees to the specific effort to be made, and

(c) Coast Guard units and personnel are not unduly hazarded by the operation.

4.3.2.2 Prudent actions include:

(a) Allowing the next tide to refloat the vessel,

(b) Helping the mariner set anchors,

(c) Evacuating the passengers,

(d) Helping the mariner determine the vessel's seaworthiness.

4.3.3 Operator Insistence

Occasionally an operator will insist that the Coast Guard take action, such as pulling a vessel from a reef, which Coast Guard personnel on scene consider unwise. The Coast Guard is under no obligation to agree to any such request or demand. If a decision to comply with such a request is made, it should be made clear that the operator is assuming the risk of the operation. The fact that the action is undertaken at operator's request, and is against Coast Guard advice, should be logged.

Section 4.4
Firefighting Activities Policy

The United States Code at 46 U.S.C. § 70031 et seq. acknowledges that increased supervision of port operations is necessary to prevent damage to structures in, on, or adjacent to the navigable waters of the United States, and to reduce the possibility of vessel or cargo loss, or damage to life, property and the marine environment. This statute, along with the traditional functions and powers of the Coast Guard to render aid and save property (14 U.S.C. 521(b)), is the basis for Coast Guard firefighting activities.

4.4.1 Overview

Traditionally, the Coast Guard has provided firefighting equipment and training to protect its vessels and property. Occasionally, the Coast Guard is called upon to provide assistance at major fires onboard other vessels and waterfront facilities. Although the Coast Guard clearly has an interest in fighting fires involving vessels or waterfront facilities, primary responsibility for maintaining necessary firefighting capabilities in U.S. ports and harbors lies with local authorities. The Coast Guard renders assistance as available, based on the level of personnel training and the adequacy of equipment. Coast Guard units do not normally have advanced firefighting capabilities. Firefighting requires technical expertise and a long-term training program to be done safely. Maritime firefighting is particularly hazardous on vessels due to closed compartments, HAZMAT, etc. The Commandant intends to maintain this traditional “assistance as available” posture without conveying the impression that the Coast Guard is prepared to relieve local fire departments of their responsibilities. Paramount in preparing for vessel or waterfront fires is the need to integrate the Coast Guard planning and training efforts with those of other responsible agencies, particularly local fire departments and port authorities.

4.4.2 Operations

4.4.2.1 Responsibilities and guidance. In accordance with reference (y), primary responsibility for coordinating firefighting activities involving commercial vessels or waterfront facilities within their AOR rests with COTPs. ***SMCs shall assume the responsibilities of the Incident Commander upon receiving a report of a fire involving a commercial vessel or waterfront facility that involves search and rescue. As the incident evolves beyond normal search and rescue actions, consideration shall be given to identify the appropriate firefighting authority with specific firefighting expertise. The discussion to determine the appropriate agency for Incident Commander or members of the Unified Command shall occur as the Incident Command is established. Once an initial Incident Command is established, SMC shall transition firefighting coordination to the firefighting authority.***

SMCs may direct firefighting efforts to save lives. If firefighting is being conducted for non-lifesaving purposes, consideration should be made to ensure it falls within the incident command structure.

Command Centers should refer to the Vessel Response Plan or Facility Response Plan to identify the planned firefighting agency. Reference (y) provides SRU crews with guidance on firefighting equipment, extinguishing agents and procedures.

NOTE: The SMC has coordination and planning responsibilities for fires involving recreational vessels.

Reference (y) provides detailed guidance on responsibilities for coordination, contingency planning, training, and how to do firefighting involving commercial vessels or waterfront facilities. In developing a Coast Guard unit's assistance posture, the following needs to be considered:

(a) threat level of fire;

(b) the jurisdictions involved;

(c) the capabilities of local fire departments;

(d) the availability of Coast Guard equipment;

(e) level of Coast Guard training.

4.4.2.2 Operations. ***Coast Guard personnel shall be prepared for and respond to fires onboard Coast Guard vessels***. For all other marine firefighting situations, Commanding Officers of Coast Guard units shall adopt a conservative response posture. ***They shall focus their actions on those traditional Coast Guard activities not requiring unit personnel to enter into a hazardous environment***.

(a) **Independent firefighting.** ***Coast Guard personnel shall not engage in independent firefighting operations, except to save a life or in the early stages of a fire to avert a significant threat without undue risk***.

(b) **Commercial vessels and waterfront facilities.** ***Coast Guard personnel shall not actively engage in firefighting except in support of a regular firefighting agency under the supervision of a qualified fire officer***.

NOTE: This term means a person who has been trained and certified, under National Fire Protection Association (NFPA) guidelines to take command of firefighting operations.

The Commandant recognizes the significance of the cautious approach the Coast Guard has adopted for marine firefighting situations. High training, equipment, and staffing thresholds will limit the response capability of many units, and in some areas, sources of support will not be readily available. Consequently, there will be occasions when a unit will be unable to mount a complete response to an incident. This circumstance is preferred to attempting a complex and potentially hazardous job without the necessary staffing, training and equipment.

4.4.2.3 Firefighting in an ICS response structure. If the Incident Command System (ICS) structure is used in responding to incidents involving fires on vessels or at waterfront facilities, a Firefighting Group should be established to coordinate local authorities responsible for fighting the fires. This should be coordinated prior to an incident.

Section 4.5
Direction and Navigation Assistance to Mariners

4.5.1 General

The responsibility for the safety and navigation of a vessel rests with the vessel's operator, not the Coast Guard. Units may pass any printed information, including navigational in nature that comes from a recognized source. This includes any information from current/updated NOAA or NIMA nautical charts, Local Notice to Mariners, Light Lists Coast Pilot, etc. In all situations, the standard to follow is to make sure any information passed is prudent, based on fact, and never based on opinion or conjecture. ***The Coast Guard shall not provide courses to steer except as permitted in Note to 4.5.2.4 below***. Additionally, any information passed to a mariner requesting assistance should be reflected in the appropriate communications log. Regardless, passing information should not interfere with more urgent operations**.** ***If there is any doubt for the safety of the individuals requesting assistance, this shall be treated as a SAR case and an appropriate response developed***.

4.5.1.1 Stated current standard navigational information that may be passed includes:

(a) Characteristics of lights;

(b) Magnetic or true bearings between charted objects;

(c) Charted range bearings;

(d) Charted traffic separation scheme bearings;

(e) Charted depth of water;

(f) Charted hazards;

(g) Radio beacon frequencies;

(h) Charted buoy positions;

(i) Lat/Long of charted objects.

If information is provided, the following language is recommended:

"Captain, based on your request, the following information from (chart #, light list #, NTM, etc.) is provided to assist you with your responsibility to safely navigate your vessel." Pass relevant information from the list above.

NOTE: The Coast Guard will not assume responsibility for navigating a vessel, but it may provide the master of a vessel certain navigation information if available as charted or published by a reputable source. In the field there is a perception that passing navigational information to mariners is discouraged because of the potential for liability. However, certain types of navigational information may be passed if it is accurate and reliable. Another consideration is that, while a mariner may only be requesting information and has not declared a distress, the vessel situation may dictate a more active involvement by the SMC as a precautionary measure.

4.5.2 Lost/Disoriented Mariner

Most requests for navigational information come from lost or disoriented mariners.

4.5.2.1 When contacted by a lost or disoriented mariner, the watchstander should ask the mariner questions regarding:

(a) Any nearby landmarks;

(b) Aids to navigation;

(c) Presence of commercial traffic (i.e., ferries, harbor tour boats, merchant vessels, etc.);

(d) Depth and color of water;

(e) Point of departure and destination;

(f) Description of vessel's trackline from departure to present, etc.

4.5.2.2 **If the Sector Command Center is equipped with direction finding (DF) equipment**, it may also be used within its stated accuracy, and if the DF fix or bearing is deemed reliable, to determine or verify the approximate position.

4.5.2.3 **If the mariner's approximate position can be ascertained**, the following response is appropriate:

> "Based on the information you have provided (and/or the approximate position determined by our direction finding equipment), your vessel appears to be located in the vicinity of **_____________**. Please be advised that this is an approximate position and should be used with other navigational information to assist you with your responsibility of safely navigating your vessel. We strongly recommend you study the chart for that area or consult with a passing vessel before proceeding further."

4.5.2.4 **Passing courses to Steer.** ***Watchstanders shall not pass courses to steer***. However, in situations involving navigational safety, bearings between <u>charted</u> objects may be provided from a corrected chart in either degrees true or magnetic, provided you can determine the boater's position with reasonable certainty. Units should exercise caution because there are numerous geographical reference points with the same name and numerous buoys with the same numbers and characteristics (e.g., M1A). When passing a bearing between charted objects the watchstander should state whether the bearing is either true or magnetic and ensure that the mariner understands the difference. ***When a bearing using charted buoys is provided, the mariner shall be advised that this bearing was obtained from the buoy's <u>charted</u> position, which could differ from the <u>actual</u> location.*** It should also be pointed out to the mariner that this "bearing" is <u>not</u> a course to steer. ***Compass courses shall never be given because of the unique aspects of deviation, wind and current. If a compass course to steer is specifically requested, the following statement shall be passed to the mariner:***

> "Captain, we understand your request for steering directions, but because we do not know the affects of winds and seas on your vessel or any error you may have on your compass, we cannot calculate a safe course for you to steer to ____________."

Note: If a Coast Guard unit is escorting a vessel, courses to steer may be provided by the escort unit if by not doing so, the escorted vessel would be put in imminent danger.

4.5.2.5 **Unable to Determine Position.** If the mariner's general position cannot be determined, particularly in reduced visibility, the best course of action may be to suggest that the lost/disoriented mariner anchor the vessel if it is not in or near a major shipping channel, and the on scene conditions safely permit. If anchoring is not an option, the mariner should attempt to stay in the same position if deemed to be in safe water. If warranted, a communications schedule should be established with the vessel.

4.5.2.6 **If the situation escalates from the uncertainty phase to the alert phase** due to apprehension for the safety of the mariner, then dispatching a Coast Guard asset to locate and assist the lost/disoriented boat before a distress situation evolves may be the most prudent course of action. Important considerations include deteriorating weather, time of day, mariner's navigational competence, age and health of those on board, and size of vessel.

4.5.3 Hazardous Bars and Inlets

The Coast Guard may receive a request for advice on whether to enter an inlet or breaking bar during hazardous weather conditions. ***If a unit receives such a request, its first response shall be to advise the mariner to have all personnel aboard put on their PFDs.*** Generally, if the vessel is presently not in danger, it may be prudent to tell the vessel's operator not to attempt entering (or leaving) port until the weather moderates. "When in doubt, stay out" is good advice. If the mariner elects not to heed the advice and decides to put the vessel in a potentially hazardous situation, then consideration should be given to maintaining a communications schedule with the vessel until it is out of harm's way. Additionally, this may be treated as a potential distress case; the SMC should evaluate the possibility of dispatching a Coast Guard resource to stand by or provide a precautionary vessel escort. The following text is recommended as a standard reply:

> "Captain, we recommend each person on board put on a life jacket immediately. Because we do not know the capabilities of your vessel or the exact on scene conditions, we cannot advise you to attempt crossing the bar/inlet. If you have doubt about your vessel's ability to safely cross the bar/inlet then you should not attempt the crossing."

4.5.4 Weather Information

If mariners request weather forecast information, they should be advised of the local VHF-FM frequency or channel where they can find continuous National Weather Service (NWS) broadcasts. If the mariner is unable to receive the NWS broadcasts, the latest NWS weather warnings for the local area may be read over the radio, operations and time permitting. If this is done, ensure that the entire text is read exactly as written, including the period and geographic area for which the forecast is valid. Actual observed conditions of wind direction/velocity, visibility, cloud cover and sea height may be also relayed. Observations made with a calibrated weather instrument may be reported as is while all other observations should be reported as "observed". Whenever weather conditions are reported, the date, time and location of the observation should also be included.

4.5.4.1 **Coastal Warning Displays (Weather Flags) at Coast Guard Units.** The requirement to maintain coastal warning displays (weather flags during the day and light signals at night) was eliminated by Commandant Directive in the late 1980s. In 2007 a program was put in place to have one boat station per sector again display the flags. These mandatory units are to be designated by the Sector Commander. Additional units have on their own kept or reinstated the tradition of displaying the flags as a service to their communities. This section provides service-wide policy and direction for daytime coastal warning displays (weather flags) for these locations where district commanders deem it appropriate to do so. Nighttime light displays are not authorized. ***Weather flags shall not be displayed by Coast Guard units except as provided in this section.***

(a) ***Units that display weather flags must do so in accordance with the warnings in force for their location as established by the National Weather Service and the scheme published in the United States Coast Pilot. Units that display weather flags must:***

(1) ***Not rely upon ready crews to raise and lower flags***.

(2) ***Display flags as required from an hour before sunrise to an hour after sunset. For units with lighted flag poles that display the national ensign 24 hours a day, these flags will also be displayed 24 hours a day.***

(3) ***Have a unit instruction in force that establishes and articulates the method used to promptly notify and direct the appropriate watchstander to raise and lower flags when National Weather Service advisories change.***

(4) ***Ensure sufficient guidance and training is in place such that watchstanders and other personnel understand and are able to promptly display the correct signals***.

(5) ***Have an established method of displaying the flags such that they can be seen from a navigable waterway*** (no construction projects should be undertaken for the sole purpose of displaying weather flags).

(6) ***Record in the unit log which flags are displayed and the time and date when they were raised and lowered.***

(7) ***Have two complete sets of weather flags and a reliable source of supply for replacements***.

(b) ***For units that now display weather flags, District Commanders shall ensure***:

(1) Submission of a change to the unit's entry in the U.S. Coast Pilot indicating:

a. that the flags will be displayed at the unit;

b. the hours of the day during which they will be displayed (normally from an hour before sunrise to an hour after sunset);

c. and from what location on the unit grounds the flags will be flown.

(2) That NOS charts and marine weather service charts (published by the National Weather Service) are updated with the correct symbols and comments reflecting the daytime display of weather flags at the unit.

(c) All U.S. Coast Pilot entries should also include the following language at their conclusion:

"Weather flags are flown only at select Coast Guard stations to supplement other weather notification sources. Light signals corresponding to these flags are not displayed at night. In all cases mariners should rely upon National Weather Service broadcasts as their primary source of government provided weather information."

(d) For units wishing to discontinue display of the weather flags: ***Districts Commanders shall ensure appropriate changes are made to the U.S. Coast Pilot, NOS charts and marine weather service charts***. After these changes are in effect, issue a notice to mariners to advise of the change 90 days before display is discontinued and keep it in effect for 120 days after the change has taken place.

(e) For units wishing to begin display of the weather flags: ***District Commanders shall ensure the provisions of Section 4.5.4.1(a) are met and ensure that changes to the U.S. Coast Pilot, NOS charts and marine weather service charts are made as per Section 4.5.4.1(b) and that a Notice to Mariners advising of the change is issued as of the date of the change and remain in effect for 120 days after***.

Section 4.6
SAR Cost Recovery and Reimbursement

This section outlines the Coast Guard's position in regard to cost recovery and reimbursement in light of services provided, statutory direction, international obligations and the impact on SAR system effectiveness.

Issues of cost recovery and reimbursement may surface from both foreign and domestic entities assisting in SAR operations as well as the public in general. ***While we must be mindful to employ a cost-effective response to an incident, response to distress itself must not be delayed or limited by the misplaced concern of "who is to pay the bill".***

NOTE: 14 U.S.C. § 521(c) makes it a federal felony for anyone to knowingly and willfully communicate a false distress message to the Coast Guard or cause the Coast Guard to attempt to save lives and property when no help is needed. Penalties include up to 6 years in prison, $250,000 fine, $10,000 civil penalty, and the liability for all resulting costs incurred by the Coast Guard.

4.6.1 SAR Cost Recovery

The Coast Guard as a matter of both law and policy does not seek to recover the costs associated with SAR from the recipients of those services. There are currently two situations where the Coast Guard may seek to recover costs:

(a) 14 U.S.C. §942 authorizes the Coast Guard, under limited circumstances to sell fuel and supplies to furnish services to public and commercial vessels and other watercraft. Coast Guard policy clarification and procedures for cost recovery under this statute are found in reference (z).

(b) 14 U.S.C. §521 (c) authorizes the Coast Guard to collect all costs the Coast Guard incurs as the result of an individual who knowingly and willfully communicates a false distress message to the Coast Guard, or causes the Coast Guard to attempt to save lives and property when no help is needed. See Section 3.4.10.4.

4.6.2 SAR Cost Reimbursement

The Coast Guard **does not** reimburse other agencies or individuals for costs associated with SAR. Per the National SAR Plan, federal agencies may assist or request assistance in conducting SAR operations, and state and local agencies are encouraged, but not required to assist in SAR operations. Since there is no obligation for any agency to assist the Coast Guard, they do so on a not-to-interfere non-reimbursable basis.

4.6.3 MEDEVAC at Sea

A MEDEVAC at sea is considered SAR. The Coast Guard does not charge or accept charges for SAR.

4.6.4 MEDEVAC vs. Medical Transport/Air Transportation between Medical Facilities

A MEDEVAC from land is also SAR. A Medical Transport, air transportation between medical facilities, is essentially an air ambulance service and should be done only on a not-to-interfere basis with other missions or commercial providers. (See Section 4.8.3)

Section 4.7
Emergency Medical Assistance

The Coast Guard is routinely involved in requests for emergency medical assistance, both traditional maritime response and non-maritime emergency medical service incidents. ***Medical advice transmitted by Coast Guard facilities must come from qualified medical officers***. Also, replies to requests for medical advice should be done on a not-to-interfere basis with commercial providers. Two policy sections address how emergency medical assistance will be provided and the criteria for action under various medical situations for maritime and non-maritime medical response.

Areas, Districts and Sectors are to have procedures in place for responding to a request for medical advice at sea (MEDICO) or for medical evacuation (MEDEVAC).

MEDICOs and MEDEVACs are part of the traditional Coast Guard SAR mission. Some shipping companies and vessel owners, however, have contractual arrangements with hospitals or commercial medical advisory companies to provide medical advice.

Often calls for emergency medical assistance cannot be immediately classified as a MEDICO or MEDEVAC. Knowledgeable operational medical advice is required to make this determination. The possibility of a MEDICO developing into a MEDEVAC is always present.

4.7.1 MEDICO

4.7.1.1 MEDICO, discussed in references (a) and (b), is an international term normally meaning the passing of medical information by radio. Medical advice is available through many sources that include Coast Guard and DOD medical providers, medical firms and hospitals contracted by shipping companies and international service organizations such as the International Radio-Medical Center (CIRM).

4.7.1.2 ***The Coast Guard shall cooperate to the extent possible to identify appropriate medical resources to relay medical assistance messages or assist in establishing communication between the vessel and their contracted services if commercial channels of communication are not available***.

4.7.2 MEDEVAC

4.7.2.1 MEDEVAC can be extremely hazardous to both patient and crew because of severe environmental conditions frequently encountered at sea, and from dangers inherent in transferring a patient from vessel to vessel or from vessel to helicopter.

4.7.2.2 When deciding whether a case is sufficiently urgent to justify the risks involved with a MEDEVAC, the SMC should obtain advice from medical personnel, preferably Coast Guard or Department of Defense medical personnel, familiar with:

(a) SAR operations.

(b) Emergency medical capabilities of Coast Guard crews.

(c) Operating characteristics of Coast Guard SRUs.

4.7.2.3 ***In all MEDEVAC operations, the risks of the mission must be weighed against the risks to the patient and the responding resource***. Factors to consider include:

(a) The patient's clinical status.

(b) The patient's probable clinical course if MEDEVAC is delayed or not performed. A delayed MEDEVAC which does not have a negative impact on the patient’s probable clinical course may:

(1) Provide for adequate planning;

(2) Allow the rescue unit to stay within its range limits;

(3) Enable a daylight evacuation;

(4) Allow the vessel to enter port; or

(5) Allow for the weather to moderate.

(c) Medical capabilities of responding Coast Guard personnel and equipment. Some Coast Guard operating units have Emergency Medical Technicians (EMTs); a few units have a Health Services Technician attached. Helicopter rescue swimmers are all EMT trained. All qualified boat crews have taken basic first aid training.

(d) Prevailing weather, sea, and other environmental conditions.

(e) Contractual arrangements between vessels and hospitals or commercial medical advisory services.

4.7.2.4 The final decision to conduct a MEDEVAC rests with the aircraft commander, cutter commanding officer, or coxswain on scene.

4.7.2.5 Guidance for filling out the required MEDEVAC Report is provided in Chapter 1 of this Addendum.

4.7.3 District Procedures

4.7.3.1 To help ensure timely response for MEDEVACs and prompt relay of MEDICO advice through Coast Guard channels of communication, each District should maintain a list of:

(a) Medical personnel available and qualified to recommend MEDEVACs and advise on MEDICOs. The medical personnel should be knowledgeable in Coast Guard helicopter and vessel SAR operations and in the capabilities of Coast Guard crews, helicopter rescue swimmers, Emergency Medical Technicians (EMTs), and Health Services Technicians (HSs).

(b) Primary sources of emergency medical advice include:

(1) Coast Guard or Department of Defense flight surgeons.

(2) Coast Guard or Department of Defense aviation medical officers.

(3) Coast Guard or Department of Defense general medical officers.

(4) Civilian physicians.

4.7.3.2 District Commanders should, if possible, indoctrinate personnel likely to make operational medical recommendations. The indoctrination may include aircraft familiarization, helicopter hoisting, and aircraft and boat operations.

4.7.4 Medical Resources

The primary sources of emergency medical advice should be contacted by telephone or the most rapid means available, as soon as possible after a call for emergency medical assistance is received. If none of these sources are immediately available within the District, similar resources in other Districts may be contacted. If contacting a qualified medical advisor is unavoidably delayed, the SMC may take action prior to receiving medical advice, but should continue to seek medical recommendations.

4.7.5 MEDEVAC Procedures for Merchant Vessels

The United States has developed a recommended checklist for merchant vessels to use in medical emergency cases. Most of the information parallels that found on the MEDEVAC/MEDICO Checklist in Appendix G. The information requested to be on the merchant vessel checklist should be incorporated in procedures for MEDEVAC.

4.7.5.1 Recommended checklist content for use by vessels and the controllers is as follows:

"When requesting medical assistance for an ill or injured person, additional relative information as indicated below should be furnished. Other information may also be necessary in certain cases. Codes from Chapter 3 of the International Code of Signals may be used if necessary to help overcome language barriers. ***If medical evacuations are being considered, the benefits of an evacuation must be weighed against the inherent dangers of such operations to both the person needing assistance and to rescue personnel.***

(a) Patient's name, age, gender and nationality;

(b) Patient's respiration, pulse rate, temperature and blood pressure;

(c) Location of pain;

(d) Nature of illness or injury, including apparent cause and related history;

(e) Symptoms;

(f) Type, time and amounts of medications given;

(g) Time of last food consumption;

(h) Ability of patient to eat, drink, walk or be moved;

(i) Whether the vessel has a medical chest, and whether a physician or other medically trained person is aboard;

(j) Whether a suitable clear area is available for helicopter hoist operations or landing;

(k) Name, address and phone number of vessel's agent;

(l) Last port of call, next port of call, and ETA of next port of call; and

(m) Additional pertinent remarks."

4.7.5.2 Action upon receipt of a request for emergency medical assistance, either MEDICO or MEDEVAC, in general, is to:

(a) Contact qualified medical resources to obtain operational medical advice.

(b) Alert SAR forces when a MEDEVAC is likely.

(c) If an immediate MEDEVAC is not required, determine whether the vessel has a contractual arrangement with a commercial medical advisory service or hospital, and assist them as practicable.

SAR Coordinators may delegate this responsibility.

4.7.6 Transport of Next of Kin (NOK) with MEDEVAC Patients

Transporting NOK decisions are made by the SMC. These decisions should be made in consultation with the cutter commanding officers, boat coxswains and aircraft commanders directed to respond to the incident. The following paragraphs provide guidance for transport decisions for the possible situations that may arise. Final decisions to transport NOK for safety of operations are made by cutter commanding officers, boat coxswains and aircraft commanders. Normally, in those situations where the decision is made to transport NOK with a patient, only one person would be permitted.

4.7.6.1 Hoisting of NOK. Due to the inherent dangers of hoisting, NOK will not normally be hoisted along with MEDEVAC patients except in cases where the patient is a minor child. For minor children one parent (or legal guardian) may accompany the child. Other situations, which may call for hoisting NOK, are:

(a) Patient being hoisted is the only parent present of a minor child (NOK);

(b) Hoisting of patient(s) from a vessel would leave the vessel and remaining person(s) in danger due to inability to safely operate the vessel in conjunction with current weather, location, delay in other help arriving; or

(c) There is severe emotional trauma to either the patient or NOK and on recommendation of the flight surgeon or other MEDEVAC advice source, it would be medically beneficial for the NOK to accompany the patient.

4.7.6.2 Transporting NOK by aircraft not involving hoisting. In MEDEVAC situations where a patient is to be transported by aircraft but hoisting is not involved, NOK to accompany the patient may be allowed after evaluation of the risks and capabilities of the on scene resource.

4.7.6.3 Transporting NOK by surface craft. In MEDEVAC situations where a patient is to be taken off a vessel or other location by cutter or boat, the risks involved are generally lower then those with hoisting. Transporting the NOK by surface craft may be permitted after evaluation of risks and capabilities of the on scene resource. ***The SMC must consider the following in evaluating the risk involved when making a decision to transport NOK by surface craft***:

(a) Dangers in transferring between vessels given relative sizes of vessels;

(b) Current on scene conditions (seas, winds, weather, daylight/dark); and

(c) Physical ability of the NOK to negotiate the move across to the Coast Guard vessel.

4.7.7 Protocols When Encountering Infectious Diseases.

Commandant (CG-112) is responsible for establishing appropriate protocols for medical response and protection of Coast Guard rescue personnel from infectious diseases they may encounter in the performance of their duties. Protocols may be found via their web site: Operational Medicine and Quality Improvement Division(CG-1121) (uscg.mil) .

4.7.7.1 Blood-borne Pathogens

(a) Blood-borne pathogens are microorganisms that are passed via exposure to human blood or other infectious materials that could result in disease or death. Hepatitis B virus and Human Immunodeficiency Syndrome Virus (HIV) are most commonly associated with blood-borne pathogen diseases. Other infectious materials could include semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid visibly contaminated with blood and all body fluids in situations where it is difficult or impossible to differentiate between body fluids, as well as any unfixed tissue or organs other than intact skin from a human (living or dead). ***Personnel shall take precautions whenever the potential of exposure to blood-borne pathogens exists. To reduce possible exposure, properly fitting latex or vinyl gloves shall be worn whenever the hands of personnel may come in to contact with blood or other potential infectious material. Eye protection, facemasks, or face shields shall be worn whenever splashes, spray, spatter or droplets of blood could contaminate the month, nose, or eyes. The use of pocket masks and resuscitation bags shall be used when emergency mouth-to-mouth resuscitation is performed.***

(b) ***Personnel shall refer to reference (aa) for further guidance to minimize the inadvertent exposure and disposal of contaminated materials due to blood-borne pathogens***. This instruction provides detailed instructions on the use of protective equipment and proper disposal and clean up of contaminated materials

4.7.7.2 Respiratory Diseases such as the Severe Acute Respiratory Syndrome (SARS) and various strains of influenza are serious health concerns for rescue personnel and may be encountered in the course of rescue as well as other Coast Guard missions requiring interaction with vessel crews and passengers. Appropriate safeguards should be put in place to protect rescue personnel from possible infection. Protocols and updates may be found via the Commandant (CG-112) web site.

4.7.8 Cardiopulmonary Resuscitation

During SAR missions or MEDEVACs, Coast Guard SAR responders often recover victims of injury or medical emergencies who are in cardiopulmonary arrest (not breathing and do not have a pulse). The Coast Guard has an established cardiopulmonary resuscitation protocol to address these situations. This protocol may be found in appendix D of this addendum and at: Operational Medicine and Quality Improvement Division(CG-1121) (uscg.mil). All persons who may be designated as SMC and EMS responders should become familiar with this protocol.

4.7.8.1 Withholding CPR. Recent medical research on emergency cardiac resuscitation has resulted in new recommendations on "Do Not Start CPR" and "Stop CPR" guidelines. The Coast Guard protocol addresses these aspects of response to cardiopulmonary arrest incidents. The protocol is posted at https://www.dcms.uscg.mil/Our-Organization/Assistant-Commandant-for-Human-Resources-CG-1/Health-Safety-and-Work-Life-CG-11/Office-of-Health-Services-CG-112/Operational-Medicine-and-Quality-Improvement-Division/, the Office of Operational Medicine's web site and provided in Appendix D for quick reference.

4.7.8.2 Stopping CPR to conduct a hoist or transferring a patient. Stopping CPR may turn sometimes a near futile effort into a virtually certain futile effort to save a life. Accordingly, the decision to stop CPR for a hoist is made by the flight surgeon, if available. If the flight surgeon is not available, the CPR protocol should be consulted and followed assuming the start time for CPR is on completion of the hoist. A multitude of factors impact this decision, among them:

(a) Time elapsed since the patient went into cardiopulmonary arrest,

(b) Proximity to advanced medical care,

(c) Expected duration of hoist (patient and rescue personnel if sufficient personnel are not available on board the helicopter to continue CPR without on deck rescue personnel),

(d) On scene conditions and risk in conducting the hoist in regards to medical condition, and

(e) Other medical factors (injuries, chronic illness, etc.).

Section 4.8
Non-Maritime EMS Response

4.8.1 Types of Non-Maritime Emergency Medical Service Incidents

4.8.1.1 Coast Guard SAR resources may, and often do, become involved in the following types of non-maritime emergency medical service (EMS) incidents, MEDEVAC and Medical Transport missions, even though they are not required to do so:

(a) Emergency evacuation of injured from highways.

(b) Transfer of critically injured or ill persons from isolated locations to medical care facilities.

(c) Evacuation of non-critically injured or ill persons from remote or inaccessible areas where surface transportation is not practicable.

(d) Transfer of critically injured or ill persons from a medical care facility to another more capable of treating the case.

(e) Emergency deliveries of medical supplies, equipment, blood, and human organs for transplant.

What distinguishes medical transportation as a MEDEVAC, is the transportation takes the persons from a distress situation to a medical care facility.

4.8.2 Statutory Background

4.8.2.1 Reference (bb) requires states to develop a highway safety program following Department of Transportation guidelines. Standard 11, "Emergency Medical Services (EMS)," of reference (bb) is the basis for many state EMS systems. This standard is being supplanted by national voluntary standards developed by the American Society for Testing Materials (ASTM) F30 Committee on Emergency Medical Services. These standards provide for growth and quality assurance of future prehospital care.

4.8.2.2 Research has shown that helicopters are used effectively in civilian EMS systems. The Military Assistance to Safety and Traffic (MAST) program evolved as a cooperative effort of the Departments of Transportation, Defense, and Health and Human Services. The National Highway Traffic and Safety Administration of the Department of Transportation administers the program.

4.8.3 EMS Agreements

4.8.3.1 District Commanders are authorized and encouraged to enter into agreements for mutual cooperation and coordination of emergency medical services, with state, county, or local officials. General guidance on establishing agreements is provided in Chapter 1 of this Addendum. EMS agreements should include provisions such as the following:

(a) Coast Guard facilities should respond to requests only when operations permit. Their primary missions in the maritime areas take precedence.

(b) Agencies or officials should limit requests for Coast Guard assistance to serious cases in which response by non-Coast Guard resources would apparently be ineffective or not timely. ***Conflict of Interest, including air ambulances, shall be avoided. As required by reference (bb), all inland cases shall be reported to, and coordinated with, the U.S. Air Force RCC (AFRCC).***

(c) The pilot of an aircraft responding to an emergency medical request is the final judge of whether a mission can be accomplished safely, and may discontinue the mission.

(d) Agreements should be entitled "Emergency Medical Service Agreements" rather than "SAR Agreements."

4.8.3.2 ***Operational commanders may include other requirements in agreements, and must forward copies of all agreements to Commandants (CG-SAR-1), (CG-711), (CG-1121) and (CG-01).***

4.8.3.3 A sample EMS Agreement is contained within Appendix E.

4.8.4 Air Transportation between Medical Facilities (Medical Transport)

4.8.4.1 This section is intended to reflect the paramount concern for patient care in light of emergency conditions while conserving scarce Coast Guard resources by placing the burden of providing trained health care personnel and any special medical equipment needed to affect the transfer on the supported hospitals and/or medical facilities. However, shifting the burden to the supported hospitals and medical facilities is not always possible or practicable, and some units have reported encountering the need to undertake emergency transport without Hospital provided health care personnel or equipment.

4.8.4.2 Nothing in this section should be understood to limit the discretion of an Air Station Commanding Officer (CO) to undertake emergency transfers of critically ill or injured patients to/or between hospitals or other medical facilities when and under such circumstance deemed necessary by the CO, as advised by the cognizant flight surgeon. The use of medical equipment should be coordinated between the consulting flight surgeon and the sending or receiving hospital, as appropriate.

4.8.4.3 Criteria listed below are to be used as a guide for Coast Guard aircraft making emergency transfers of critically ill or injured patients to/between hospitals or other medical facilities:

(a) Non-competition with available, suitable commercial air ambulance services;

(b) Suitability and availability of aircraft;

(c) Non-interference with Coast Guard primary missions and training;

(d) Case is designated as an emergency involving actual lifesaving or reduction of disability;

(e) Documented medical need for the movement;

(f) ***Appropriately trained health care personnel shall be provided by the requesting medical facility in accordance with needs and circumstances to support the care of transported patient.*** (***This training shall not only be that necessary to meet the needs of the patient during the transfer, but also in accordance with guidelines established by the Air Station CO to safely function in Coast Guard aircraft***. It is highly recommended that COs performing frequent Medical Transport missions have an ongoing training program established to train personnel at the supported medical facility to provide care safely aboard CG aircraft.);

(g) ***The transferring medical facility shall supply any special medical equipment (i.e. pumps, ventilators, etc.) needed to effect the transfer. (Such equipment shall be of the type authorized by Commandant (CG-711) based upon an airworthiness determination by Commandant (CG-41). Non-approved equipment shall not be used.*** This will require prior coordination by the COs with frequently supported facilities.);

(h) Return transportation for attending medical personnel is NOT provided by, nor the responsibility of, the Coast Guard.

4.8.5 Transportation of Medical Supplies, Equipment, Blood, and Human Organs for Transplant

Emergency medical transportation requests may include the movement of medical supplies, equipment, blood, and human organs for transplant. ***The criteria for transportation of patients in 4.8.4 above shall be applied to non-patient medical cargo***. Key to the decision is the medical necessity and urgency that cannot be met by other transportation.

4.8.6 Escort of MEDEVAC/Medical Transport Aircraft by Emergency Fire Equipment

MEDEVAC/Medical Transport aircraft should request an escort, when available, by emergency fire equipment during landing and taxi operations. This precaution allows for rapid evacuation of non-ambulatory patients from the aircraft in the event of a ground emergency.

Section 4.9
Ice Rescues

4.9.1 Ice Rescue Operations

Several domestic SAR Regions contain a variety of lakes, rivers, and tributaries that are extensively used by the public during the winter for recreational purposes. In some areas "ice bridges" are used to travel from mainland to islands and across frozen streams. Recreational and transit use of the ice, however, is hazardous and often results in the Coast Guard being called upon to perform search and rescue missions. This section discusses responsibilities, procedures, training, and equipment necessary to ensure the safety of Coast Guard personnel tasked with performing search and rescue operations on the ice. These operations, perhaps more than any other category of SAR, depend upon an interactive network of response agencies; each having specific capabilities and limitations. Maintaining close working relationships at the local level is essential to providing, safe, effective response to ice emergencies. Sectors will incorporate this information into their MOUs as appropriate.

4.9.1.1 Sector Responsibilities. Sectors have specific responsibilities, which include;

(a) Designate those units that are required to maintain an ice rescue capability. This designation should be based on factors such as historical SAR data, and availability of non-Coast Guard ice rescue resources. Designations should be made in SOP or applicable instructions.

(b) Ensure that designated units are properly equipped and personnel trained.

4.9.1.2 Air Station Responsibilities. Air Stations should develop operational procedures specifically adapted for ice rescue situations, and identify training and equipment shortfalls to the applicable District (drm).

4.9.1.3 Cutter Responsibilities. Cutters have specific responsibilities, which include;

(a) Cutters should identify potential ice emergency situations such as man overboard situations, whether from the cutter itself or vessels in the vicinity. Emergency bills should provide an adequate framework to respond to such situations. Ensure full use of risk assessment procedures for any response.

(b) Cutters should identify any training and equipment shortfalls and notify their applicable OPCON.

4.9.1.4 Station Responsibilities. Stations have specific responsibilities, which include;

(a) ***Stations designated to maintain an ice rescue capability shall follow the guidelines contained in this chapter***. These guidelines are open to comment, and should be continuously evaluated and updated as necessary.

(b) ***ALL Stations shall maintain close working relationships with local agencies that conduct ice rescue operations.*** This will ensure that the Coast Guard is able to notify the appropriate resources under any circumstances.

(1) Since multi-agency resources are not uncommon, the conduct of joint training exercises and the development of local working agreements are encouraged as they are essential elements of pre-planning for an ice emergency.

(2) Mixed agency crews are permissible, but should be organized with care. Jurisdictional issues and conflicting policy guidance often limit the scope of operations for such "teams".

(c) ***Designated ice rescue stations shall develop and publish an ice rescue bill, instruction, or standing order.*** Each station's instruction will vary due to the presence of various rescue agencies or other local conditions.

(d) Ice Rescue Courses. There are various ice-rescue training courses available in the private sector. The curriculum of these courses varies, depending upon the type of ice rescue most prevalent in a particular region. Note: the Coast Guard does not endorse these courses.

4.9.2 Ice Development and Characteristics

Crews tasked with ice rescue responsibilities should have a thorough knowledge of ice characteristics, ice formation, and the hazards of hypothermia and frost bite. The more rescuers know about the risks involved with ice rescue, the better they are able to perform the mission, and, more importantly, be a survivor on the ice. Whenever possible, efforts should be made to include identification of different ice conditions during training exercises. Ice conditions are affected by a number of factors.

4.9.2.1 When water is cooled at the surface it begins to sink because it is heavier than the warm water that rises to replace it. This is called vertical circulation. This vertical circulation stops when the body of water becomes isothermic (all water at different depths is exactly 39.2 degrees). At this point water becoming colder stays at the surface and ice begins to form.

4.9.2.2 Ice near shore on a frozen lake may be unsafe due to pressures outward and upward which causes cracks to appear. Fluctuating water levels also cause inshore ice to be unsafe. Dropping water levels leave ice "high and dry" with no liquid beneath it to give it support.

4.9.2.3 Deep lakes usually remain open in the middle throughout the winter because of winds and currents.

4.9.2.4 New ice is stronger than old ice. Direct freezing of lake-water is stronger than ice formed from melting snow or refrozen ice. Clear new ice is stronger than ice clouded with air bubbles. Discolored or cloudy ice tends to indicate weaker ice.

4.9.2.5 Ice around stumps, pilings, or submerged objects is often weakened by convection heat given off by the object.

4.9.2.6 Underwater streams or springs with flowing water will cause weak spots by the circulating water. Any ice over or near moving water is too weak to be safe.

4.9.2.7 Strong sunshine shining through the ice and reflecting back off of the bottom will warm the ice from beneath and cause deterioration.

4.9.2.8 Table 4-1 lists ice thickness levels that are the minimums required to support a person or a vehicle:

Table 4-1 Ice Thickness Minimums to Support a Person or Vehicle
Provided for Internal Coast Guard Use Only

	Centimeters	Inches
Single person on skis/foot/snow shoes	5	2
Two people on skis, side by side shoes	10	4
½ ton vehicle	20	8
¾ ton vehicle	25	10
Over snow vehicle	30	12

Only with complete knowledge of ice formation and strength will the ice rescuer, be able to effectively judge how to complete the ice rescue.

4.9.3 Ice Rescue Planning

A critical part of a safe, effective ice rescue program is planning. Those stations designated as ice rescue units, should identify potential accident sites within their AOR, select the safest and most effective rescue approaches, and practice possible techniques using appropriate equipment at the site. The time spent planning and practicing is not fully appreciated until the time it becomes most valuable during a rescue. ***Ice rescue stations shall maintain quick-action cards or files that list the locations in their AOR where ice related accidents are most likely to occur and where ice rescue resources can be deployed.*** Some suggestions are:

(a) Survey all potential accident sites within the unit's AOR before winter freezes. Record the size of the area, water depth and any structures within the water at the site.

(b) Examine those sites to locate natural and man-made hazards, especially those with a history of accidents.

(c) Include the location of access sites and direct routes to them. Pay particular attention to areas that are relatively inaccessible or dangerous such as canyons, marshlands, etc.

(d) Survey all potential accident sites during periods of initial freeze, again recording characteristics of the location.

(e) Hold training exercises at potential accident sites when suitable ice forms. Staying within the limitations of the rescue team will help avoid unnecessary dangers.

(f) Organize and participate in multi-agency ice rescue drills to develop a greater understanding of capabilities, resources, and policies of various contributing agencies.

4.9.4 Risks to Crews

4.9.4.1 **Hypothermia** is primarily a function of temperature, body conditions, and weight, combined with exposure to the elements with inadequate protective clothing. ***COs/OICs shall ensure personnel are in top physical condition, and are provided with proper cold weather gear, prior to being sent out on the ice***.

4.9.4.2 **Frostbite** is the effect of excessive exposure to extreme cold. ***To minimize this risk, ice skiff crews shall be provided with adequate protective clothing, including foam padded ski***

masks, to minimize exposed skin. A wind-chill factor of –54 degrees Fahrenheit will cause frostbite in 10 minutes on exposed skin. At a wind-chill factor of –20 degrees Fahrenheit, frostbite will result on exposed skin in one hour.

4.9.5 Ice Rescue Resources and Utilization

4.9.5.1 Helicopters. Helicopters are the primary SAR resource for Ice Rescues. ***Sector Command Center's shall determine when to request a helicopter, considering such factors as distance offshore, air temperature, ice conditions, urgency, and distance to the nearest air station***. If any doubt exists, units should request a helicopter. The applicable Command Center is the approving authority for using helicopters.

4.9.5.2 Ice Skiffs

(a) Ice skiffs will normally be launched only in case of a known emergency with reliable position information, and will launch as close as possible to the actual emergency site. Ice skiffs should not be used to search for overdues, or investigate flare sightings.

(b) Untethered crewmembers should not normally go on to the ice without the skiff, or an equivalent platform to provide support in the event of breaking through the ice en route to the victim. ***In those rare instances where personnel must transit the ice without a skiff, they shall be tethered or closely observed***.

(c) Ice skiffs should not be launched when wave height is above two feet, or when a combination of air temperature and wind velocity exceeds a wind-chill factor of –54 degrees (F). ***The Sector may waive these requirements on a case-by-case basis, but must notify the applicable Command Center***.

(d) A minimum of four persons should be dispatched with the ice skiff and government vehicle when responding to a case. The coxswain and two crewmen should conduct the rescue while the fourth person should stay with the vehicle and maintain communications with the skiff and the Station.

(e) Handheld GPS receivers should be used on all deployments to provide reliable position information.

(f) Ice Skiff (and ATV) operations carry an inherent risk to personnel. ***The SMC shall be notified prior to deployment of personnel on an ice skiff.***

4.9.5.3 Small Boat Use

(a) Except for bona fide emergencies involving immediate danger to life, boats should not be operated when wind and temperature conditions are such that accumulations of topside ice in excess of one inch may reasonably be expected.

(b) ***COs/OICs needing to operate a boat in the ice shall carefully consider the situation, ice conditions, and alternative methods of achieving objectives***. Coast Guard small boats are not designed to break ice. ***Sector and District Command Center's shall also be kept advised.***

(c) ***Observation of instability due to topside icing on any class of boat shall be immediately reported to the Command Center***.

4.9.5.4 Other Equipment. New equipment that offers enhanced performance for our missions is constantly being developed. Units are encouraged to share information and experiences with such equipment with other units, other agencies, District (drm), and Commandant (CG-SAR-1).

4.9.5.5 Ice Rescue Dive Teams. Many local agencies have ice rescue dive teams that can provide assistance to the CG if requested. ***Whenever the case involves a person slipping below the surface of the water/ice, diving operations must be considered. All stations shall maintain a file of those agencies in their AOR that have ice rescue dive teams.***

4.9.5.6 Animal Rescues. Rescue attempts for animals stranded on the ice should only be conducted under ideal conditions after proper RISK ASSESSMENT. ***The chance of the animal being wild or rabid must be considered when evaluating the potential for injuries to crewmembers***.

Section 4.10
Float Plans

4.10.1 General

The Coast Guard has neither the responsibility nor the facilities to follow the voyages of vessels to their destinations and does not generally accept float plans. Mariners should be encouraged to pass information regarding proposed voyages to other responsible parties such as relatives, friends, yacht clubs, marinas or other facilities willing to perform that function.

4.10.2 Receiving a Float Plan

If a mariner insists on providing a Coast Guard unit with information regarding a proposed voyage, all pertinent information should be recorded on an Overdue Check Off Sheet, including estimated times of arrival and departure at way points. The following disclaimer should also be presented or read:

"The Coast Guard will keep this information on file and use it in the event your vessel is reported overdue. However, the Coast Guard does not have the responsibility or the facilities to follow the voyages of vessels. The Coast Guard strongly recommends that you keep a responsible party informed of the movements of your vessel. Keep that party specifically advised of your expected and actual arrivals. You should instruct them that in the event your vessel does not arrive as planned, they should contact the nearest Coast Guard station."

4.10.3 Action Taken After Receiving a Float Plan

A copy of all float plans should be retained for a minimum of one month beyond the provided final expected arrival date. Retaining the float plan longer may be appropriate when the length of the voyage itself is of a long duration (e.g. trans-oceanic or around-the-world) or where the type of vessel lends uncertainty to duration of the voyage (e.g. sail vs. power vessels). On receipt of overdue vessel reports, Coast Guard units should check float plan files as a part of PRECOM checks.

4.10.4 Float Plan Form

When informed of the Coast Guard's policy many mariners will request a float plan form to fill out and provide to an alternative responsible party. Float Plan forms are available in some boating safety brochures produced by the Coast Guard and have in the past been printed individually. These may be provided directly to mariners. A sample Float Plan form that may be copied and used if other sources are not readily available is provided as Figure 4-2.

4.10.5 Float Plan Services

Some commercial and private organizations provide float plan services for members or subscribers. The methods of tracking voyages or reporting overdue vessels by these services vary. Some services offer SAR authorities access to all voyage and vessel data on the report of an overdue. Coast Guard units with personnel that may be designated as SMC should maintain a listing and access instructions for all float plan services that serve their area of responsibility.

Complete this page, before going boating and leave it with a reliable person who can be depended upon to notify the Coast Guard or other rescue organization, should you not return as scheduled.

Do Not file this plan with the Coast Guard.

Name of person filing: Phone Number:

Description of Vessel

Type:	______	Color:	______	Trim:	______
Registration No:	______	Document No:	______	Length:	______
Vessel Name:	______	Make:	______	Other info:	______
Engine Type:	______	Horsepower:	______		
No. of Engines:		Fuel Capacity:			

Survival Equipment (check as appropriate)

☐ PFDs	☐ Flares / Type: ______	☐ Mirror	☐ Smoke Signals
☐ Flashlight	☐ Food	☐ Paddles	☐ Water
☐ Anchor	☐ Raft	☐ Dinghy	☐ EPIRB/Type ______
☐ Other			

Communication / Navigation Equipment

☐ Radio (check as appropriate) ☐ VHF-FM ☐ MF ☐ HF ☐ Other: ______

☐ Cellular phone Number:

☐ GPS ☐ RADAR ☐

Automobile/Trailer

Auto license No./State:	______	Auto make/model:	______
Auto color:	______	Auto year:	______
Trailer type:	______	Trailer license No.	______
Where parked:	______		

Persons On Board (# ____)

Name	Age	Address & Telephone No.
______	______	______
______	______	______
______	______	______
______	______	______

Do you or any of the persons on board have a medical problem? ☐ Yes ☐ No

If yes, what?

Trip Expectations

Leave at ______ From ______ Going to ______

Via ______ Via ______ Via ______

Expect to arrive/return by ______ (time) and not later than ______

Other pertinent info:

If not returned by ______ (time) call the COAST GUARD, or (local authority) ______

Telephone numbers:

Figure 4-2 Sample Float Plan

Section 4.11
Self-Locating Datum Marker Buoys

Self-Locating Datum Marker Buoys (SLDMB) utilize satellite-based technology to determine buoy position. SLDMBs provide frequent, high-resolution position information independent of the search unit (search unit does not have to relocate the SLDMB). The SLDMBs drift with the water mass, providing high quality current information. The use of satellite technology greatly reduces the cost of a position determination in comparison to the cost associated with the RDF/DMB.

Current information provided by SLDMBs may be used directly in search planning tools in conjunction with leeway data to estimate the direction and distance of drift for a search object. The information provided also is highly valuable in comparison to EDS current sources to determine reliability and choosing the best current data source for that evolution.

Although fielded to support the SAR mission, SLDMBs may be used to support other missions as well. Possible applications exist for fisheries (high-seas drift nets tracking), law enforcement (floating contraband; bales of narcotics), maritime environmental response (oil spill tracking), and general maritime safety (marking of vessels or other objects adrift). Available stocks and funding will determine the resource commitment outside the SAR mission.

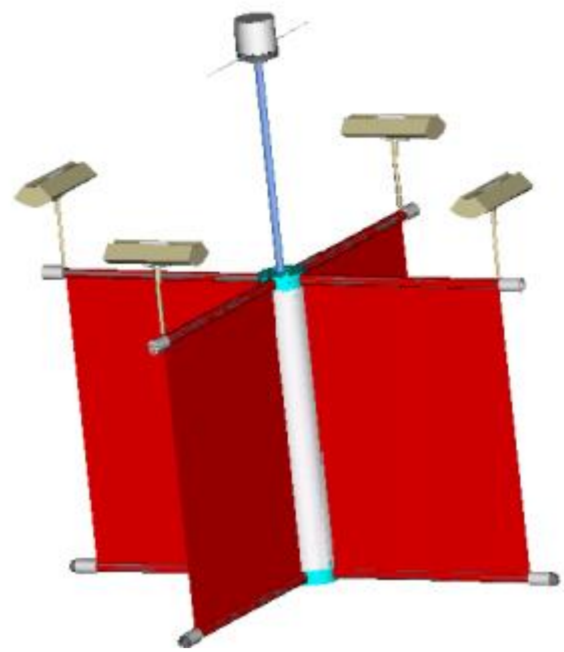

Figure 4-3 Deployed SLDMB (METOCEAN)

4.11.1 The SLDMB System

There are three major components to the SLDMB System: the buoys, the satellite system and the data system.

4.11.1.1 Self-Locating Datum Marker Buoy (SLDMB). A 7/10th Coastal Ocean Dynamics (CODE)/Davis-style oceanographic surface drifter with drogue vanes between 12 and 37 inches deep. The onboard electronics provide Global Positioning System (GPS) positioning and sensor data (buoy ID, position, and sea temperature).

(a) GPS positions are acquired at 15-minute intervals for the first two hours and at 30-minute intervals thereafter. Up to 13 half-hour data sets can be stored if necessary before transmission to a satellite.

(b) SLDMBs are air- or ship-deployable, and buoys are operational for 14 to 30 days after deployment.

4.11.1.2 Service Argos Inc. Argos is the satellite data system that receives and forwards the information transmitted from the SLDMB to the Coast Guard using National Oceanographic and Atmospheric Administration (NOAA) polar-orbiting n-series satellites.

(a) SLDMB data will be transmitted within 30 – 90 minutes of deployment/activation. Depending on the deployment location, time of day, and position of the Argos satellites, there may be as much as a five-hour gap in satellite coverage (satellite footprint). SLDMBs retain up to 13 data reports, which will be uploaded to the Argos network when a satellite comes in view. Drift data requires a minimum of two positions (at least 30 minutes), but additional positions will ensure the electronics on board the SLDMB are operating properly. Waiting for the first hour's data (four 15-minute interval positions) is recommended.

(b) Sources for satellite pass data are available via the Internet. A recommended list is available via the SAR Program's Intranet web site.

4.11.1.3 USCG SLDMB Web Site. The SLDMB web site is hosted at the Coast Guard's Operations Systems Center and is accessed via the intranet at the web address: http://sldmb.osc.uscg.mil/. The site provides operational data, logistics support, system documentation, and administrative functions.

(a) Operational SLDMB position (drift) data is made available via data requests and may be viewed or downloaded as a data table or requested via SAROPS for visual display.

(b) Logistics functions are used to track the ordering, shipping and deployment of SLDMBs. In addition, the system tracks the buoy shelf life, performance and failures. Reports on various logistics aspects can be generated for system management.

(c) System documentation provides a user's guide, tutorial, frequently asked questions, user forum, comments and new features listing. This on-line documentation provides the line-by-line user information needed to fully use the web site application. Brief descriptions are provided as needed in this Addendum.

(d) Administration functions include user accounts and contacts for the system.

4.11.2 SAR Mission Coordinator Actions

The SMC provides direction to SAR units for the deployment of SLDMBs, enters the deployed status in the SLDMB web site, and retrieves the data produced by the SLDMBs for use in SAR mission planning.

4.11.2.1 Deployment Considerations. The purpose of deploying SLDMBs is to measure the surface currents within SAROPS's Area of Interest (AOI) during the period of interest. The period of interest begins with the distress incident, which often occurs before an SLDMB can be deployed simply because it takes time to respond and travel to the distress location after notification. The amount of time that passes between the distress incident and the deployment of SLDMBs affects the size and location of the area where they should be deployed. The nature and complexity of the situation, e.g., number of possible scenarios, accuracy of the distress location(s), also has an impact. The presence or absence of significant ocean current features that have large horizontal variations or rapidly change with time (e.g., the north wall of the Gulf Stream is example of current with strong horizontal current variation and tidal and wind currents exhibit rapid temporal changes) are also important factors. The proximity to shore will also affect how and where SLDMBs should be deployed, since currents tend to have shorter time and space scales near shore. Significant ocean current features are often easy to see in EDS surface current products. A single SLDMB deployed at a datum position (or between two divergent datum positions) soon after the distress incident will provide valuable information. However, when any of the survivors still remain unlocated for any significant period after arrival on scene, it will be necessary to deploy several SLDMBs to get a true picture of the surface currents in the area of interest. The following guidance will help the SMC make decisions as to using SLDMBs as a tool in SAR efforts.

(a) **Type of case.** SLDMBs should be used in all cases where current data is not available from the EDS or the current data available from the EDS is suspect or low quality. SLDMBs should also be used during all significant searches.

(1) For cases where EDS data is lacking or shown to be inaccurate, the SLDMB data should be used directly.

(2) Where EDS data is present and shown to be accurate, the EDS data should be used. In these instances, the SLDMB data should be monitored to check the continued accuracy of the EDS products and to highlight where anomalies in the currents may be present and not shown by the EDS. These anomalies should be considered in search planning.

(3) SLDMBs may also be used during all searches for contraband and provide solid information for use when legal prosecution may be required.

(b) **When to deploy.** One or more SLDMBs should be deployed as soon as it is apparent that the case will not be quickly resolved. It is far better to drop SLDMBs on a case that turns out to quickly resolve than to hold back dropping SLDMBs on a case that will absolutely require sea current information to plan a search. *If you think you might need to deploy SLDMBs, then you should deploy SLDMBs.* SLDMBs should be dropped as early as possible, since the goal is to provide estimates of the drift of the SAR objects from the time of incident up until the end of the next search period. The earlier an SLDMB is dropped, the more useful the data will be to the case. SLDMBs can also be pre-deployed during peak SAR season, in anticipation of weekend SAR cases, opening of fishing seasons or tournaments, and seasonal refugee migrations. Regardless of why or when they are deployed, SLDMBs provide valuable oceanographic data.

(c) **Number of SLDMBs to deploy.** SAROPS's Currents Sketch Toolbox can import SLDMB tracks directly into SAROPS and compute surface current fields from the trajectories of several SLDMBs in reasonably close proximity and cached for use by SAROPS's simulator. The number of SLDMBs that should be deployed will depend on the size of the area of interest (SAROPS AOI) and the nature of oceanographic features in the area. Larger areas and/or more complex currents will often require deployment of multiple SLDMBs. At the start of a case most SRUs arriving on scene will not be carrying multiple SLDMBs unless directed by the SMC to do so before launch; a single SLDMB may be all that is available initially.

(1) A single SLDMB may be all that is needed if the currents across the region are essentially the same or if the area of interest (SAROPS AOI) is fairly small.

(2) Multiple SLDMBs may be needed when the area of interest includes known or suspected varying currents such as in or near the boundary of the Gulf Stream or other major current feature, around or between island chains, in the vicinity of major river outflows, or in the vicinity of inlets with significant tidal influence. The size of the region may also determine the number of SLDMBs needed. As the size of the region increases so will the number of SLDMBs required to accurately represent the current flow field.

(d) **Where to deploy.** SLDMBs should be deployed in the vicinity of the last known position (LKP) when the time lag between the distress incident and deployment is reasonably short (a few hours at most). Otherwise, they should be deployed in the vicinity of the computed datum(s) or high probability region(s).

(1) **Single SLDMB.** Where a single SLDMB is to be used, it should be deployed at the last known position (LKP), or in the center of the region that is most likely to contain the search object (which is not necessarily the single highest probability cell on a probability map if that cell happens to be isolated from the main body of the distribution).

(2) **Deployment Patterns for Multiple SLDMBs.** There are three basic geometric patterns for multiple SLDMB deployments—corners of a polygon, in a line, or as an "X". However, other patterns and deployment dispositions may be used if the SMC has reason to believe they will provide better data for search planning purposes, as discussed under "generalized patterns" below.

a. **Corners of a Polygon.** Three or more SLDMBs may be deployed at corner points of a not-too-large polygon containing the datums(s) or high-probability region(s) that have been estimated for the expected deployment time or possibly a somewhat later time. The SMC may wish to consider using a somewhat later time for computational purposes, especially in high leeway situations, so as to keep the SLDMBs and search objects in closer proximity for a longer period by placing the SLDMBs somewhat ahead of where the high probability regions are expected to be at the time of deployment. When determining the deployment polygon, the idea is ***not*** to contain the entire distribution of possible search object locations but to place the SLDMBs in the midst of the distribution near the high-probability regions in some sensible pattern. The number of corner points will be determined by the number of SLDMBs readily available, and the shape and disposition of the high probability region(s). This type of pattern is best used offshore in the open ocean away from prominent surface current features.

b. **In a Line (Transect or Along Track Line).** In areas where specific current features are known or suspected to exist, the best deployment is often along a line perpendicular to the axis of the feature in or near the high-probability region(s). This is called a transect and it is particularly useful for strong currents like the Gulf Stream that exhibit a considerable range of speeds across their width. Eddies and counter-currents may also exist just outside the main flow and a transect would usually discover these as well if extended far enough. Another reason for a linear deployment would be to accommodate a missing craft's intended track. However, unless the track line is short or the missing craft's pre-distress speed is large (as with an aircraft, for example), the times involved may dictate deployment along a path (possibly curved or even crooked) to accommodate where the search object may have drifted from various points along the intended track up to the time of SLDMB deployment.

c. **"X" Pattern.** In situations where it is unclear whether the major surface current influence is parallel or perpendicular to a given feature, such as the shoreline, it may be appropriate to deploy SLDMBs in an "X" pattern so that transects along the two perpendicular axis are obtained.

d. **Generalized Pattern.** In areas where surface currents are expected to exhibit considerable complexity due to a complex shoreline, complex bottom topography, river outflows, and/or tidal influences, a less geometrically regular deployment pattern than those given above may be appropriate. In such cases, detailed local knowledge from reliable sources can be an invaluable aid for determining the best placement of SLDMBs.

e. **Multiple Scenarios.** The deployment strategy for cases with multiple scenarios should be to cover all the scenarios using the patterns suggested above.

(3) **Spacing.** Spacing between multiple SLDMBs is dependent upon the situation. The optimal spacing ranges from 3 nm for near-shore cases with strong tidal currents to 6 nm for offshore cases in regions that lack significant open ocean currents. However, the number of SLDMBs that can be made available in combination with the size of the area of interest may dictate larger spacing. For larger spacing, more care is needed to determine the best deployment locations. During the latter stages of a multi-day case, additional SLDMBs should be deployed to fill the gaps between the existing SLDMBs and to seed the area down-drift.

(4) **Other Sources.** Most surface current data for search planning comes from either models that are updated with observations from a variety of sources (which may or may not have direct observational data for the region and time of SAR interest), or from climatological databases or atlases. In both cases it is generally necessary to deploy SLDMBs to get better data for the area of interest. In the (presently rare) event that reliable direct observations are available from other sources in some parts of the region of interest, it may be more beneficial to deploy SLDMBs elsewhere rather than duplicate the efforts of these other sources. As the ability to assimilate SLDMB data into oceanographic models in a timely fashion improves, it will be possible to realize the benefits of both direct observation and modeling with minimal or no impact on the search planner beyond directing the deployment of the SLDMBs as needed. However, for the present time SLDMB-based surface current data will generally take precedence in the vicinity of the SLDMBs over data from other sources.

(e) **Incidents in remote areas** present additional difficulties. Deployment of an SLDMB in an initial sortie is particularly critical due to the likely delay in additional sorties and the need to maximize searching during those sorties. Delaying until a later sortie to deploy an SLDMB can add hours to the delay in receiving critical sea current data. Dropping more then one in case of failure should also be considered for very remote area insertions.

(f) **Approaching nightfall or significant weather** may impact when an SLDMB should be deployed.

(g) **Time of year or climate.** In northern climes where water temperatures are colder, as in all response actions, deploying an SLDMB early may be prudent. Warmer climates make for longer survival of persons in the water, requiring longer searches, which will benefit more from the long-term availability of sea current information.

(h) **SLDMBs from previous cases** may still be in the area of a new incident, or have drifted into that area. A quick check of the data system may yield immediately available total water current information for the vicinity and time of the new incident.

(i) **Combining USCG and Canadian SLDMB data**. Assume the USCG SLDMBs have zero leeway but assume the Canadian SLDMBs have a leeway of approximately 1% of the (standard 10-meter) wind in the downwind direction.

4.11.2.2 SMC Deployment Actions. SMCs are the primary authority for directing the deployment of SLDMBs and will most times make the decision to deploy an SLDMB. However, SRUs arriving on scene often will not immediately find the search object. Prior direction to SRUs by the SMC can be given that would task the SRU to deploy SLDMBs in these situations giving consideration to time spent initially searching the area, nature of the incident, and remaining sortie time.

(a) **Direction to SRUs.** SMCs should provide SRUs with the location(s) for deploying SLDMBs. If multiple SLDMBs are needed, the SMC should direct the SRU to take additional SLDMBs on board. SRUs arriving on scene may not immediately find the search object. Prior direction should be given that would task the SRU to deploy SLDMBs with consideration to time spent initially searching the area, nature of the incident, and remaining sortie time. SRUs should be directed to pass location, time and Argos ID to the SMC immediately after deployment.

(b) **Marking SLDMBs as deployed.** SMCs will receive deployed location, time and Argos ID from SRUs. To mark the SLDMB as deployed within the data system, the SLDMB Web Site (http://sldmb.osc.uscg.mil/) is accessed and SMC's select the appropriate Buoy by entering the Buoy Number in the Buoy Search and Deploy field. Scroll to the SRU's home unit and click the "arrow" to the SLDMB, scroll to the bottom of the page enter desired output parameters and click "Submit." The SMC will be asked to input the MISLE case number, the buoy deployment data passed from the SRU, SMC (command/initials) in the "Enter Comment" block and then click "Submit," to begin receiving data. **ONLY** SMCs should be entering this data and marking SLDMBs as deployed. ***If the wrong Argos ID is used inadvertently, the SMC must immediately contact the OSC help desk (304-264-2500) to have the status reset on that Argos ID***.

(c) **Checking SLDMB Operation.** To ensure the SLDMB has deployed and begun operating, the SMC should check to see if data is being transmitted as soon as data would reasonably be available. Timing for this check is dependent on satellite pass (para. 4.10.1.2(b)).

4.11.2.3 Direct Data Retrieval and Output. SMCs and other persons interested in the drift data provided by SLDMBs access that data via the SLDMB Web Site (http://sldmb.osc.uscg.mil/) Data Request Page. Select the District that the buoy was deployed in from the main menu and scroll to the SRU that deployed the buoy. Click the box to the left of the buoy number and scroll to the bottom of the page and select your data output parameters. For Advanced Search parameters click on the "Advanced Search" button at the top left of the page once you have selected your District. Within the Advanced Search page buoy data can be selected using tailored time frames and entering geographical regions. Data output is available as a screen display table that can be exported to a spreadsheet. Step-by-step direction is available in the on-line user's guide. *Note: The number of buoys, size of geographical region, and time frame requested all impact the size of the data record returned. It is recommended that a data record count of no more than 1500 be returned to avoid protracted delays when downloading data. A table of data parameters and number of records is available via the SAR Program's Internet web site.*

4.11.2.4 SAROPS Data Use Guidance

(a) SAROPS SLDMB Wizard can be used to locate and display SLDMB tracks from a user defined AOI and time period. Each SLMDB active in the AOI is color coded in the ArcMap table of contents. The SAROPS time slider can be used to view the track of the SLDMBs and be displayed over surface currents obtained from the Environmental Data Sever (EDS).

(b) Once displayed, a comparison with the EDS surface currents can aid in determining how well the EDS currents appear in comparison to the SLDMB. And when multiple EDS surface current sources are available for the AOI, help in selection of the best for use during that time period.

(c) Where comparison of SLDMB to EDS shows the EDS products to be suspect, SAR planners should check with oceanographic points of contact to discuss the issue. Where EDS problems are confirmed or suspected it may be appropriate to use the SLDMB data directly.

(d) The SAROPS Currents and Winds Sketch tool can be accessed under Tools / Extensions / Currents Toolbox. Within the Currents Tools, create a 'Hydrodynamic Grid' by double clicking. A grid should be created matching the AOI and time period required by the SAROPS run. Land/Water cells can be switch by using the 'Toggle Land/Water Cells'. Next double click 'Import SLDMB'; after successful import, double click 'Spread Vectors', entering 'Yes' to 'Apply to all time steps?'. If SLDMBs were not active or available for the first portion of the time period; 'Sketch Currents' can be used to add vectors for the time step prior to availability of SLDMBs currents. Extrapolate backward in time from the available SLDMBs to estimate these sketched currents. After Sketching Currents, repeat the Spread and Smooth currents, then 'Save'. The file will now be available as a cached file in the SAROPS Surface Currents GUI for use by SAROPS to drift the particles.

(e) SLDMBs that drift longer than 4 days are used by oceanographers to evaluate the Environmental Data Sever surface currents products.

4.11.3 Failed SLDMBs

Occasionally SLDMBs will fail to operate properly. The failure may be a result of a bad part within the buoy itself, damage in shipping and handling, or damage incurred during deployment. Failure indicators are most often receiving no data or corrupt data. Occasionally units deploying an SLDMB may observe a failure. If there is a suspected buoy failure after deployment, the OSC Customer Service line should be contacted at (304) 264-2500 to verify failure. The possibility exists that a buoy with a different ID than reported was actually deployed; in this instance, no buoy failure would have occurred; the unavailability of data would be due to human error. If a buoy is found to have failed or is damaged prior to deployment, the Engineering Logistics Center (ELC) should be contacted at (410) 762-6236.

4.11.3.1 No data received (Confirmed buoy ID). When no GPS or Argos data is received from a buoy within ninety minutes, it is likely the buoy has failed, or the wrong buoy ID has been marked deployed. Once the SMC has confirmed the correct buoy ID has been deployed (and that no other buoy was erroneously marked deployed in its place), the SMC should determine whether a satellite pass for the SLDMB has occurred (see Subparagraph 4.10.1.2(b)). If so, the buoy is considered inoperative. The SMC should then deploy another SLDMB as soon as possible and notify the OSC (a POC is listed on the SLDMB web site).

4.11.3.2 Corrupt data received. When the data being received appears erratic (widely spaced positions resulting in widely varying speeds/directions, initial position far from the deployed position, very sporadic data, etc.), it is likely the SLDMB has sustained damage or has a failure in the electronics package. The SMC should call the OSC help desk to verify the SLDMB web site and transmissions from Argos are not experiencing problems. If the SLDMB appears to be the source of the corrupt data, OSC help desk personnel should notify the Duty Analyst to terminate the SLDMB. The comments should include the reason for termination as corrupt data. The SMC should deploy another SLDMB as soon as possible.

4.11.4 Requests for SLDMB deployments by other agencies or nations

The Coast Guard cooperates and lends support to a multitude of other agencies and nations in the conduct of SAR operations. SLDMBs, as with other SAR support, may be deployed on request of non-Coast Guard SMCs subject to the availability of resources. The same level of review should be applied as is for deploying search assets in support of non-CG search efforts.

4.11.5 SLDMBs and use of Standard RDF/DMBs

SLDMBs provide superior current information for the SAR planner's use in search planning. The standard RDF/DMB may still be useful in some roles, such as marking a debris field that searchers wish to relocate (homing function) over a short period of time, or in restricted waters to get a quick idea of drift for the first search effort. Standard DMBs may be used until no longer available.

4.11.6 SLDMB Deployment by Search and Rescue Units

4.11.6.1 Deployment from Aircraft. SLDMBs are deployable from Coast Guard HC-130, HU-25, HH-60 and HH-65 aircraft. Specific deployment procedures for individual aircraft types are provided in each aircraft flight manual. The General fixed and rotary-wing deployment guidance is available at the SLDMB web site. Coast Guard testing found for the HH-60 and HH-65 aircraft that 300 foot altitude and 70 knot airspeed was optimal. For situations using the drogue parachute, Coast Guard testing found the launch altitude should be no lower than 200 feet as it appeared to be the minimum altitude which allowed the parachute to open fully and be effective in directing the entry of the SLDMB into the water. ***For all deployments, the Drop Master must remove the tag that contains the SLDMB Argos ID 5-digit number.*** The Aircraft Commander should then report the time, location, altitude, air speed, sea conditions, drop observation and ID for each drop to the SMC.

(a) **Fixed-wing aircraft deployment.** The SLDMB uses a 15-foot (4.5 m) static line to ensure that the parachute is correctly deployed from the buoy. The static line has loops at 10 feet and 15 feet for various aircraft. No tools are required for this deployment. The buoy must be removed from its protective wrapper, then the static line is hooked on and the buoy ejected from the aircraft.

(b) **Rotary-wing aircraft deployment.** For deployment from rotary-wing aircraft, the deployment method depends on the altitude of the aircraft at time of deployment.

(1) When the deployment height is less than 25 feet, (8 meters), and the aircraft is hovering, the buoy is removed from its protective wrapper, and both static line and parachute are removed. No tools are required for this. The buoy can then be launched directly from the aircraft.

(2) When the launch height is greater than 25 feet (8 meters) or if the aircraft has any significant forward speed (10 knots or more), the buoy is removed from its protective wrapper, the static line and parachute cap then must be removed from the launch container. The parachute is then extracted from the top of the launch container, hand deployed from its parachute bag, but not detached from the buoy. The buoy is then launched from the aircraft. ***CAUTION: The shroud lines on the parachute present a tangle hazard to personnel deploying the SLDMB; care must be taken to avoid shrouds snagging on aircrew hands, arms, and/or flight gear before deployment.*** Note that no other parts need be removed and that the buoy will not deploy any other parts during launch or descent.

4.11.6.2 Deployment from Cutters and Boats. The design of the SLDMB with the removable parachute assembly makes it suitable for surface deployment from cutters and boats. Cutters and boats can be underway when deploying the SLDMB, with speed reduced to under 10knots to avoid causing damage during deployment. The SLDMB should be deployed with the bottom (end away from parachute shroud snap hook) of the launch container entering the water first if possible. ***For all deployments, the deploying personnel must remove the tag that contains the SLDMB Argos ID 5-digit number.*** *The Commanding Officer or Coxswain should then report the time, location, vessel speed, sea conditions and ID for each deployed SLDMB to the SMC.* Procedures for preparing the SLDMB for surface deployment may be found at the SAR Program's Internet site.

4.11.6.3 SLDMB Self-deployment. SLDMBs are designed for fully automatic deployment after impact with the water. After impact with the water, the tape holding the launch container dissolves. This allows the launch container to be released and also frees the arms to deploy the drogue panels and removes the magnet, starting the electronics. A few minutes after the arms are deployed, the tape holding the antenna mast down dissolves. This frees the spring-loaded mast to extend, which also detaches the parachute. All parts are ballasted to sink or are biodegradable. At this point the buoy is fully deployed and operational. The self-deployment process takes between 4 and 11 minutes.

4.11.6.4 Deployment Cautions

(a) **Proper Deployment**. Proper deployment of the SLDMB is best achieved by leaving the SLDMB in the launch container, and allowing the SLDMB to self deploy. In opening the launch container, damage may inadvertently be done to the SLDMB.

(b) **Drogue Arm deployment.** All SLDMBs are packaged with folded arms. These arms are under tension with shock cord. Excessive stretching may break the shock cord and could cause injury.

(c) **Mast Extension.** The mast is spring-loaded and will extend about 16.5 inches. If the buoy is disassembled beyond simple removal of the parachute, care must be taken to retain the mast in its down position. Care must be taken if the mast is extended manually. Once extended, the mast cannot be retracted without major buoy repairs. *CAUTION: SLDMBs should not be lifted by the antenna mast; lifting by the mast may damage the O-ring seal and permit water to enter the body of the SLDMB; rendering the SLDMB inoperable.*

4.11.7 Using SLDMBs to Mark Abandoned Vessels and Other Objects.

The self-locating functionality of the SLDMB makes it ideal to use when the Coast Guard has a need to track the location of an abandoned vessel or other floating object (debris, oil, contraband, etc.).

4.11.7.1 No Obligation to Mark Abandoned Vessels. Vessel owners may request the Coast Guard mark their drifting vessel so they may have a means to locate it for later recovery. The Coast Guard is under no obligation to mark a drifting vessel solely to aid in recovery by the owner. However, saving property is part of the Coast Guard’s SAR mission and vessels may be marked when it can be safely accomplished. ***When the decision is made to mark a vessel it shall only be done when the lives of responding Coast Guard crews or other persons are not put at risk. The decision to mark a vessel shall be made by the SMC with consultation with on scene cutter commanding officers, boat coxswains and aircraft commanders.***

4.11.7.2 Attaching the SLDMB to the Drifting Object. When marking vessels or other objects, which will have any significant leeway component of drift, the SLDMB should be attached to the object if possible. This is particularly important when the vessel or object will be tracked for an extended period of time. Procedures for attaching SLDMBs to abandoned vessels and other objects are located on the SLDMB web site.

4.11.8 Operating Parameters

4.11.8.1 Environment

(a) SLDMBs have been designed to operate under the conditions listed below.

Table 4-2 Environmental Operating Parameters for SLDMBs

Parameter	Conditions
Air Temperature	- 4 °F to + 95 °F (- 20 °C to + 35 °C)
Water Temperature	+ 28.4 °F to + 95 °F (- 2 °C to + 35 °C)
Water Type	Fresh and Salt Water
Significant Wave Height	0 to 26 feet (0 to 8 meters)
Wind speed at height of 10 meters	0 to 39 knots (0 to 20 meters per second)

(b) SLDMBs have also been designed to survive more extreme conditions during which they may not operate properly, but when conditions improve, they will resume correct operation. These conditions include: air temperatures down to – 22 °F (– 30 °C), significant wave heights to 39 feet (12 meters) and wind speeds up to 68 knots (35 meters per second).

4.11.8.2 Operating Life. SLDMBs are designed to operate for a minimum of 14 days from deployment. As built the expected lifetime is 22 days after 18 months storage. Newer SLDMBs may last as long as 30 days, after which they will automatically shut down.

4.11.8.3 Water depth. SLDMBs will operate in any waters which permit the free drift of the buoy with the surrounding water. For air-deployment, the water depth should be 10 feet or greater to prevent the buoy from hitting bottom when entering the water.

4.11.9 Disposition of recovered SLDMBs

On occasion the public will find SLDMBs that wash ashore or come upon them while boating. They may describe them as any number of things including buoys, mines, floats, etc. Coast Guard units should be familiar with the characteristics of SLDMBs to help to positively identify them.

4.11.9.1 Washed ashore SLDMBs. Coast Guard units when called should take custody of the SLDMB, record the time & location found, the Argos ID and condition. Forward the information to Commandant (CG-SAR-1). Current SLDMBs have been designed to be disposable, and in most instances the unit will be directed to dispose of the SLDMB.

4.11.9.2 Afloat SLDMBs. Afloat SLDMBs should be left floating whenever possible. On occasion it may be necessary to remove a floating SLDMB due to the specific location (hazard to navigation, etc.). If an afloat SLDMB may need to be removed, Coast Guard units should first ascertain that the SLDMB is not active by passing the Argos ID to their sector or district command center. The ID is on a plate near the base of the SLDMB's body; to see the number the SLDMB must be carefully removed from the water. *CAUTION: SLDMBs should not be lifted by the antenna assembly; this may cause the O-ring to fail, allowing water into the body of the SLDMB, which will render it inoperable.* If the command center does not know immediately the status of the SLDMB (in use for an ongoing case; or used in a recent case), the command center should enter the SLDMB web site and use the Argos ID to run a Buoy History. If the report shows the buoy status as deployed (active), a data request should be run entering a Time Frame of "Last 1 day" and Geographical Region – Select by Buoy Number entering the Argos ID. If no data is present, the SLDMB is no longer active awaiting automatic termination in the system. If data is still present, the SLDMB should be left in the water.

4.11.9.3 Deactivation and Disposal. On the occasion where a SLDMB is recovered it is necessary to deactivate the buoy before disposal. Deactivation is done by cutting the two wire leads running to the top of the antenna which are accessed by removing four screws under the base of the white antenna cover. Detailed deactivation instructions can be found at the SLDMB web site. Once deactivated, a SLDMB is safe to be disposed of with standard garbage.

4.11.10 Data Availability Outside the Coast Guard

SLDMB drift data is useful to many other persons and agencies outside the Coast Guard; in particular it is valuable to the oceanographic community (government and academia). At present there is not a direct access capability for persons or agencies outside the Coast Guard to the data produced by Coast Guard deployed SLDMBs. There is no restriction on providing this data upon request. Requests for data should be forwarded to Commandant (CG-SAR-1).

Section 4.12
SAR and Security Concerns

4.12.1 Non-Immigrant Security Concerns

In carrying out our SAR mission we routinely MEDEVAC persons from vessels to the US for emergency medical treatment and bring other SAR incident survivors into the US. ***In such cases where the individual(s) are not believed to be US citizens or US permanent resident aliens, the SMC shall notify immigration enforcement officials immediately to coordinate any law enforcement issues.***

Section 4.13
Maritime Law Enforcement and Vessel Safety

4.13.1 Vessel Safety Law Enforcement

Vessel safety law enforcement supports the overall goal of promoting the safety of life and property at sea and protecting the marine environment. In carrying out this mission, the Coast Guard's role primarily consists of ensuring compliance with laws and regulations through enforcement action and educating members of the maritime industry and the boating public. Specific guidance regarding vessel safety law enforcement, including terminating voyages is contained in reference (o).

4.13.2 Safe Operation founded in Law

Titles 33 and 46 of the United States Code and other U.S. laws, international laws, and treaties promote the safe operation of commercial and recreational vessels. The Safety of Life At Sea Convention (SOLAS) and associated Protocols establish international standards for seaworthiness and carriage of life saving equipment.

4.13.3 Manifestly Unsafe Voyage

Pursuant to authority contained in 33 CFR 177.04, the District Commander may declare a U.S. recreational or uninspected passenger vessel to be engaged in a Manifestly Unsafe Voyage.

4.13.4 Termination

Violations of law and treaties that create an especially hazardous condition may subject U.S. recreational and uninspected passenger vessels to voyage termination under 33 CFR Part 177. Termination is authorized when one or more specifically defined unsafe conditions exist, they cannot be corrected on the spot, and continued operation of the vessel constitutes an especially hazardous condition. Procedures regarding voyage termination, including authority to terminate the voyage of an uninspected commercial fishing vessel, are discussed in reference (o).

4.13.4.1 Termination order and additional considerations. The goal of termination is to protect the safety of the persons onboard the vessel and the maritime public. Once the decision to terminate a voyage has been made, Boarding Officers may need to consider additional actions necessary to alleviate the especially hazardous condition (e.g., removing passengers and/or cargo from the vessel, escorting or towing the vessel to port). ***An intoxicated operator shall not be directed or permitted to operate the vessel.***

4.13.4.2 Termination and the Commercial Fishing Industry Vessel Safety Act (CFIVSA), 46 USC 4501-4508.

(a) The CFIVSA establishes a national program to reduce commercial fishing vessel losses and fatalities. Pursuant to, regulations prescribing equipment and operational requirements for U.S. fishing, fish processing and fish tender vessels have been promulgated in 46 CFR Part 28. It is beyond the scope of this Addendum to describe elements and enforcement policy associated with each of these regulations. The most significant regulatory requirements are contained in reference (cc).

(b) Violations of the CFIVSA that create an especially hazardous condition may subject the boarded vessel to voyage termination under 46 CFR Part 28.

4.13.4.3 Termination and SAR considerations. Based on the situation, the Coast Guard's response to a vessel termination should be assigned the appropriate SAR phase.

Section 4.14
Places of Refuge

4.14.1 General

Ships in need of assistance may request national authorities to make available a place of refuge. Authorities may provide such assistance, while exercising the prerogatives and rights of sovereignty, including border control, coastal zone protection and national self-defense. The International Maritime Organization (IMO) has established guidelines on places of refuge (Assembly Resolution A.949(23)). A ship may be involved in an incident or marine casualty (e.g., fire, engine or other casualty that affects the seaworthiness of the vessel) and may need assistance (e.g., sheltered area where cargo can be lightered or repairs can be performed, etc.), but not be in a distress situation that requires rescue of those on board; or may be in distress, but those on board have already been rescued, with the possible exception of those who have remained or been placed on board to deal with the ship's situation. IMO recommends that nations establish a maritime assistance service (MAS) to serve as a national point of contact in such situations, and has developed relevant guidelines (Assembly Resolution A.950(23)). Both of these Resolutions are available on the internet web site of Commandant (CG-SAR-1).

4.14.2 Definitions

4.14.2.1 Ship in need of assistance: a ship in a situation, apart from one requiring rescue of persons on board, that could give rise to loss of the ship or to an environmental or navigation hazard.

4.14.2.2 Place of refuge: location where actions can be taken for a ship in need of assistance to stabilize its condition, reduce hazards to navigation, and protect human life and the environment.

4.14.2.3 Maritime Assistance Service (MAS): a contact between a ship master or company and national authorities on matters relating to a place of refuge.

4.14.3 Discussion

Places of refuge are for ships needing assistance, and are distinct from places of safety to which persons are delivered once they are recovered from a distress situation. Although a claim of force majeure under international law may give rise to a request for a place of refuge, technically, the two concepts are distinct. Place of refuge decisions typically involve complex technical, legal and political considerations beyond the realm of SAR. A MAS provides communication services similar to those provided by an RCC; in most countries, including the U.S., RCCs perform the MAS function since shipmasters naturally contact them when dealing with dangerous situations.

4.14.4 Relevance to Search and Rescue

Assistance to ships and other craft in distress is not considered to be a SAR effort unless it also entails assisting persons in distress (see the definition of "rescue"). A national point of contact that serves as the MAS often is, as in the U.S., an RCC; however, other authorities may serve as MAS in some countries. A shipmaster or shipping company dealing with a ship needing assistance can be expected to contact a Coast Guard RCC. Some scenarios may actually or eventually involve persons in distress as well as a ship in distress.

4.14.5 Priorities

Granting of a place where a ship needing assistance can come may be a difficult decision because overall risks to the ship, safety, security or the environment may be greater if the ship remains in the open sea, or greater if the ship is taken to a place of refuge. The concerns need to be balanced and considered on a case-by-case basis by experts, and might involve a political decision. ***If the situation ever evolves to where a person or persons on board the ship are in distress, concerns for lifesaving shall take priority over other concerns, and SAR authorities become responsible for assisting the persons in distress.***

4.14.6 Responsibility for Places of Refuge and Maritime Assistance Service

Within the Coast Guard, Captains of the Port (COTPs) have the primary responsibility for decisions made on place of refuge requests, and should incorporate the relevant IMO guidelines into their contingency planning and response activities. RCC staff should understand the distinctions between place of refuge and SAR cases. They should be prepared to function as MAS should the need arise, and have plans of operation in place to ensure close cooperation with the appropriate COTP in such cases. RCCs should be prepared to immediately relay any request for a place of refuge to the COTP, have cooperative arrangements in place with the COTP to monitor such cases if potential exists for persons in distress, and as appropriate, facilitate communications between the COTP and the shipmaster or other company representative who made the request.

Section 4.15
Persons Falling or Jumping from Bridges

4.15.1 Appropriate Response

Whenever a Coast Guard facility receives a report of a person falling or jumping from a bridge into the water and any doubt about the person's safety exists, the report shall be treated as a distress call with a corresponding appropriate response. Appropriate local authorities shall be notified immediately. They should be requested to investigate the incident and, if they have appropriate resources, to assist in the search. If the report is received from local authorities with a request to provide Coast Guard assistance, standard policy for providing assistance to local authorities applies (see Section 1.5.4 of this Addendum and Section 15-3-1 of reference (dd)).

4.15.2 Duration of Search

4.15.2.1 The duration of Coast Guard participation in a search for someone who has fallen or jumped from a bridge may be based on the following factors:

(a) Chances of surviving the fall. The primary factor is height of the bridge above the water at the point from which the person fell or jumped. Water depth at the point of impact is another consideration.

(b) Chances of continued survival in the water. Primary factors include likelihood of injuries from the fall, water temperature, and nature of the currents.

(c) Will to live. Some who jump from bridges are attempting suicide, but this does not necessarily correspond to a lack of the will to live.

(d) Availability of adequate resources on scene from local agencies.

(e) Nature of the searching being done by the responsible local agencies. If in body recovery mode, the SAR aspects of the incident may be considered ended. Further Coast Guard participation may take place at the discretion of the local unit or higher authority, but only as providing non-SAR assistance to local agencies.

(f) Knowledge of distress location narrowing the initial search area.

(g) Cessation of search activities by the responsible local agencies.

4.15.2.2 After searching the specific area around the water entry point (with consideration for drift), when deemed by the SMC that the chance of survival is negligible, search efforts may be suspended. An additional consideration is survivors are most often found soon after rescuers arrive on scene.

4.15.3 Local Liaison

Units with bridges in their areas of responsibility should liaise with the appropriate local authorities and develop joint plans and agreements on responses to incidents involving persons falling or jumping from bridges.

Section 4.16
Rescuing Pets and Other Animals

4.16.1 Overview

Occasionally, the Coast Guard is called upon to provide assistance to family pets aboard vessels or in other situations where persons are in distress. Coast Guard units are also called to rescue animals other then pets stranded due to natural causes.

4.16.2 Rescuing Pets during SAR Operations

When feasible, Coast Guard units should conduct pet rescues when their owners are rescued.

4.16.2.1 Authority. The person in charge of the rescue unit (pilot in command, boat coxswain, and cutter commanding officer) has the final decision authority to rescue the animal or not. The decision to rescue the animal should take into consideration:

(a) The space on the vessel or aircraft available to accommodate the animal;

(b) Rescue unit crew's ability to safely transfer the animal;

(c) Risk to the crew/victims to stay on scene and render aid;

(d) Risk to the crew/victims if the animal is brought on board;

(e) Ability of the animal to survive on the vessel until other rescuers can arrive to perform the animal recovery.

4.16.2.2 Assessment of Risk. The SAR unit should not be placed at increased risk solely for the purpose of pet rescue.

(a) Typically, when a vessel is in distress, the weather conditions in which a vessel is in distress are not ideal.

(b) The transport of animals in SAR facilities can pose a problem based on size, health and temperament of the animal being rescued.

4.16.2.3 Animal preparation. Animals are under a lot of stress and may bite or attack strangers out of fear. If there is time vessel owners should be directed to prepare the animal for rescue. For example, request that the animal be muzzled, kenneled, leashed, etc. This will not only assist the rescue but will make the rescue safer for the crew.

4.16.2.4 ***If pets cannot be rescued then their location shall be provided to animal rescue services for possible separate recovery of the pets.***

4.16.3 Rescuing Animals from the Water

There may be times when a call for assistance is made to rescue an animal from the water, e.g. on floating debris, adrift vessels, ice floes, weak ice, or caught in a rip tide when swimming.

4.16.3.1 ***SMC's shall work with local authorities to render assistance***. The marine police, DNR, animal services, etc. may be better equipped and in a better position to rescue the animal.

4.16.3.2 Coast Guard units should only assist when requested by local authorities, on a not to interfere with primary mission basis. This assistance will normally be limited to providing a platform from which the local authorities (animal services) can perform the rescue.

CHAPTER 5
COAST GUARD SEARCH AND RESCUE UNITS (SRUs)

Section 5.1
Operations Overview

All Coast Guard operational platforms (afloat and airborne) may be used to perform SAR. This Chapter assists SAR planners in selecting appropriate SRUs. Operating guidelines and procedures are contained in vessel type manuals or policies issued by SAR coordinators to meet local operating conditions.

Aircraft resources include Long-Range Search (LRS) fixed-wing aircraft (HC-130), Medium-Range Search (MRS) fixed-wing aircraft (HC-144), Medium-Range Recovery (MRR) helicopters (HH-60), and Short-Range Recovery (SRR) helicopters (HH-65). Decisions on using aircraft for the search or rescue phase of a SAR mission should be based on the availability of resources and a sound knowledge of their capabilities and limitations. Tables in this Chapter detail the capabilities and limitations of Coast Guard SRUs. Rescue planning should always include direct consultation with the SRU parent activity.

Surface craft include but are not limited to Medium Endurance (WMEC) cutters, Fast Response Cutters (WPC), Patrol Boats (WPB), ATON vessels and tugboats, standard boats (MLB, RB-M, and RB-S II), and nonstandard boats. While the majority of SAR responses among surface resources are by the standard and nonstandard boats, all surface craft are an important part of the Coast Guard SAR system. The various sections and tables in this chapter describe the capabilities and limitations of the many Coast Guard cutters and boats. SAR planners should have a thorough understanding of what these resources are capable of accomplishing.

Section 5.2
Surface Craft Operations

5.2.1 Overview

Coast Guard surface craft have numerous capabilities and characteristics that make them excellent search and rescue platforms. ***SMCs must have knowledge of the capabilities of all Coast Guard vessels, including Coast Guard Auxiliary vessels and non-Coast Guard surface assets***. Some of these non-Coast Guard assets include: state and local marine agency vessels, recreational vessels, commercial fishing vessels, and large merchant ships, such as those that participate in the Amver program.

Coast Guard patrol boats, High and Medium Endurance cutters, and Icebreakers have extensive communications suites that make them excellent command and control platforms. They also have the capability to stay on scene for longer periods of time than aircraft. Cutters are capable of rendering assistance in weather conditions than may preclude or limit the use of Coast Guard aircraft, and can generally recover a greater number of survivors than Coast Guard aircraft. Although larger cutters tend to operate primarily in Deepwater regions, all cutters (except WLICs, WLIs, and WLRs) are capable of performing search and rescue operations in the coastal zone.

All cutters are equipped with boats that are capable of directly recovering survivors from the water. In conditions that do not allow for the launching of cutter boats, direct cutter recovery can be accomplished through the use of cargo nets deployed over the side. Many cutters also have a designated cutter swimmer who can be deployed (tethered) directly from the ship under certain conditions to recover survivors from the water.

Cutters equipped with flight decks may have deployed helicopters that can improve the range and effectiveness of the cutter in a sustained offshore search operation. In addition to Coast Guard surface assets, SMCs should engage USN commands to determine if USN vessel “Lily Pad” support is a possibility to increase the range of the rescue helicopter. Some cutters are also equipped with night vision goggles that are useful during night searches.

Coast Guard boats are the primary surface search and rescue platform. Their smaller size allows them to conduct searches in harbors, bays, and other remote areas that are inaccessible to larger patrol boats and cutters. The majority of Coast Guard search and rescue cases take place within the range of station boats, such as the 45’ Response Boat – Medium (RB-M) and 47’ Motor Lifeboat (MLB). Both the 45’ RB-M and the 47’ MLB are equipped with de-watering pumps to assist flooding vessels, and they can tow vessels up to 100 and 150 gross tons, respectively. All Coast Guard boats can be used to insert Datum Marker Buoys, execute search patterns, and recover and transport survivors.

Section 5.3
Coast Guard Boats

Boats are multi-mission vessels that operate in coastal and inland waters and are not intended to operate independently for long periods of time. Boats are "single-watch" resources meaning they cannot be underway for an indefinite period of time. The information provided in this section will aid in selecting the appropriate boat resources for a given mission. Additional information can be found at the Coast Guard Boat Forces web page:
https://cg.portal.uscg.mil/units/cg731/SitePages/Home.aspx.

5.3.1 Standard Boats

The Coast Guard's multi-mission boats are designed to perform SAR missions in adverse weather and sea conditions. Some are designed for surf and bar operations and are self-righting and self-bailing.

5.3.1.1 47-Foot Motor Life Boat (MLB). The MLB is designed as a fast response rescue resource in high seas, surf, and heavy weather environments. The distribution of buoyancy in the deckhouse and mast platform, combined with the low center of gravity, allows the MLB to self-right in less than 30 seconds. With state of the art electronically controlled engines, fuel management systems and an integrated electronics suite (including four coxswain control stations), the MLB is the ideal platform for operations in extreme sea conditions. Operating limitations are published in reference (ee) and include those listed in Table 5-1.

5.3.1.2 Response Boat-Medium (RB-M). The RB-M is an aluminum, self-righting, high-speed, multi-mission capable boat. RB-Ms are designed to operate in moderate weather and sea conditions and are not permitted to operate in breaking surf or bar conditions.

5.3.1.3 Response Boat-Small (RB-S II). These highly maneuverable 29-foot boats provide excellent crew protection with an enclosed cabin and a heater and are powered by twin outboard gas engines. The Generation II RB-S is slightly larger than previous generation.

5.3.1.4 Aids to Navigation Boats (ATON) boats. The primary small response boat platform used by Aids to Navigation Teams is the 26' Trailerable Aids to Navigation Boat (TANB). The TANB is the workhorse for Aids to Navigation Teams (ANTs) throughout the country. Easily transportable via trailer, the TANB is also beneficial as a search and rescue unit as it can be driven to and launched from various boat ramps throughout the Area of Responsibility (AOR), minimizing underway transit time and allowing for faster response.

5.3.1.5 Cutter-Based Response Boats. Cutters typically have some form of boat capable of operating independently, although insight of the cutter. Commanding Officers/Officers in Charge will determine response restrictions.

5.3.2 Nonstandard Boats (NSBs)

NSBs, the majority of which are now Ice Skiffs (SKF-ICE) and Skiffs (SKF) run the gamut of capability in sea keeping, communications, navigation ability, and crew protection. SKFs are limited to within 1 NM of land and SKF-ICE are limited to within visibility for short-range ice rescue. While some NSBs may be more capable vessels with navigation and communications systems, others may be smaller and minimally equipped boats. ***The SMC shall be fully aware of the various types of NSBs available for use within the assigned AOR. In addition, the SMC shall constantly be aware of the potential risks when using a NSB vice standard boat***. A NSB's equipment outfit and operating limits are established by the applicable district commander.

5.3.2.1 ***SMCs must be sensitive to the effect of exposure and wet conditions on nonstandard boat crews***. Boat crew mission effectiveness degrades significantly after the first sortie hour.

5.3.2.2 ***SMCs must ensure NSB crews comply with the requirements of reference (gg).***

5.3.2.3 Towing with NSBs should be undertaken with caution, as they are not typically well equipped for towing.

5.3.3 Coast Guard Auxiliary Vessels

These boats frequently conduct coastal SAR. They are privately owned and not specifically designed for SAR. They vary in size, type, design, power, endurance, and durability. SAR planners should be familiar with their operating characteristics, capabilities, and limitations, and use them only for missions within their capabilities as directed by reference (e). Coast Guard Auxiliarists should keep the SAR planner (SMC) apprised of crew fatigue and vessel condition and capabilities during any SAR mission.

Table 5-1 Coast Guard Boat Characteristics and Limitations *

		RB-S II	45’ RB-M	47’ MLB
Type		Std – Shore	Std - Shore	Std – Shore
Length (ft)		31’ 7”	44’ 9”	48’ 11”
Cruise Speed (KTS)		25	30	21
Sprint Speed (KTS)		47	42.5	25+
Max Range (NM)		200	250	200
Max Offshore Distance (NM)		10	50	50
Max Sea conditions (ft)		6	12	30
Max Surf/Bar Conditions		None	None	20
Max Wind (KTS)		25	50	50
Max Draft (DIW)		2’ 9”	3’4”	4’ 6”
Towing Capacity (tons)		10	100 Tons	150 Tons
Max Persons O/B (incl. Crew)		10	24	34
SAR Equipment	Medical	Basic First Aid	Basic First Aid	Basic First Aid
	Litter	Capable	Yes	Yes
Special Equipment Capability	Dewatering Pump	P-6	P-6	P-6
	Illumination Flares	Varies	Varies	Varies
	Searchlight	1 Installed 1 Hand-held	1 Installed 1 Hand-held	3 Installed 1 Hand-held
	Radar	Yes	Yes	Yes
	UHF	Yes	Yes	Yes
	VHF-AM	No	No	No
Navigation	VHF-FM	Yes	Yes	Yes
	HF	No	Yes	Yes
	Loud Hailer	Yes	Yes	Yes
	Direction Finder	Yes	Yes	Yes
	GPS/DGPS	GPS (displaying digital, graphical, and WAAS)	GPS (displaying digital, graphical, and WAAS)	GPS (displaying digital, graphical, and WAAS)

* Summary only – See Operator’s Manual for definitive and most current information.

Section 5.4
Coast Guard Cutters

5.4.1 Patrol Boats

Patrol Boats are multi-mission cutters that perform SAR in coastal and deepwater environments. Their sea-keeping ability, speed, crew size, and moderate endurance provide an offshore SAR capability. WPB characteristics are summarized in Table 5-2.

5.4.1.1 87-Foot "Marine Protector Class" (WPB). The 87' Marine Protector Class is an extremely capable short-range SAR vessel. They have a 3-day endurance with a range of over 800 nautical miles. The 87' WPB is capable of speeds up to 25 knots, and can operate safely in 8-12 foot seas and conduct small boat operations in 5-8 foot seas. The 87' WPB carries sophisticated electronic navigation equipment capable of SAR planning and has a rated towing capacity of 200 tons.

5.4.1.2 110-Foot "Island Class" (WPB). The Island Class motion in heavy seas is greatly reduced through use of a stabilizing fin system. They carry a medium sized boat capable of being launched safely in 5-8 foot seas. Island Class Patrol Boats have a rated towing capacity of 500 tons but may be capable of towing larger vessels in ideal conditions. A and B class cutters have a minimum speed of 9.5 knots on one shaft or 11.5 knots on both shafts. This makes it complicated, although possible, for them to tow small vessels. All Island Class WPBs are capable of speeds in excess of 26 knots. Their range (full fuel load of 10,382 gallons) is 3,300 nautical miles at 12.8 knots. Their maximum expected continuous underway period is 5 days without replenishment or 10 days with replenishment.

5.4.2 Medium Endurance Cutters and National Security Cutters (WMEC and WMSL)

Medium Endurance Cutters and National Security Cutters (WMEC and WMSL) are multi-mission vessels and will perform SAR in coastal and oceanic environments. These cutters serve as excellent platforms as OSCs due to extended operational periods, seaworthiness, range, speed, communications, and space for a large number of survivors and equipment. General characteristics of WMECs and WMSLs, as provided by Commandant (CG-751), are in Table 5-2.

5.4.3 Fast Response Cutters (WPC)

Fast Response Cutters (FRC), have a wide range of capabilities that make it a capable coastal SAR asset. The cutter is capable of minimally operating in seas up to 20ft, and the CB-OTH-IV is capable of being launched in up to 10ft seas and speeds up to 28 kts. It's advanced communications and electronics suite provides more efficient SAR planning and execution. General characteristics of FRCs, as provided by Commandant (CG-751), are in Table 5-2.

5.4.4 Icebreakers (WAGB)

Icebreakers (WAGB) are multi-mission vessels and will perform SAR in coastal, oceanic, and high latitude (Arctic/Antarctic) environments. These cutters serve as excellent platforms as OSCs due to extended operational periods, seaworthiness, range, speed, communications, and space for a large number of survivors and equipment. General characteristics of WAGBs, as provided by Commandant (CG-751), are in Table 5-2.

5.4.5 Tugs (WYTL and WTGB)

Coast Guard tugs are often used for SAR. They also serve as primary assets for assistance to vessels in distress due to ice conditions. Because they are slow and have poor sea-keeping ability in adverse weather, they operate primarily in protected waters.

5.4.5.1 65-Foot Harbor Tugs (WYTL). Harbor tugs normally operate in protected waters with seas less than 6 feet. They can tow vessels up to 300 tons, break ice up to 12 inches, and have either a 3 or 4 meter RHI. Their endurance is 2 days without replenishment and maximum speed is 10 knots.

5.4.5.2 140-Foot Ice-Breaking Tugs (WTGB). These can be operated inshore and offshore in less than heavy weather conditions. Crew performance declines in 3-6 foot seas due to excessive deck wetness and rolling, but these vessels can proceed safely, although uncomfortably, in seas up to 15 feet. The WTGB is capable of towing a vessel up to 2000 LT and breaking ice from 24 – 36 inches. It has a draft of 12 feet. Endurance is 10 days. They are equipped with one RHI, but launching it in other than calm seas is hazardous.

Section 5.5
Aids to Navigation (ATON) Vessels

The Coast Guard operates a variety of boats and cutters in coastal waters to maintain aids to navigation. Search and rescue command centers should be familiar with the capabilities of those vessels operating in their area of responsibility in the event they are used for SAR. Although ATON vessels are designed and staffed for their mission of aids to navigation, they are excellent vessels of opportunity for distress SAR cases. A description of ATON vessels and their general capabilities is provided below.

5.5.1 49-Foot BUSLs

This vessel has fairly good sea-keeping ability, up to 6-foot seas, and can remain on scene overnight because of onboard accommodations. The top speed 10.5 knots limit a quick response. This boat may be operated up to 20 NM offshore.

5.5.2 55-Foot ANB

This is a fast platform with overnight accommodations and sea-keeping qualities. This boat has twin screws and a top speed of 21 knots and is capable of operating at low speeds for towing.

5.5.3 WLR Vessels

The 65-foot and 75-foot River Tenders (WLR), operate in calm river areas and can transit in seas less than 4 feet. Maximum speed is 10 knots and endurance is 10 days without replenishment. These have a small workboat onboard and can be used as a dive platform.

5.5.4 WLI and WLIC Vessels

The 65-foot and 100-foot Inland Buoy Tenders (WLI), and 75-foot, 100-foot and 160-foot Inland Construction Tenders (WLIC), operate in protected areas and can transit in seas of 3 to 6 feet. Maximum speed is 10 knots and endurance is 4 to 10 days without replenishment. These have a small workboat onboard and can be used as a dive platform.

5.5.5 175-Foot WLMs

The WLM is capable of limited offshore operations in 5-8 foot seas. They have a 3-day endurance, 2000 nm range, and a maximum speed of 12 kts. The WLM can transport fuel and water, and can carry a 40-ton deck load with a 10 ton lifting capacity. The WLM can operate in up to 9 inches of frozen ice or 3 feet of brash ice, and carries sophisticated electronic navigation and positioning equipment that includes SAR planning.

5.5.6 225-Foot WLBs

The WLB is a highly capable offshore platform with outstanding sea keeping capability in 12-20 foot seas. They have a 21-day endurance, 8000 nm range, and a maximum speed of 16 kts. The WLB can transport fuel and water, and carry an 80-ton deck load with a 20-ton lifting capacity. The WLB can operate in 14 inches of frozen ice and carries sophisticated electronic navigation and positioning equipment that includes SAR planning.

Table 5-2 Coast Guard Cutter Characteristics

		USCG Cutters						
		87' WPB	**110' WPB**	**140' WTGB**	**154' WPC**	**175' WLM**	**210' WMEC**	**225' WLB**
Deployment Duration		3 days	5 days/10 days w/replenishment	10 days	5 days	3 days	6 wks.	21 days
Max/Cruise Speed (KTS)		25/?	26+/12.8	14/12	28/18	12/10	18/13	16/12
Max Range (NM)		875	3,300	1,800	3,600	2,000	2,500/ 6,500	8,000
Max Sea Conditions (ft)		8-12	8-12	15	20	5-8		12-20
Towing Capacity (tons)		200	500		350	800	10,000	2,000
Draft (ft)		6	10	12	8.5	8	11	13
Ice Break (inches)				24 - 36		9		14
Lift Capacity (buoy boom)						10 tons		20 tons
SAR Equipment	First Aid	x	x	x	x	x	x	x
	Sickbay/ Corpsman						x	x
	Cutter swimmer	x	x	x	x	x	x	x
	Litter	x	x	x	x	x	x	x
	Portable Pump	x	x	x	x	x	x	x
	Flares	x	x	x	x	x	x	x
	Raft	x	x	x	x	x	x	x
	Portable VHF-FM Radio	x	x	x	x	x	x	x
Special Equipment Capability	Cutter boat Launch Restrictions	CBM; Up to 8ft.	CBM; Up to 8ft.	CBM; Calm seas	CB-OTH; Up to 10ft.	CBM; Calm seas	MSB/ CB-OTH/ CBL Up to 6ft.	CB-UTL/ CB-OTH/ CBL Up to 8ft.
	Flt. Deck Equipped	None	None	None	None	None	HH-65; In flight daylight fueling of HH-60	None
	NVG	x	x		x		x	x
	Searchlight	x	x	x	x	x	x	x
	VHF-AM DF		x		x		x	
	VHF-FM DF	x	x	x	x	x	x	x
	MF/HF DF	x	x			x	x	x
	X-band Radar	x	x	x	x	x	x	x
	S-band Radar	x						
	Air Search Radar							
Comms	UHF	x	x		x		x	x
	VHF-AM		x		x		x	
	VHF-FM	x	x	x	x	x	x	x
	VHF-FM DSC	x			x	x		x
	MF/HF	x	x	x	x	x	x	x
	MF/HF DSC				x			
	SATCOM		x		x		x	OCONUS Only
	MILSATCOM		x		x		x	

		USCG Cutters			
		270' WMEC	**418' WMSL**	**399' WAGB**	**420' WAGB**
Deployment Duration		6 wks.	60 days	80 days	65 days
Max/Cruise Speed (KTS)		19.5/12	28/15	20/13	17/12.5
Max Range (NM)		3,850/10,250	12,000	25,000	Unknown
Max Sea Conditions			8'	45'	
Towing Capacity (tons)		Unknown	21,000 Long Tons	Unknown	Unknown
Draft		14'	22.5'	32'	29'
Ice Break (inches)			N/A	"	54"
Lift Capacity (buoy boom)			N/A		
SAR Equipment	First Aid	x	x	x	x
	Sickbay/ Corpsman	x	x	x	x
	Cutter swimmer	x	x	x	x
	Litter	x	x	x	x
	Portable Pump	x	x	x	x
	Flares	x	x	x	x
	Raft	x	x	x	x
	Portable VHF Radios	x	x	x	x
Special Equipment Capability	Cutter Boat Launch Restrictions	MSB/CB-OTH up to Sea state 6ft. CBL up to Sea state 5ft.	LRI-II/CB-OTH: up to Sea state 5ft.	ASB/LCVP/CB-OTH/CBL; up to Sea state 7ft.	ASB/LCVP/CB-OTH/CBL up to Sea state 7ft.
	Flight Deck	HH-65/60	HH-65/60	HH-65/60	HH-65/60
	NVG	x	x		
	Searchlight	x	x	x	x
	VHF-AM DF	x	x		
	VHF-FM DF	x	x		
	MF/HF DF		x		
	X-band Radar	x	x	x	x
	S-band Radar	x	x		
	Air Search Radar	MK92	x		
Comms	UHF	x	x	x	x
	VHF-AM	x	x	x	x
	VHF-FM	x	x	x	x
	VHF-FM DSC	x	x		
	MF/HF	x	x	x	x
	MF/HF DSC		x		
	SATCOM	x	x	x	x
	MILSATCOM	x	x		

Section 5.6
Coast Guard Aircraft

Aircraft SRUs can quickly search large areas, intercept and escort aircraft or other SRUs, and perform aerial delivery of supplies, equipment and personnel. While the pilot is the final judge of SRU capability during a mission, the SMC should be aware of the specifications of the aircraft within the Coast Guard inventory. This will allow the SMC to make more informed decisions when allocating resources. Table 5-3 provides the characteristics of Coast Guard aircraft.

Table 5-3 Coast Guard Aircraft Characteristics[1]

		USCG Aircraft				
		H-65	**H-60**	**HC-130H**	**C-130J**	**HC-144**
MAX Weight (lbs.)		9,480	21,884	155,000	155,000	36,340
Fuel Capacity (lbs.)		1,900	6,460	62,900	62,900	9,150
MAX Endurance (hrs.)		3.5	6	13.5	19.5	11
Cruise Speed (KTAS)		125	125	298	320	220
Max Range (NM)		375	700	4,585	5,251	2,000
Radius of Action		150 [2]	300	1,600	2,283	880
Normal Crew (pilots/aircrew)		2/1	2/2	2/5	2/4	2/3
SAR Equipment	Hoist	x	x			
	Sling	x	x			
	Basket	x	x			
	Litter	x [3]	x	x[3]	x[3]	x[3]
	Pump	x [3]	x	x	x	x
	Homer	x	x	x	x	x
	Flares	x	x	x	x	x
	DMB	x	x	x	x	x
	SLDMB	x[4]	x[4]	x	x	x
	Raft	x	x	x	x	x
	Radios	x	x	x	x	x
	Survival kits			x	x	x
Special Equipment	NVG	x	x	x	x	x
	Searchlight	x	x			
	FLIR	x	x	x	x	x
	Air Search Radar					
	Surface Search Radar	x	x	x	x	x
	Weather Radar	x	x	x	x	x
	AIS receiver (unencrypted)			x	x	x
	Cargo Hook	x [5]	x [5]			
Communications	UHF	x	x	x	x	x
	VHF-AM	x	x	x	x	x
	VHF-FM	x	x	x	x	x
	HF	x	x	x	x	x
	Vinson	x	x	x	x	x
	AES	x	x		x	x

		USCG Aircraft				
		H-65	H-60	HC-130H	C-130J	HC-144
	ANDVT		x	x	x	x
	HF-ALE	x	x	x	x	x
	MILSATCOM	x	x	x	x	x
	STE				x	x
	CGDN (SIPR)					x
	CGDN (NIPR)				x	
	Classified COP					x
	Unclassified COP			x	x	
Navigation	VOR	x	x	x	x	x
	TACAN	x	x	x	x	x
	ADF	x	x	x	x	x
	GPS	x	x	x	x	x
	INS	x	x	x	x	x

Notes:
[1] Summary Only – See Operator's Manual for definitive and most current information.
[2] HH-65 radius of action reduced to approximately 120nm with the addition of a rescue swimmer.
[3] Not routinely carried on aircraft. Use determined by circumstances of each mission.
[4] SLDMB: Capable/certified to deploy; not stored on board for all units, SMC should direct taking along when launching
[5] HH-65A: 2K lbs – routine operational 1K lbs; HH-60J: 6K lbs

5.6.1 Helicopter Operations

Medium-Range Recovery (MRR) and Short-Range Recovery (SRR) aircraft are excellent resources for coastal searches. Maneuverability and outstanding visibility for search scanners make helicopters ideal for closely checking sightings and searching shorelines. They are generally excellent rescue platforms, capable of recovering personnel from a wide variety of distress situations on land and water.

5.6.2 Helicopter Capabilities

5.6.2.1 Coast Guard helicopters have the following capabilities:

(a) Hover;

(b) Perform hoists;

(c) Deliver de-watering pump;

(d) Confined area landing;

(e) Direction finding;

(f) Night illumination;

(g) Search radar;

(h) Datum marker buoy deployment;

(i) Night vision goggles;

(i) Where available: deliver fire suppression kit; deploy rescue swimmer/emergency medical technician; forward-looking infrared.

NOTE*: Litter and de-watering pump are not normally on board the HH-65, and must be specified for the mission*.

5.6.2.2 Procedures for helicopter hoisting are contained in the Flight Manual for each type of aircraft, and may vary depending on the on scene situation. Hoists from Coast Guard helicopters will normally be accomplished using a rescue basket, stokes litter, or rescue strop.

(a) The rescue basket is usually preferred, since it can be readily lowered to most surfaces and offers the greatest protection to the person being hoisted.

(b) The Stokes litter is used to hoist non-ambulatory persons, or persons who have injuries that might be aggravated by sitting in a rescue basket. ***Only the Coast Guard air-hoistable Stokes litter shall be used for helicopter hoisting. The Stokes litter is not normally carried aboard SRR helicopters; the aircrew shall be briefed when the need for a litter is anticipated***.

(c) The rescue strop is used only to hoist persons familiar with its proper use, for example, a military aviator. ***In all such cases, the rescue strop's safety straps must be fastened.***

(d) Hoists may be performed by lowering the rescue device directly or by first lowering a polypropylene trail line with weight bag, which allows persons on the surface to assist in maneuvering the rescue device as it is lowered and retrieved.

5.6.2.3 **Helicopter Evacuation/Hoist Safety Briefing for Vessels.** The safety and efficiency of helicopter hoist operations is greatly enhanced if the crew of the vessel or the ground party at the rescue scene is briefed in advance on what is required. The following "canned" briefing for alerting vessels covers the essential points, and should be transmitted as far in advance of the helicopter arrival as practicable:

HELICOPTER EVACUATION SAFETY BRIEFING FOR VESSELS

I have a detailed briefing on the helicopter evacuation. Please let me know when you have everyone who will be involved in the operation assembled around the radio. If some members of the crew cannot be spared due to duties, do the best you can to assemble the remainder. Let me know when you are ready.

[*Pause until advised the crew is assembled*]

I will begin this detailed briefing, but I will pause periodically to answer your questions. If you have none after checking that everyone understands, simply say, "go ahead".

A Coast Guard helicopter is en route to your location. You need to make some simple preparations to maximize the safety of the hoisting operation for the patient, your vessel, and the helicopter. Lower or stow all masts and booms that can be lowered. Provide a clear area for hoisting, preferably on the port side of the stern. Think about the clearance of rigging lines and antennas, as well as the chosen deck area. The helicopter pilot will make the final determination as to the location of the hoisting area upon arrival. Plan to keep all unnecessary personnel out of the way. All personnel on deck must wear PFDs. Do not take any flash photographs because they distract the helicopter crew during this demanding operation. During the entire hoist operation, gale force winds are generated by the rotor system of the helicopter and are strongest directly beneath it. Ensure that all loose gear is stowed or secured so as not to pose a personnel injury hazard due to being blown around on deck, or a hazard to the helicopter's rotor system or engines.

[*Pause*]

Ensure that the patient is wearing a PFD, unless their condition absolutely prevents it. The patient should be informed of any instructions of the rescue device. If a litter is used, the uppermost strap (chest strap) must be placed under the patient's arms and over the patient's chest. All other straps are to be placed over the patient's body. If a basket is used, the patient should sit in the bottom of the basket, with their back to one end and must keep their arms and legs inside the basket until the basket is brought inside the helicopter. The patient should have appropriate personal identification such as a driver's license, social security card, or passport and immunization record, a record of any medication(s) administered, and a modest supply of personal items, including any prescribed medications they may be taking regularly. Use of a small soft-type bag is recommended for packing these items. It should be tied to the litter between the patient's legs, or placed in the basket with the patient. Do not tie it to the hoist cable, hook, or steadying line. A person being hoisted should be free of any items of entanglement such as purses or luggage.

[*Pause*]

When the helicopter arrives in your area, change course to place the wind 30 degrees off your port bow and continue at standard speed. Once steadying up on the new heading, and after you are satisfied that you have no hazards on your radar, turn it to standby so that it does not radiate. You may turn it on again as soon as the helicopter departs the area with the patient. This new heading may be modified again at the request of the helicopter pilot upon arrival. Ensure that any heading the pilot asks for will not endanger your vessel. For smaller vessels, the rotor wash may make it difficult to steer the vessel. Advise the pilot immediately if any sea conditions or hazards exist which will limit your navigational capabilities.

[*Pause*]

The helicopter will provide all of the required equipment for the hoist operation and will brief you prior to commencing the hoist operation. The helicopter may first deliver an orange steadying line with weighted bags at the end. Until the hoist operation is completed, one of your crewmembers must tend this line at all times, keeping the line free from fouling. The rescue device should be guided to the selected location on deck by the vessel's crew using the steadying line. On each approach, allow the rescue device to touch your vessel, to discharge static electricity. If the rescue device has to be moved to the person being evacuated, unhook it from the hoist cable. Do not move the rescue device from the hoisting area with the hoist cable still attached. If the cable is unhooked, do not, I repeat, do not attach the hook or the cable to any part of your vessel. For everyone's safety, the helicopter may move off to the side while the patient is prepared for the hoist.

[*Pause*]

Upon signal from your vessel, the helicopter will move back over the vessel and lower the hook. Allow the hook to touch your vessel to discharge static electricity, and then fasten the hook to the rescue device using the large part of the hook. When everyone is ready for the hoist, have the deck crew give a thumb up signal to the helicopter. Ensure that the steadying line is tended to prevent the rescue device from swinging excessively, this is the primary reason it is being used. Once the rescue device is inside the helicopter, the helicopter crew will probably discard the steadying line. You may recover it or toss it overboard, but ensure you do not foul your screw either way.

[*Pause*]

When the helicopter, call sign "Coast Guard rescue ________", arrives, it will contact you on ________. The helicopter will look over your vessel, give final instructions, and begin the hoist. Do you have any questions?

[*Pause*]

The ETA of the helicopter is _______. I may be contacted on _______ if you have any further questions.

5.6.3 Fixed Wing Aircraft Operations

Long-Range Search (LRS) and Medium-Range Search (MRS) aircraft are excellent search platforms for most SAR missions. Fixed-wing aircraft generally are capable of covering large search areas and remaining on scene for several hours. Visual scanning by crewmembers, combined with electronic sensors such as radar, homing and night vision devices, and other specialized equipment, provide an extremely effective search capability. They are particularly effective when searching for larger targets and when searching large areas. Their higher speed makes them less effective when searching for a person in the water or when searching with track spacing less than one nautical mile. Fixed-wing aircraft may also be effective during the rescue phase of a SAR mission, especially in cases requiring: aerial delivery of equipment, communications, navigation assistance for rotary wing or surface craft, locating targets prior to arrival of rescue units, briefing vessel on helicopter hoisting procedures, providing on scene weather, providing SAR and communications coverage for the helicopter, or extended coverage.

All aircraft are equipped with an onboard navigation system that can compute the heading, distance, time and location (rendezvous point) to reach a distressed aircraft or vessel. Data necessary for this computation includes last known position of the target (latitude/longitude), time of the location, target heading and target speed (true air speed for aircraft/speed of advance for vessels).

5.6.4 Aerial Delivery

The Coast Guard fixed-wing MRS and LRS aircraft that can deliver various SAR equipment in flight. Specific delivery procedures for each aircraft are in the aircraft flight manuals. However, the following information is useful to personnel planning SAR operations.

5.6.4.1 Aerial Delivery Procedures. Items may be dropped either free-fall (message block only) or with a parachute. A parachute with trail line attached is used for most SAR aerial deliveries. The parachute slows descent, reducing the possibility of damaging the item on impact, and of endangering the vessel if it is inadvertently hit. Ideally, the trail line falls over the target and the dropped object lands in the water close aboard. Except in special cases, equipment should not be dropped directly onto target vessels. Parachute weight limits are listed in reference (hh).

5.6.4.2 Air-Deployable Rescue Equipment. Reference (hh) restricts aerial delivery to the items listed in that publication. Authorization for delivering other items should be requested from

Commandant (CG-711) as soon as the need is anticipated. Analyzing the many safety factors of each nonstandard delivery takes time, and may preclude immediate approval.

5.6.5 Judging Distances by Lookouts on Aircraft

Lookouts in search aircraft must concentrate their visual scans within the distance conforming with the track spacing assigned to the SRU. Distance determination over open water can be very difficult and sight distance varies with the altitude of the aircraft. When there is an opportunity, an effective method is to locate a search object such as a vessel on the radar and maneuver the aircraft to place the vessel the same approximate distance from the aircraft as the lookout's required scan based upon the track spacing. Once the lookouts can see the actual distance, they can better orient their scan to the required track space. Without a visual reference, lookouts have a tendency to look much farther out than the distance desired, particularly when visibility is good.

NOTE: ***A lookout must be looking at least 10 degrees below the horizon to be searching within 1 NM of the SRU when the aircraft is at an altitude of 1000 feet***. In particular, lookouts should avoid the natural tendency to look at the horizon, which is many miles farther away than the maximum detection range of most SAR search objects. The maximum scan range should fall between one and two sweep widths of the SRU.

5.6.5.1 Example. On a visual search with a 1 NM sweep width, lookouts should concentrate their search within about 1 NM of the SRU since the area beyond this distance will yield only a small chance of search object detection. Scanning distance from the SRU should not be adjusted on the basis of track spacing. It is important to understand that the POD vs. Coverage curves are based on the cumulative effects of scanning the areas between tracks from the adjacent tracks. However, for all practical purposes the maximum detection range usually falls between one and two sweep widths. This means that in a low-coverage search, the scan range may be less than the track spacing, while at moderate to high coverage the scan range should be equal to or greater than the track spacing. For all track spacings, the maximum scan range should fall between one and two ***sweep widths*** of the SRU. ***As noted, a lookout must be looking at least 10 degrees below the horizon to be searching within 1 NM of the SRU when the aircraft is at an altitude of 1000 feet***. It is surprising to find out how low below the horizon 10 degrees looks. See Figure 5-1. ***Lookouts must use a plotter or other measuring device to identify the desired angle.*** The following procedures are suggested for aircraft lookouts to use to determine the correct sight distance for searches:

(a) Using a clear plastic plotter:

(1) Hold the plotter with the straight edge up and sight down the straight edge to the horizon.

(2) Without moving anything but your eyeball, look down the desired degree line (for example, 10 degrees for 1 mile at 1000 feet). See Figure 5-1.

(3) The point where your gaze meets the water is the desired distance from the aircraft.

(4) To fix this sight picture, make a small mark on the window with a grease pencil or use a point on a fixed structural part of the aircraft such as wing pods, engine nacelles,

sponsons, etc. Remember, this sight line is correct for the altitude of the aircraft and the lookout's seated or standing height.

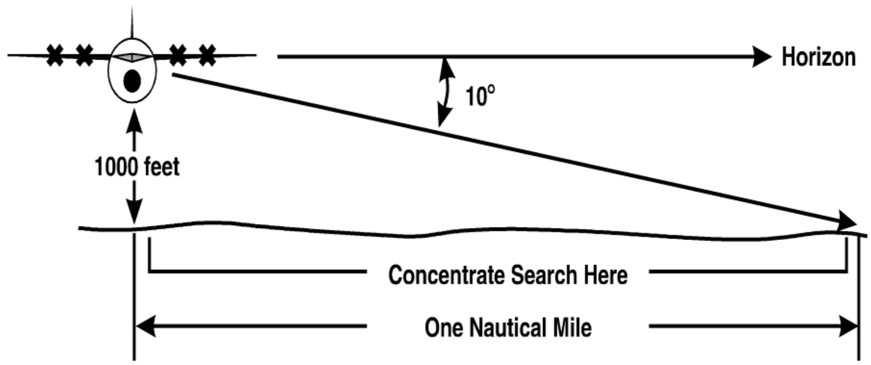

Figure 5-1 Example of Angle Below Horizon for Search Distance

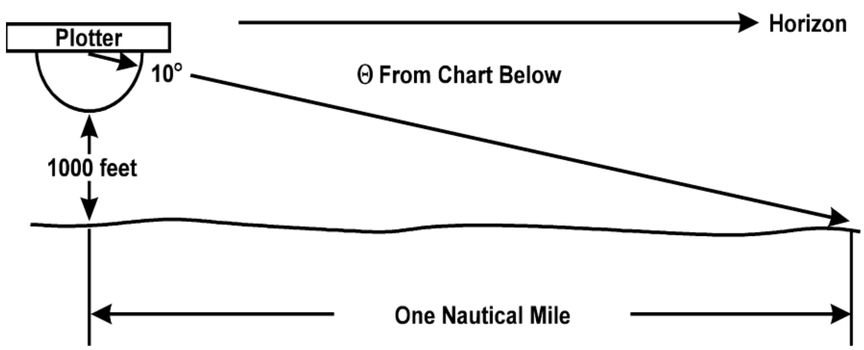

Figure 5-2 Use of Plotter to Determine Proper Sight Angle

(b) Use of points of reference on aircraft.

(1) Aircrews should determine various reference points on the aircraft for each lookout position that would correspond to distances for certain altitudes. Once established and lookouts are trained, then angles can be adjusted easily by the lookouts when the SRU changes altitude or track spacing assigned to the SRU is revised.

(2) The following table shows angles below the horizon by altitude for "rule of thumb" determination of distance.

Table 5-4 Angle Below Horizon by Altitude for Appropriate Distance

Altitude in Feet	Angle (in degrees) Between Horizon and Max Point of Search							
5000	59	40	29	23	12	8	6	5
4000	53	34	24	18	9	6	5	4
3000	45	27	18	14	7	5	4	3
2000	34	18	13	9	5	3	2	
1500	27	14	9	7	4	2		
1000	18	9	6	5	2			
500	9	5	3	2				
	0.5	1.0	1.5	2.0	4.0	6.0	8.0	10.0
	Distance In Nautical Miles							

Section 5.7
Crew Fatigue

5.7.1 Overview

Crew fatigue can place greater limitations on the performance capabilities of SAR vessels and aircraft than the operating environment. Fatigue is a condition of impaired mental and physical performance brought about by extended periods of exertion and stress, which reduces the individual's capability to respond to external stimuli. Some factors contributing to fatigue are sleep loss, exposure to temperature extremes (hypothermia and heat stress), motion sickness, and changes in work and sleep cycles, physical exertion, workload, illness, hunger, and boredom.

5.7.2 Boat Crew Fatigue Standards

The standards for boat crew fatigue are provided in reference (g).

5.7.2.1 Background

Accidents in boat operations injure our personnel, reduce our operational capabilities, and cost money. Many of these mishaps have generally been attributed to crewmember error caused by insufficient training, or experience, compounded by prolonged operations and crew fatigue. Evidence exists to associate a high percentage of the mishaps with prolonged operations and crew fatigue. Since fatigue adversely affects operational capability and safety, it is necessary to establish reasonable boat crew utilization criteria. In doing so, mandatory boat crew mission hour limits have been established in reference (g).

Fatigued personnel may not realize their physical state. A fatigued boat crew is physically and mentally unprepared for the rigors of a mission. They make judgment errors in boat handling and seamanship and exhibit decreased coordination, a narrowed attention span and a lower standard of performance. In addition, they show a decreased concern for safety and a willingness to "cut corners." Chronic fatigue must be reduced.

These guidelines are not a new concept. They are based on operational experience and subjective analysis of boat crew missions. The most immediate benefits to be derived from this program are the reduction of fatigue related mishaps involving boat crews and improved boat crew performance.

Fatigue standards generally provide maximum underway hours. These hours may be an accumulation of several missions (SAR, ELT, MEP, etc.) over a 24-hour period. However, there are occasions, especially during periods of severe weather, where operations will require a long amount of time to complete. In such cases, the prolonged hours and heavy weather will have an accelerating effect on the onset of fatigue as will the amount of time a crew member has been on duty or working prior to the mission. ***In establishing boat crew utilization criteria, consideration must be given to the cumulative effects of fatigue-inducing factors (heavy weather, temperature, boat mission, etc.), and human factors (motion sickness, survival clothing, changes in sleep and work cycles, work-duty time, etc.).***

The guidelines presented are not intended to unduly restrict operational commanders when urgent operations are necessary. They are designed as the basis to modify the manner in which we pursue our missions to ensure safety, protect our personnel and to improve the overall quality of the services provided. ***No guidelines can cover every situation that will arise; however, the operational commander must consider the potential for urgent SAR (season, boating activity, weather, etc.) and risk. Common sense and sound judgment must be applied. The operational commander must determine the best course to follow in accomplishing certain urgent missions***. Except for emergencies, it is not intended that additional crews be recalled when fatigue limits are reached. Other means of assistance such as other federal, state, local government resources, commercial, Coast Guard Auxiliary or adjacent units should be utilized in responding to non-urgent cases.

Units that cannot comply with operational and training requirements** and **the intent of the boat crew utilization guidelines without an increase in the unit's personnel allowance shall bring this information to the attention of the applicable program manager through the chain of command. This information provides operational justification for the billet needs. Subsequent request for additional billets, which would permit compliance, must be specific and fully justified.

The Crew Rest and Utilization guidelines, outlined in reference (g), provide operational commanders maximum underway limits for boat crew personnel in order to improve their mental and physical readiness. Individual benefits derived depend upon the proper use of off-duty time to ensure good mental and physical condition. It is the responsibility of each boat crewmember to engage only in those off-duty activities that will not prevent reporting to duty fully rested.

The Commanding Officer/Officer-in-Charge of a station is responsible to determine when his or her boat crew is fatigued.

5.7.3 Aircrew Fatigue Standards

The standards for aircrew fatigue are provided in reference (hh).

5.7.3.1 Background. Uniform aircrew utilization standards are necessary to help reduce fatigue as a factor contributing to aircraft mishaps. The standards are not intended to unduly restrict operational commanders when urgent operations are required; exceptions may be made by cognizant commanders as authorized per reference (hh). The standards cannot cover every situation that will arise. ***The command must determine the best course to follow in accomplishing certain urgent missions.*** However, conformance with the "spirit" of these standards is necessary if chronic and acute fatigue is to be reduced. Commanding Officers may establish more stringent comprehensive requirements after taking into account the variety of conditions that affect their units such as mission, Bravo-Zero requirements, predominant weather, terrain, geographic location, individual pilot experience, use of sensors and mission time of day.

The spirit of these standards is to ensure that flight crews are well rested, alert, and capable of performing their duty safely. ***Although ground duties not related to a specific sortie are not counted as crew mission time, they must be considered in crew scheduling***.

Section 5.8
Rescue Swimmers

Properly trained rescue swimmers should be used, when possible, to recover fatigued, unconscious, entangled or injured survivors from the water. Their use may reduce significantly some of the dangers inherent in maneuvering rescue vessels close to survivors.

NOTE: ***Rescue and surface swimmers shall not enter capsized or submerged objects – they may reach inside while maintaining a grasp on a reference point on the exterior of the object***.

5.8.1 Coast Guard Air Station Rescue Swimmers

All Coast Guard air stations with helicopters have highly trained helicopter rescue swimmers who are EMT qualified. They are trained to deploy from the helicopter to recover an incapacitated victim from the water, day or night.

5.8.1.1 ***An SMC anticipating the need of a rescue swimmer shall specifically request one from the air station command; rescue swimmers are not a part of all flight crews***. Their availability also depends on helicopter weight and space limitations and on scene conditions. Policies and procedures for use of helicopter rescue swimmers are delineated in reference (jj).

5.8.1.2 Reference (jj) states:

"The decision to deploy a rescue swimmer (RS) is initiated by the pilot-in-command, but the rescue swimmer has the authority to decline deployment if the RS assesses the situation to be beyond his/her capabilities . . . if deployed next to a capsized or submerged object, the RS is permitted to search visually and reach inside while maintaining a grasp on a reference point on the exterior of the object."

5.8.2 Coast Guard Surface Swimmers

Surface swimmers are collateral duty swimmers trained through the Personnel Qualification Standard (PQS). They are deployed from floating units, piers, or the shore.

5.8.2.1 Surface swimmers deployed from cutters assist people in the water. They are tethered to the cutter and are not meant to act on their own. While surface swimmers are not required to be EMT qualified, they can assess an individual's physical condition and provide rescue breathing while the person is in the water. Surface swimmers become qualified by completing the Cutter Surface Swimmer PQS. Reference (kk) states:

"The Cutter Swimmer <u>shall not</u> enter capsized hulls air frames, submerged vessels, or vehicles. If a swimmer determines that a person is trapped under or in any object, they may reach inside while maintaining a grasp on a reference point from the exterior of the object. The decision to deploy the swimmer rests with the CO/OIC. Cutter swimmers may decline to deploy if they believe the situation is beyond their personal capability."

Dive operations shall not be conducted by surface swimmers. Dive operations should only be conducted by qualified civilian or military rescue divers, and may be supported by aviation or surface assets.

5.8.2.2 Surface swimmers from station boats are normally deployed only to assist in man-overboard situations. ***They shall not enter capsized hulls***. Reference (g) states: ". . . the coxswain will designate one of the crew as a swimmer . . .a swimmer should be used only when absolutely necessary because when a crewmember goes over the side to assist, it means an additional person has to be picked up from the water. ***Another crewmember must tend the line attached to the swimming harness at all times*** . . ."

Section 5.9
Passive Watchstanding

Many operational units in a BRAVO readiness status adhere to a passive watchstanding ("sleeper watch") posture to maintain the highest degree of readiness and for risk management purposes. This guidance governing Passive Watchstanding is intended to ensure that SAR Mission Coordinators have established a reliable means to contact crewmembers of operational units after-hours for tasking.

5.9.1 Maintaining Contact Access

Commanders of operational units shall ensure that adequate fail-safe measures are established and incorporated in unit Standard Operating Procedures and local directives. Commanding Officers and Officers-In-Charge responsible for units using passive watches shall ensure that phone systems are tested regularly for proper operation (i.e.; ring audio level and phone line connectivity). It is imperative that commands tasked with providing a BRAVO-0 response establish secondary call notification procedures using other CG support elements, methods or equipment external to the unit in the event of catastrophic failure of their phone system. Support elements or methods may include other adjacent Coast Guard commands, external local 7X24 emergency response providers, etc, who may physically relay CG Command Center notifications.

5.9.2 Command Center Requirements

Command Centers that exercise launch authority must examine their phone contact lists to ensure all notification means are quickly and clearly outlined in their respective SOPs.

CHAPTER 6
PROCEDURES FOR UNDERWATER INCIDENTS

Section 6.1
Underwater Incidents Overview

Though not mandated to perform underwater rescues, the Coast Guard is responsible for developing, maintaining, and operating facilities for the promotion of safety under--on and over--the high seas and navigable waters subject to the jurisdiction of the United States. Traditionally, the Coast Guard has assisted distressed persons wherever and whenever possible. The responsibility extends to civilian submersibles operating on scientific, industrial or other missions; capsized or sunken vessels; or crashed aircraft in which persons may be trapped. In many of these incidents the use of rescue divers is a likely course of action. Reference (ll) should be used in conjunction with this Addendum for all matters regarding the employment of rescue divers.

Section 6.2
Submersibles

Most SAR cases involving submersibles have occurred on the surface. The Coast Guard or local resources handle these. Rescues of persons trapped in sunken vessels will normally require assistance from outside resources.

Submersibles have good safety records, but the few underwater accidents have demonstrated the difficulty of rescue and the potential for high public interest. The number of submersibles overall, and especially for recreational and passenger-for-hire use, is increasing. This increases the probability of rescue incidents.

6.2.1 Coast Guard Resources

The Coast Guard has no special equipment to assist submerged vessels or persons trapped in underwater habitats. ***Suitable outside equipment and assistance must be requested.***

6.2.2 U.S. Navy Support

The U.S. Navy is the primary source of expertise and resources for complex underwater SAR incidents. The Navy's point of contact is the Navy Command Center Duty Captain at the Pentagon (703) 695-0231. This Navy command center can provide fleet resources, specialized experimental equipment and civilian undersea salvage specialists. When the Navy responds, it normally assumes SAR Mission Coordinator and the Coast Guard takes on a support role. ***Until then the Coast Guard must respond with its own or other available resources***.

6.2.3 Use of Divers

Reference (ll) states that a Commanding Officer may use military divers, commercial divers or similarly highly trained diving resources, such as local police divers. If a Commanding Officer (CO) is faced with a life-threatening situation and none of the military, commercial, or other highly trained diving resources is reasonably available, the CO may consider using personnel with recreational diver qualifications who volunteer their services. Reference (ll) states clearly that this discretion should be exercised most carefully after seriously considering the training, qualification, medical, physical, and psychological condition of the volunteer, the condition of the diver's equipment, and the hazards of the dive.

6.2.4 Mutual Assistance Plans

Submersible operators have no mutual assistance plans at this time. However, plans are being developed which may consider creation of a mutual assistance program for research/construction deep submersible owners and operators. NOAA and members of the deep diving submersible community are facilitating this effort.

6.2.5 Safety Requirements for Passenger-Carrying Submersibles

6.2.5.1 The regulations governing passenger-carrying submersibles can be found at Title 46, Code of Federal Regulations, subchapter T (46 CFR parts 175-187). Under 46 CFR 175.110 (a)(4), the requirements of subchapter T are applicable when the submersible is carrying at least one passenger for hire. Since those regulations are primarily intended to cover surface vessels, many of the requirements cannot be applied to or may otherwise be inappropriate for submersibles. Guidance for Certification of Passenger Carrying Submersibles, NVIC No. 5-

93 provides general guidance relative to the inspection and certification requirements for submersibles, and includes:

(a) Design and stability requirements;

(b) Lifesaving equipment;

(c) Fire protection equipment;

(d) Submersible operations; and

(e) Manning and licensing.

Additionally, submersibles may be subject to local operating restrictions imposed by the Captain of the Port (COTP) relative to navigation safety, port safety and security, and vessel traffic considerations.

6.2.6 Voluntary Reporting System for Submersibles

The Coast Guard operates a voluntary reporting system for civilian submersible operations for salvage, research, construction, etc. Submersible operators should be encouraged to provide the nearest Coast Guard District with details of their planned submersible operation.

Section 6.3
Persons Trapped in Capsized Vessels

Persons trapped under capsized vessels or in compartments (among others, this includes vessels, aircraft, and automobiles) pose extreme safety risks to both the victim and the SAR responders. Coast Guard resources for rescue in these cases are severely limited. Immediate Coast Guard SAR response resources may include SRUs that have rescue or surface swimmers. ***Rescue of persons trapped below the surface of the water must fully consider proper risk assessment and management***. The situation could easily be of such extreme risk that it is imprudent to risk the lives of Coast Guard personnel even when the lives of others are in peril. ***The District Commander shall ensure guidance is in place so that experienced supervisors--not the SRU crew--decide how to proceed with rescue attempts***.

6.3.1 Swimmers

Section 5.8 provides a description and operating guidelines for the various Coast Guard rescue swimmers. References (g), (jj), and (kk) provide detailed operating guidance and limitations on what the rescue swimmer, cutter swimmer and surface swimmer are allowed to do. ***Essentially, a Coast Guard swimmer shall NOT go under the water and enter a capsized or submerged object.***

6.3.2 Divers

For diving policy refer to the Coast Guard Diving Policies & Procedures Manual, COMDTINST M3150.1 (series), reference (ll). For policy on Rescue Diving use Reference (ll), Section 1.G.4 and for policy on Public Safety Diving use reference (ll), Section 5.E.5.

6.3.3 Rescue Procedures

6.3.3.1 Procedures recommended for rescuing personnel trapped in a capsized vessel are:

(a) Keep in contact with the person(s);

(b) Stabilize the hull;

(c) Estimate the volume of air remaining;

(d) ***Surface swimmers may attempt to direct trapped persons out but shall not dive under the vessel;***

(e) Inject clean air if possible;

(f) Only if no rescue is possible, may you consider re-righting the vessel. Refer to reference (kk).

Section 6.4

Underwater Acoustic Beacons (Pingers)

The Underwater Acoustic Beacon, commonly called a "pinger," emits a sound that may be detected by surface craft or divers using an underwater acoustic locator. Some aircraft have pingers installed, and in limited circumstances, SAR forces may be aided by attaching a pinger to the hull of a vessel.

6.4.1 Acoustic Beacons on Aircraft

Many aircraft downed in moderate or shallow waters are not found, or excessive time and funds are expended in determining crash locations. Some of these aircraft could have been located if they had an installed pinger. All Coast Guard aircraft are equipped with pingers.

6.4.2 Acoustic Beacons on Vessels

Pingers may be attached to the hull of an overturned vessel that is in danger of sinking when personnel are known or suspected to be trapped inside the hull. This action is not routine, and is not taken in all SAR cases involving overturned hulls. When such action is needed, the OSC should request a pinger from the SMC.

6.4.3 Acoustic Beacon Support

Pingers are not readily available in all locations. They may be obtained from a Coast Guard or U.S. Navy air station or by calling the U.S. Navy Command Center Duty Captain desk at the Pentagon for supply by the Supervisor of Salvage. Personnel trained to locate pingers using locator receivers are available through the U.S. Navy Supervisor of Salvage office. For emergencies, requests for service are to be made with the U.S. Navy Duty Captain Desk in the Pentagon (703) 695-0231.

Section 6.5
Action Required for Underwater SAR Preparation

Due to the limited capability of Coast Guard resources to respond to underwater incidents, the best response is to plan ahead, to know the limitations, and to know whom to contact for additional assistance.

6.5.1 Coast Guard Rescue Coordination Centers

6.5.1.1 ***Coast Guard Rescue Coordination Centers shall***:

(a) ***Monitor civilian submersible and underwater habitat activity within the District and advise the Commandant of developments that may affect procedures and policies of this directive***.

(b) ***Encourage submersible manufacturers, owners and operators to participate in the voluntary reporting system for submersible operations***.

(c) ***When informed of a civilian submersible operation, send a message to Chief of Naval Operations and issue a Notice to Mariners giving the location(s) and time(s) of the operation***. Tourist submersibles are approved for specific sites and may have as many as 12 dives per day; therefore, notification for tourist submersibles should be as a permanent record.

(d) ***Maintain files of copies of the Certificate of Inspection (COI) and a copy of the submersible operations manual as approved by the COTP in the RCC for reference in the event of a rescue incident***.

(e) ***Establish a resource file of local, state, commercial, military rescue and/or salvage divers and submersibles for use in underwater search and rescue***.

(f) ***When assistance is required for a civilian underwater SAR incident***:

(1) ***Notify the Navy Command Center Duty Captain at the Pentagon*** (on duty 24 hours: Commercial (703) 695-0231, Autovon 225-0231).

(2) ***If the incident involves a civilian submersible, request implementation of SUBMISS/ SUBSUNK per reference (mm). Send a follow-up message confirming the request***.

(3) ***Respond with Coast Guard resources as appropriate (On Scene Commander, rescue platform such as buoy tender, traffic control, aircraft, communications and/or logistics.).***

(4) ***Designate a SAR Mission Coordinator (SMC).*** If Navy resources are used, the Navy may assume and designate a SMC. If the Navy assumes SMC, continue to assist as requested.

(5) ***Inform the Area Commander, Coast Guard National Command Center and Commandant (CG-SAR) of the progress of the rescue before and after the Navy assumes SMC.***

(6) ***Prepare a SAR case study in addition to the normal assistance report***.

(g) ***Maintain liaison with the Navy and other organizations to coordinate planning for civilian underwater SAR emergencies.***

(h) ***Be familiar and ensure subordinate commands that may designate SMCs are familiar with the contents of reference (ll) in regard to use of rescue divers, and treatment & evacuation of injured divers.***

6.5.2 Sectors/Officer in Charge of Marine Inspection (OCMI)

Sectors/OCMIs shall:

6.5.2.1 ***Forward copies of the Certificate of Inspection (COI) and the approved operations manual of passenger carrying submersibles which they license to the appropriate RCC showing safety features and conditions, determined route, depth and any other applicable information necessary to prosecute a SAR case with the vessel***.

6.5.2.2 ***Submit to the appropriate RCC information on any requirements developed for recreational submersibles. Authorizations for recreational submersible operations should be copied to the RCC***.

Section 6.6
Scuba Diving Incidents

Scuba divers occasionally suffer unique, compressed-gas injuries that few SAR response personnel understand or are prepared to handle. Coast Guard SRUs are not required to be experts in providing medical diagnosis or treatment for such injuries. However, it is expected that personnel will be able to recognize the general symptoms of dive related injuries so that their potential severity is recognized and that basic steps are taken to minimize worsening the medical condition.

6.6.1 Dive Related Injuries and Symptoms

Dive related injuries fall into three general categories: decompression sickness, air embolism, and nitrogen narcosis. Decompression sickness and air embolism are the most serious threats to the diver and require immediate treatment with hyperbaric oxygen in a recompression chamber.

6.6.1.1 **Decompression sickness**, sometimes called the "bends", is generally brought about by the diver absorbing gas into the blood from the compressed air breathed while diving. A diver must ascend slowly to avoid having these gases form into bubbles. Symptoms of bubble formation include pain at the joints, chest pain, headache/dizziness, confusion and numbness.

6.6.1.2 **Air embolism** is caused by excess gas pressure inside the lungs. It is most likely to develop during an improperly executed ascent. As the diver ascends, the air in the lungs expands, forcing gas bubbles directly into the bloodstream. This air (bubble) typically is transported to the brain where blockage of blood flow will occur depriving the brain of oxygen. Symptoms include blurred vision, paralysis, dizziness/nausea, weakness, confusion, headache, chest pain and unconsciousness.

6.6.1.3 **Nitrogen narcosis** or "rapture of the deep", which is not a decompression illness, is caused by the narcotic effect of the nitrogen in the diver's breathing medium and disappears when the diver moves into shallower water or surfaces.

6.6.2 Emergency Treatment for Decompression Sickness and Air Embolism

Companion divers of the victim will be excellent sources of information. An effort should be made to have one travel with the patient to the medical facility. Since it can be difficult to differentiate between decompression sickness and air embolism, it is best for field treatment of both. While many SRUs cannot provide extensive medical assistance, they do serve the essential role of transporting the victim and possibly stabilizing the situation.

6.6.2.1 Where the capability exists, the following steps are advised:

(a) Ensure airway, breathing, and circulation (ABC);

(b) Calm and reassure the victim;

(c) Attempt medical assessment and diving history;

(d) Administer fluids: If more than one hour from medical help, allow victim oral fluids at the rate of 4 fluid ounces every 15 minutes as tolerated. Oral Fluids should be withheld if transport time is less than one hour;

(e) Administer 100% oxygen.

(f) Place victim in a supine (flat on back) position; if the victim is nauseated, place the victim on his/her left side for airway management;

(g) Transport to nearest medical facility/recompression chamber.

6.6.3 Transport of Diving Accident Patients

Dive accident injuries are aggravated by reduced atmospheric pressure. Unpressurized aircraft conducting a diving accident MEDEVAC should fly at the lowest safe altitude; recommendation is for MEDEVAC aircraft is to transport at 1000 feet or below. Pressurized aircraft need to pressurize to sea level.

6.6.4 SMC Procedures

Any Coast Guard facility that would expect to designate a SMC for a diving accident incident, typically RCCs and Command Centers, shall maintain a list of resources that can provide diving medical advice and a list of available recompression chambers. Divers Alert Network (DAN), located at Duke University Medical Center in North Carolina, is a nonprofit organization that provides emergency medical advice and assistance for underwater diving accidents. Diving emergency guidance can be obtained by telephone, **(919) 684-8111 for emergencies**, and (919) 684-2948 for routine matters.

CHAPTER 7
Emergency Support Function (ESF) #9/Catastrophic Incident Search and Rescue (CISAR) Policy

Section 7.1
Catastrophic Incident Search and Rescue (CISAR)

7.1.1 Overview

(a) Per references (pp) and (qq), CISAR consists of SAR operations carried out as all or part of the response to a Presidential emergency or disaster declaration.

(b) The nature of CISAR could range from limited SAR operations (e.g., limited number of persons in distress requiring assistance) to the conduct of a Mass Rescue Operation (MRO).

(c) For an incident to be identified as CISAR:

(1) The response is associated with a Presidential Declaration; and

(2) Reference (pp) is activated.

7.1.2 Catastrophic Incident Search and Rescue (CISAR) Addendum to the National Search and Rescue Supplement (NSS) to the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual (Reference (rr)).

(a) There are many different Federal, State, Tribal, Territorial/Insular Area, and local SAR response cultures, each with unique capabilities, terminology, and responsibilities. During a catastrophic incident, the Coast Guard, Department of Defense (DoD), National Park Service (NPS), and the Federal Emergency Management Agency (FEMA) may conduct multi-agency CISAR operations together in support of a unified command.

(b) Reference (rr) was developed to provide a common overarching framework for Federal SAR services on the interagency planning, management, and conduct of CISAR operations. It is an invaluable resource for Area and District SAR Coordinators, Sector Commanders, and Coast Guard SAR units in the conduct of CISAR operations. Reference (rr):

(1) Helps to resolve differences and define relationships between Federal Agencies under references (pp) and (qq), SC responsibilities under reference (ss), and Incident Commander responsibilities under the National Incident Management System (NIMS);

(2) Provides universal CISAR terminology and guidance that would apply in a multi-agency CISAR response in a catastrophic incident;

(3) Highlights the coordination required between Federal SAR authorities and FEMA Regions, States, Tribes, Territories/Insular Areas responsible for SAR support (e.g., logistics support, animal rescue, body recovery, etc.); and

(4) Standardizes CISAR geo-referencing.

7.1.3 Application

(a) In a disaster, the affected State, Tribe, Territory/Insular Area normally assumes responsibility for the SAR response. Each SAR authority may have different SAR capabilities and response plans—some SAR authorities are better prepared and equipped to conduct CISAR operations than others.

(b) Area and District SC and Sector Commander coordination and planning with their respective SAR authority partners before an incident occurs helps to improve coordination, cooperation, timeliness, and effectiveness of a unified response when a CISAR operation is conducted.

7.1.4 CISAR Policy

(a) ***Per references (tt) and (uu) and in support of references (pp), (qq), and (ss), Area and District SCs and Sector Commanders are authorized to coordinate and conduct CISAR operations.***

(b) ***Area and District SCs and Sector Commanders shall review and be familiar with references (pp), (qq), and (rr).***

(c) ***Area and District SCs and Sector Commanders shall use reference (rr) as an additional reference for the planning, coordination, and conduct of Coast Guard CISAR operations.***

(d) ***Area and District SCs and Sector Commanders shall plan for the conduct of Coast Guard CISAR operations with appropriate FEMA Region and State, Tribal, Territorial/Insular Area, and local SAR authorities within their respective aeronautical and maritime SRRs and Sector AORs.***

(e) ***References (a), (ss), (vv), and this policy shall remain in effect during the conduct of CISAR operations.***

(f) ***Coast Guard SAR units conducting CISAR operations are authorized to support the incident command, coordinating the response under NIMS/ICS.***

(g) ***If CISAR operations are conducted under reference (pp), then reference (rr) shall apply. Reference (rr) shall support Coast Guard CISAR operations, but not supplant reference (vv) and this policy.***

(h) ***During the conduct of CISAR operations, the Coast Guard shall initially consider an isolated person in the alert phase.***

(Note: Per reference (rr), in an ESF #9 incident only, an isolated person is any non-distress person or persons stranded within a specific area or residence by incident conditions where immediate assistance is not determined to be required.)

(i) ***During the conduct of CISAR operations, when in receipt of notification of a possible person in distress, the Coast Guard, in coordination with other SAR authorities, as required, shall determine whether the notification is in the alert phase or distress phase. Prioritization, coordination, and conduct of the CISAR operation shall be based on this determination.***

(Note: In non-CISAR operations, when the Coast Guard is in receipt of notification of a person in distress, the SMC initially classifies the incident as in the distress phase (i.e., the person making the notification makes the distress determination). As additional information is obtained and based on the circumstances of the incident, this initial assessment can be reevaluated and reclassified to another emergency phase. By comparison, a CISAR operation may include an MRO in which a large number of persons are in distress. With limited available CISAR resources, Coast Guard personnel, units, and other CISAR responders must be able to effectively evaluate the distress

notification and determine if the person making the notification is in grave and imminent danger and requiring immediate assistance (distress phase), or if apprehension exists as to the person's safety (alert phase). This evaluation is necessary so that Coast Guard units, personnel, and other CISAR responders are able to effectively provide immediate assistance with limited resources to life-threatening situations first. However, a person considered in the alert phase may need to be reclassified to the distress phase as the incident progresses, or the person's medical condition, environment, or other on scene circumstance change. Bottom line: Coast Guard units, personnel, and other CISAR responders cannot ignore persons considered in the alert phase.)

(j) ***Per reference (ss), Coast Guard SAR operations in Area and District aeronautical and maritime SRRs and in Sector AORs, not in support of a CISAR operation, shall continue to be coordinated and conducted as detailed in this policy and references (c), (ww) and (xx).***

(k) ***In a CISAR operation, the Coast Guard shall maintain and operate telecommunication capabilities to receive notification from persons in distress.***

(l) ***The Coast Guard shall claim SAR cases for all CISAR operations conducted.***

Section 7.2
Emergency Support Functions (ESFs)

7.2.1 Overview

(a) The Federal Government and many State, Tribal, Territorial/Insular Area governments organize their resources and capabilities, as well as those of certain private-sector and nongovernmental organizations, under 14 ESF Annexes:

(1) ESF #1 – Transportation.

(2) ESF #2 – Communications.

(3) ESF #3 – Public Works and Engineering.

(4) ESF #4 – Firefighting.

(5) ESF #5 – Information and Planning.

(6) ESF #6 – Mass Care, Emergency Assistance, Temporary Housing, and Human Services.

(7) ESF #7 – Logistics.

(8) ESF #8 – Public Health and Medical Services.

(9) ESF #9 – Search and Rescue.

(10) ESF #10 – Oil and Hazardous Materials Response.

(11) ESF #11 – Agriculture and Natural Resources.

(12) ESF #12 – Energy.

(13) ESF #13 – Public Safety and Security.

(14) ESF #14 – Cross-Sector Business and Infrastructure.

(15) ESF #15 – External Affairs.

(b) ESFs are a critical mechanism to coordinate functional capabilities and resources provided by Federal Departments and Agencies, along with certain private-sector companies and NGOs.

(c) ESFs may be selectively activated for both Stafford Act and non-Stafford Act incidents where State, Tribal, or Territorial/Insular Area authorities request Federal assistance.

7.2.2 ESF Primary Agency

(a) An ESF Primary Agency (PA) is a Federal Agency with significant authorities, roles, resources, or capabilities for a particular function within an ESF. A Federal Agency designated as an ESF PA serves as a Federal executive agent under the Federal Coordinating Officer (or Federal Resource Coordinator for non-Stafford Act incidents) to accomplish the ESF mission.

(b) When an ESF is activated in response to an incident, the PA is responsible for:

(1) Supporting the ESF Coordinator and coordinating closely with the other PAs and Supporting Agencies (SAs).

(2) Orchestrating Federal support within their functional area for an affected State.

(3) Providing staff for the operations functions at fixed and field facilities.

(4) Notifying and requesting assistance from SAs.

(5) Managing their respective Mission Assignments (MAs).

(6) Coordinating with SAs, as well as appropriate State officials, operations centers, and agencies.

(7) Working with appropriate private-sector organizations to maximize use of all available resources.

(8) Supporting and keeping other ESFs and organizational elements informed of ESF operational priorities and activities.

(9) Conducting situational and periodic readiness assessments.

(10) Executing contracts and procuring goods and services as needed.

(11) Ensuring financial and property accountability for ESF activities.

(12) Planning for short and long-term incident management and recovery operations.

(13) Maintaining trained personnel to support interagency emergency response and support teams.

(14) Identifying new equipment or capabilities required to prevent or respond to new or emerging threats and hazards, or to improve the ability to address existing threats.

Section 7.3
ESF #9 – Search and Rescue

7.3.1 Overview

(a) Reference (pp) provides the process in which Coast Guard SAR units are provided to assist a FEMA Region, or State, Tribe, Territory/Insular Area SAR authority requesting Federal SAR assistance.

(b) During incidents or potential incidents requiring a unified SAR response, Federal SAR responsibilities reside with ESF #9 PAs that provide timely and specialized SAR capabilities. SAs provide specific capabilities or resources that support reference (pp). In summary, reference (pp):

(1) Assigns the process in which Federal SAR facilities are deployed to support FEMA Regions, and State, Tribal, Territorial/Insular Area, and local SAR authorities when there is an actual or anticipated request for Federal SAR assistance.

(2) Is scalable to meet the specific requirements of each incident, based upon the nature and magnitude of the event, the suddenness of onset, and the availability of existing SAR facilities supporting the response. Federal SAR facilities are drawn from ESF #9 PAs and SAs.

(3) Is divided into three operational environments with PAs assigned for each environment:

a. Structural Collapse (Urban) SAR (US&R).

1. PA: Department of Homeland Security (DHS)/Federal Emergency Management Agency (FEMA).
2. US&R includes operations for natural and manmade disasters and catastrophic incidents, as well as other structural collapse operations that primarily require FEMA US&R task force operations.

b. Maritime/Coastal/Waterborne SAR.

1. PA: DHS/U.S. Coast Guard.
2. Maritime/coastal/waterborne SAR includes operations for natural and manmade disasters that primarily require Coast Guard air, cutter, boat, and response team operations.

c. Land SAR.

1. PAs: Department of the Interior (DOI)/National Park Service (NPS); Department of Defense (DoD).
2. Land SAR includes operations that require aviation and ground forces to meet mission objectives, other than maritime/coastal/waterborne and structural collapse SAR operations.

(c) ESF #9 Coordinator.

(1) DHS/FEMA is designated the ESF #9 Coordinator and is responsible for ESF #9 management and oversight.

(2) For every incident, the ESF #9 Coordinator assesses the specific SAR requirements and assigns one of the four PAs as the Overall Primary Agency (OPA) for that particular incident. Designation is dependent upon incident circumstances and the type of response required.

7.3.2 Application

(a) Because ESF #9 has four PAs for three different SAR environments, coordinating which PA provides the requested SAR resources to a FEMA Region, State, Tribe, or Territory/Insular Area can be a challenge. Based on the SAR environment, the ESF #9 Coordinator may designate the Coast Guard as ESF #9 Overall Primary Agency (OPA) during an incident response.

(b) Designation as ESF #9 OPA is a coordination responsibility between the Coast Guard and the other ESF #9 PAs, FEMA, and the SAR authority requesting Federal SAR assistance.

(c) When a FEMA Region, State, Tribe, or Territory/Insular Area requests Federal SAR support, the ESF #9 OPA receives the request and determines, in consultation with the other ESF #9 PAs, which PA provides the requested resources.

(d) Important ESF #9 OPA considerations include the following:

(1) ESF#9 Federal SAR facilities operate in support of the FEMA Region, State, Tribe, or Territory/Insular Area requesting the support.

(2) When Federal SAR facilities are requested by a FEMA Region, State, Tribe, or Territory/Insular Area, reference (rr) provides operational guidance during the CISAR operation.

(3) Anticipate only having a 72-96 hour window to conduct CISAR operations.

(4) Federal SAR facilities contracted to a requesting SAR authority under a Mission Assignment (MA) continue to follow Agency specific policies, procedures, and doctrine in the conduct of CISAR operations.

7.3.3 ESF #9 – Search and Rescue Policy

(a) Per reference (pp), the Coast Guard is designated ESF #9 PA for maritime/coastal/waterborne SAR.

(b) When Federal SAR facilities are requested under ESF #9 for CISAR operations, based on the geographical location of the incident, Commanders, Atlantic or Pacific Area may be designated ESF #9 OPA for a maritime/coastal/waterborne disaster (e.g., flooding, hurricane landfall). This designation shall be made by the ESF #9 Coordinator.

(Note: Designation as ESF #9 OPA is not based on whether Coast Guard SAR units are involved in the response, but solely on the type of incident.)

(Note: Coast Guard designation as ESF #9 OPA is based on the type of incident that has occurred (e.g., maritime, coastal, or waterborne event). For example, if flooding occurs within the continental U.S. beyond the U.S. coastal region, the Coast Guard normally is designated ESF #9 OPA because the incident is considered to be a "waterborne" incident.)

(Note: For hurricane landfall where there is minimal flooding, but significant structural/wind damage, the ESF #9 Coordinator may designate another ESF #9 PA to assume OPA other than the Coast Guard. However, this is the exception rather than the rule. The Coast Guard should always plan to assume ESF #9 OPA for any maritime, coastal, or waterborne incident requiring ESF #9 Federal SAR support.)

(a) ***Coast Guard ESF #9 OPA shall:***

(1) ***Support the ESF #9 Coordinator.***

(2) ***Coordinate requested Federal SAR support with the other ESF #9 PAs and SAs.***

(3) ***Notify and request assistance from ESF #9 SAs, as assigned in Reference (c).***

(4) ***Coordinate tasking of Coast Guard SAR units and personnel conducting ESF #9 CISAR operations.***

(5) ***Conduct ESF #9 planning with FEMA, other ESF PAs and SAs, as required.***

(6) ***For each incident operating period, compile Coast Guard SAR statistics for submission to FEMA and the other ESF #9 PAs.***

(b) ***Area SCs shall develop policy for the coordination and conduct of ESF #9 OPA responsibilities.***

(c) ***Area SCs shall coordinate ESF #9 policy and activities with District SCs to ensure effective CISAR response coordination and communication.***

(d) ***Per reference (rr) and this policy, when designated ESF #9 OPA, the Area shall coordinate the provisioning of Federal SAR facilities in support of the requesting FEMA Region or State, Tribe, Territory/Insular Area SAR authority requesting Federal SAR support.***

(e) ***Headquarters, Area and District SCs, and Sector Commanders preplanning between the ESF #9 PAs at the respective organizational level before an incident occurs shall be conducted to ensure effective coordination and provisioning of Coast Guard CISAR units and personnel when requested.***

(f) ***Headquarters, Area and District SCs, and Sector Commanders shall conduct ESF #9/CISAR planning and response preparedness activities with their respective Federal, State, Tribal, Territorial/Insular Area and local SAR authorities, as well as other local, State and regional ESF #9 PA representatives.***

(Note: Coast Guard CISAR planning is critical before an incident occurs to set expectations and improve coordination for an effective, unified SAR response.)

(g) ***For the conduct of a CISAR operation, the ESF #9 Coordinator may activate a Federal SAR Coordinator Group (FSARCG) comprised of representatives from each ESF PA to***

assist in coordinating the use of Federal SAR resources and information concerning the response. When activated by the ESF #9 Coordinator, the Coast Guard ESF #9 OPA shall provide a representative to the FSARCG.

(h) ***Area SCs shall develop FSARCG policy, training, and identify personnel available to deploy when the FSARCG is activated by the ESF #9 Coordinator.***

(i) ***The Coast Guard ESF #9 OPA shall conclude Federal SAR support for a CISAR operation when the following three criteria are met:***

(1) ***No Federal ESF #9 SAR facilities are being utilized by the SAR authority that requested Federal SAR assistance;***

(2) ***The SAR authority requesting ESF #9 support no longer requires or anticipates the use of Federal SAR facilities; and***

(3) ***The Coast Guard ESF #9 OPA, in consultation with FEMA and the ESF #9 PAs, concurs with terminating Federal ESF #9 SAR support.***

Section 7.4
Mission Assignments (MAs)/Mission Assignment Task Orders (MATOs)

7.4.1 Overview

(a) Mission Assignment (MA).

(1) Per references (xx) and (yy), a MA is a work order issued by FEMA to another Federal Agency that directs the completion of a specific task (e.g., State requests Coast Guard SAR logistical support), and cites funding, managerial controls, and other requirements. A MA may or may not provide funding for the work ordered.

(2) In general, a MA is:

a. Issued leading up to and during the emergency response phase of an incident in anticipation of, or in response to, a presidential declaration of an emergency or major disaster;

b. Involves only non-permanent work;

c. Capitalizes on the unique resources of a Federal Agency; and

d. Is directive in nature

(3) FEMA may issue a MA to any Federal Agency, with or without reimbursement, in support of disaster relief efforts. The FEMA Disaster Relief Fund (DRF) is a funding source available to Federal Agencies to seek reimbursement for activities conducted pursuant to these actions.

(4) ESF #9 PAs providing SAR facilities during a CISAR response may be issued a MA for the provisioning of that support.

(b) Mission Assignment Task Order (MATO).

(1) A MATO is a specific task associated within a MA.

(2) MATOs may be issued for specific personnel, requirements, locations, dates, logistics, duration of assignments, etc.

7.4.2 ESF #9 Mission Assignment Policy

(a) ***References (yy) and (zz) provide MA policy on reimbursement of expenses for Coast Guard support of CISAR operations.***

(b) ***The Coast Guard is authorized to receive ESF #9 MAs for CISAR operations under the Stafford Act.***

(Note: The Coast Guard is appropriated to maintain, establish, and operate lifesaving services on the high seas and navigable waters of the United States. The Coast Guard is not funded to carry out sustained, large-scale CISAR operations in support of FEMA, FEMA Regions, States, Tribes, Territories/Insular Areas, or other Federal Agencies.)

(c) ***The Coast Guard ESF #9 OPA shall coordinate ESF #9 MAs with FEMA and the State, Tribe, or Territory/Insular Area, or other Federal Agency requesting Coast Guard CISAR support, as required.***

(Note: Coast Guard ESF #9 MAs should normally identify the SAR tasks to be performed rather than directing the use of specific response assets. This ensures the Coast Guard retains the flexibility, in coordination with the unified command, to provide CISAR assistance while maintaining the capability to respond to SAR events in areas of Coast Guard responsibility as a Federal SC under reference (ss).)

(d) ***The Coast Guard will retain Tactical Control (TACON) and Operational Control (OPCON) of Coast Guard personnel and SAR units conducting CISAR operations under an ESF #9 MA, unless mutually agreed upon by the Coast Guard and the receiving agency.***

(e) ***By agreement, circumstances may dictate that TACON of Coast Guard personnel and SAR units should be delegated to a Federal, State, Tribal, Territorial/Insular Area SAR authority, or other Federal Agency for improved CISAR operational coordination. The Area SC shall ensure adequate SAR facilities are available to render assistance to other persons, vessels, aircraft, or other craft in distress in the U.S. aeronautical and maritime SRRs.***

(Note: FEMA recognizes the dual Coast Guard responsibilities as Federal SC under reference (ss) and in support of ESF #9 CISAR operations conducted in support of FEMA under reference (zz). The Coast Guard must have the flexibility to effectively coordinate and conduct SAR and CISAR concurrently.)

(f) ***The Coast Guard is authorized to assign MATOs to existing MAs to support ESF #9 CISAR operations. ESF #9 MATOs shall be coordinated with FEMA, FEMA Region, State, Tribe, Territory/Insular Area, or other Federal Agency requesting Coast Guard SAR unit support.***

(g) ***The Coast Guard may accept or decline a MATO from FEMA, FEMA Region, State, Tribe, Territory/Insular Area, or other Federal Agency requesting Coast Guard SAR unit support.***

(Note: For example, the Coast Guard may need to reject an ESF #9 MATO to conduct other SAR missions of a higher lifesaving priority not directly associated with ongoing CISAR operations (e.g., SAR offshore). If a MATO is declined, the Coast Guard should pursue the provisioning of other resources either within the Coast Guard or with the other ESF #9 Primary Agencies to support the request.)

(h) ***Per reference (yy), the Coast Guard ESF #9 OPA shall track and compile expenses associated with CISAR logistical support provided via ESF #9 MA for reimbursement.***

(i) ***Per reference (yy), the Coast Guard ESF #9 OPA shall track and compile expenses associated with Coast Guard personnel and SAR unit expenses provided via ESF #9 MA for reimbursement.***

(j) ***The Coast Guard ESF #9 OPA shall track and compile Coast Guard logistical, personnel, and SAR unit expenses associated with CISAR operations that may be provided through supplemental appropriations.***

(k) ***Per reference (xx), the Coast Guard is authorized to seek reimbursement through ESF #9 MAs for CISAR personnel, logistics, and operational costs, including, but not limited to, the following personnel, capabilities, and services expenses:***

(1) ***The establishment, operation, and support of forward operating bases for ESF #9 personnel and units;***

(2) ***Coast Guard personnel logistics, including travel and per diem costs;***

(3) ***Coast Guard SAR unit (e.g., helicopters, fixed wing aircraft, boats, etc.) operational, maintenance, and support costs; and***

(4) ***Any costs associated with the transportation of Coast Guard and other ESF #9 personnel, SAR facilities, or capabilities.***

Section 7.5
Geo-Referencing During SAR and CISAR Operations

7.5.1 Overview

(a) No single map/chart projection or coordinate/grid system is perfect for all applications. In the case of projecting the earth's curved surface on a flat surface, distortion of one or more features occurs.

(b) In the aftermath of Hurricane Katrina and other maritime disasters, the review of the Federal, State, Tribal, Territorial/Insular Area, and local SAR operations found that SAR agencies used different methods to communicate geographic information. This added confusion and complexity to large-scale CISAR operations.

7.5.2 Geo-Referencing Methods

Per reference (rr), two geo-referencing methods are routinely used for CISAR operations in the U.S.:[1]

(a) U.S. National Grid (USNG).

(1) USNG is intended to create a more interoperable environment for developing location-based services within the U.S. and to increase the interoperability of location services appliances with printed map products by establishing a preferred nationally consistent grid reference system.

(2) The USNG:

a. Is the primary geo-referencing system utilized by most State/local fire/rescue and FEMA Urban Search and Rescue (US&R) teams.

b. Can be extended for use world-wide as a universal grid reference system, and can be easily plotted on U.S. Geologic Survey (USGS) topographic maps by using a simple "read right, then up" method.

c. Coordinates are easily translated to distance, as they are in meters. Thus, the distance between two coordinates can quickly be determined in the field.

d. Can be used for area gridding, as well as for pinpoint locations.

(1) Appendix O provides an overview of how to read USNG coordinates.

(b) Latitude/Longitude.

(1) Latitude/longitude is a geographic coordinate system used for locating positions on the Earth's surface.

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[1] Reference (rr) identifies three different geo-referencing methods used for CISAR operations. The third method is the Global Area Reference System (GARS). For the purposes of this policy, GARS is not normally used by Coast Guard CISAR responders for the coordination and conduct of ESF #9/CISAR operations.

(2) Latitude/longitude can be read and written in three different formats:

a. Degrees, Minutes, Decimal Minutes (DD° MM.mm').

b. Degrees, Decimal Degrees (DD.DDDDº).

c. Degrees, Minutes, Seconds (DDº MM' SS”).

(3) Per reference (rr), the standard latitude/longitude format for CISAR operations is Degrees, Minutes, Decimal Minutes (DD° MM.mm').

(4) Reference (rr) standardized verbalizing latitude/longitude. For example:

a. 39° 36.06'N 76° 51.42'W, should be stated as:

b. “Three nine degrees, three six decimal zero six minutes North; seven six degrees, five one decimal four two minutes West.”

c. The words, “degrees,” “minutes,” and “decimal” are spoken.

7.5.3 Geo-Referencing Matrix during CISAR Operations

(a) Coast Guard personnel and SAR units, as well as other CISAR responders, need to be able easily interface between the Incident Command, land, aeronautical, and maritime CISAR responders. Because each has unique geo-referencing requirements, effective interface between each component is vital to an effectively coordinated CISAR response.

(b) Per reference (rr), the geo-referencing matrix (Table 7-1) minimizes confusion and provides a basis for coordinating geo-referencing systems between CISAR responders.

<table>
<tr><th colspan="3">Table 7-1: CISAR Geo-referencing Matrix</th></tr>
<tr><th>Geo-reference System User</th><th>U.S. National Grid (USNG)</th><th>Latitude/Longitude DD°-MM.mm' (Note 1)</th></tr>
<tr><td>Land SAR Responder (Note 2)</td><td>Primary</td><td>Secondary</td></tr>
<tr><td>Maritime SAR Responder (Note 3)</td><td>Secondary</td><td>Primary</td></tr>
<tr><td>Aeronautical SAR Responder (Note 4)</td><td>Secondary</td><td>Primary</td></tr>
<tr><td>Air Space Deconfliction (Note 5)</td><td>N/A</td><td>Primary</td></tr>
<tr><td>Land SAR Responder/Aeronautical SAR Responder Interface (Note 6)</td><td>Primary</td><td>Secondary</td></tr>
<tr><td>Incident Command:
Air/Maritime SAR Coordination
Land SAR Coordination</td><td>
Secondary
Primary</td><td>
Primary
Secondary</td></tr>
<tr><td colspan="3"><u>Note 1</u>: During CISAR operations (and to avoid confusion) latitude/longitude shall be in one standard format: DD°-MM.mm'. If required, use up to two digits to the right of the decimal. If required, allow three digits in the Degrees field for longitude (i.e., DDD°-MM.mm'). Do not use leading zeros to the left of the decimal for Degrees or Minutes that require fewer than the maximum number of possible digits to express their value. The minimum number of digits is always one, even if it is a zero. (Example: Recommended: 39° 36.6'N 76° 51.42'W; Not Recommended: 39° 36.600'N 076° 51.420'W).</td></tr>
<tr><td colspan="3"><u>Note 2</u>: Land SAR responders use USNG; however, a good familiarity with latitude/longitude is necessary to ensure effective interface between land, maritime, and aeronautical SAR responders (“Land SAR” includes SAR on flooded terrain).</td></tr>
<tr><td colspan="3"><u>Note 3</u>: Maritime SAR responders normally use latitude/longitude for CISAR operations; however, familiarity with USNG is necessary to ensure effective interface between maritime/land SAR responders.</td></tr>
<tr><td colspan="3"><u>Note 4</u>: Aeronautical SAR responders normally use latitude/longitude for CISAR operations; however, familiarity with USNG is necessary to ensure effective interface between aeronautical/land SAR responders.</td></tr>
<tr><td colspan="3"><u>Note 5</u>: Air space deconfliction will only use latitude/longitude.</td></tr>
<tr><td colspan="3"><u>Note 6</u>: Aeronautical SAR responders working with land SAR responders have the primary responsibility of coordinating SAR using USNG. However, both must be familiar with the USNG and latitude/longitude.</td></tr>
</table>

7.5.4 Application

(a) During CISAR operations, Coast Guard personnel must use caution in reading and receiving latitude/longitude coordinates.

(b) Based on experience, different government agencies and personnel may write and read latitude and longitude differently. Although the error may be small it can make a critical difference in a timely CISAR response.

(c) It is important to confirm the coordinates if unsure which format is being communicated.

7.5.5 Coast Guard Geo-Referencing Policy

(a) ***Headquarters and Area and District SCs shall ensure Coast Guard personnel and SAR units can effectively communicate position information using the U.S. National Grid during CISAR operations.***

(b) ***Per reference (rr), the Geo-Referencing Matrix shall be utilized during interagency CISAR operations.***

(c) ***The Geo-Referencing Matrix may be applied during interagency non-CISAR operations.***

(d) ***Per reference (rr), the standard latitude/longitude format for CISAR operations shall be Degrees, Minutes, and Decimal Minutes (DD° MM.mm'). This standard latitude/longitude format shall also apply for all non-CISAR operations coordinated and conducted in the U.S. aeronautical and maritime SRRs in which the Coast Guard is responsible.***

Appendix A
Command SAR Library

Table A-1 Joint International Publications (IMO and ICAO)

	RCC	SCC	AIRSTA	STA	WMEC	WPB
International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual						
Volume I, Organization and Management	✓					
Volume II, Mission Co-ordination	✓	✓	✓			
Volume III, Mobile Facilities	✓	✓	✓	✓	✓	✓

Table A-2 International Maritime Organization (IMO) Publications

	RCC	SCC	AIRSTA	STA	WMEC	WPB
International Convention for the Safety of Life at Sea (SOLAS) (Chapters IV Radiocommunications and V Safety of Navigation are of particular use.)	✓		✓		✓	
International Convention on Maritime Search and Rescue	✓		✓			
International SafetyNET Manual	✓					
International Code of Signals (INTERCO; NIMA Publication 102)	✓	✓	✓		✓	
NAVTEX Manual	✓					
International Maritime Dangerous Goods (IMDG) Code, as amended	✓		✓			
IMDG Code Supplement: Emergency Procedures (EMS); Medical First Aid Guide (MFAG); and Reporting Procedures	✓					

Table A-3 Unpublished IMO Documents

	RCC	SCC	AIRSTA	STA	WMEC	WPB
IMO Resolution A.706(17) - World-Wide Navigational Warning Service	✓		✓			
IMO Resolution A.855(20) - Standards for On-board Helicopter Facilities	✓		✓			
IMO Resolution A.887(21) - Establishment, Updating and Retrieval of the Information Contained in the Registration Databases for the Global Maritime Distress and Safety System (GMDSS)	✓		✓			
IMO Resolution A.894(21) - International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual	✓		✓			
Resolution MSC.70(69) - Adoption of Amendments to the International Convention on Maritime Search and Rescue, 1979	✓		✓			

	RCC	SCC	AIRSTA	STA	WMEC	WPB
COM/Circ.129- Amendments to the International Code of Signals	✓	✓	✓		✓	
COMSAR 2/7/5 - Inmarsat; Barring of SESs; Quick Unbarring of SESs by an RCC	✓					
COMSAR.3/INF.21 - Inmarsat; SAR Co-ordination Communications; Distress Priority Communications from Shore-to-Ship	✓					
COMSAR/Circ.3 - Relations Between NAVAREA Coordinators and Rescue Co-ordination Centers”	✓					
COMSAR/Circ.11 - List of Coast Earth Station Operation Coordinators in Inmarsat System	✓					
COMSAR/Circ.11/Corr.1 - Correction to COMSAR/Circ.11	✓					
COMSAR/Circ.12 - Relays of Distress Alerts by Digital Selective Calling	✓					
COMSAR/Circ.13 - Shore-to-Ship Communications During a Distress	✓					
COMSAR/Circ.15 - Joint IMO/IHO/WMO Manual on Maritime Safety Information (MSI)	✓					
COMSAR/Circ.18 - Guidance on Minimum Communication Needs of Maritime Rescue Co-ordination Centers (MRCCs)	✓					
COMSAR/Circ.19 - Distress Priority Communications for RCC from Shore-to-Ship via Inmarsat	✓					
COMSAR/Circ.20 - List of NAVAREA Coordinators	✓					
COMSAR/Circ.21 - Procedure for Responding to DSC Distress Alerts by Ships	✓					
GMDSS/Circ.8 - Master Plan of Shore-based Facilities for the GMDSS (GMDSS Master Plan)	✓					
GMDSS/Circ.8/Corr. - Amendments to the GMDSS Master Plan	✓					
MSC/Circ.597/Rev.1 Piracy and Armed Robbery Against Ships	✓					
MSC/Circ.622/Rev.1 - Recommendations to Governments for Preventing and Suppressing Piracy and Armed Robbery Against Ships	✓					
MSC/Circ.685 - Amendment to Resolution	✓					

	RCC	SCC	AIRSTA	STA	WMEC	WPB
A.706(17) World-Wide Navigational Warning Service						
MSC/Circ.750 - Amendments to Resolution A.706(17) World-Wide Navigational Warning Service	✓		✓			
MSC/Circ.794 - IMO Standard Marine Communication Phrases	✓		✓			
MSC/Circ.805 - Guidance for the Use of Radio Signals by Ships Under Attack or Threat of Attack from Pirates or Armed Robbers	✓		✓			
MSC/Circ.864 - Guidelines for Preparing Plans Between Search and Rescue Services and Passenger Ships on Fixed Routes (in accordance with SOLAS regulation V/15(c))	✓		✓			
MSC/Circ.892 - Alerting of Search and Rescue Authorities	✓		✓			
MSC/Circ.895 - Recommendation on Helicopter Landing Areas on RO-RO Passenger Ships	✓		✓			
SAR.2/Circ.6 - Area Search and Rescue Plans	✓		✓			
Note: This is consolidation of SAR.2/Circ.5 and SAR.3/Circ.5 and as of OCT 01 was not yet available.	✓					
SAR.7/Circ.2	✓					

Table A-4 International Civil Aviation Organization (ICAO) Documents

	RCC	SCC	AIRSTA	STA	WMEC	WPB
ICAO Annex 10, Aeronautical Communications	✓		✓			
Volume I, Part II, Chapter 2 - “Distress Frequencies”	✓		✓			
Volume II, Section 5.3 - “Distress and urgency radiotelephony communications procedures”	✓		✓			
ICAO Annex 11 - Air Traffic Services, Chapter 5 “Alerting Service”	✓		✓			
ICAO Annex 12 - Search and Rescue	✓		✓			
ICAO Annex 14 - Aerodromes, Chapter 9 “Emergency and Other Services”	✓		✓			
ICAO Regional Air Navigation Plans (RANPs) (applicable extracts of “Search and Rescue Services”)	✓		✓			

Table A-5 Other International Documents

	RCC	SCC	AIRSTA	STA	WMEC	WPB
Radio-Medical Assistance, Volume I: Part I-Coded Medical Messages	✓		✓			
Radio-Medical Assistance, Volume II: Part I-The More Common Acute Illnesses	✓					
Radio-Medical Assistance, Volume II: Part II-Assistance and First Aid On Board	✓					
List of Radio determination and Special Service Stations (International Telecommunication Union (ITU))	✓					
Standard Marine Navigational Vocabulary	✓		✓			

Table A-6 Regional Documents

	RCC	SCC	AIRSTA	STA	WMEC	WPB
North Atlantic Minimum Navigation Performance Specification (MNPS) Airspace Operations Manual	✓		LANT UNITS			
North Atlantic International General Aviation Operations Manual	✓		LANT UNITS			

Table A-7 National Documents

	RCC	SCC	AIRSTA	STA	WMEC	WPB
National SAR Supplement (NSS)	✓	✓	✓	✓		
National SAR Plan (NSP) (contained within the NSS)	✓	✓	✓	✓		

	RCC	SCC	AIRSTA	STA	WMEC	WPB
Coast Guard Addendum to the NSS	✓	✓	✓	✓	✓	✓
Flight Services, FAA 7110.10(series) (Federal Aviation Administration)	✓		✓			
Air Traffic Control, FAA 7110.65(series) (Federal Aviation Administration)	✓		✓			
Airport Emergency Plan, FAA's Advisory Circular AC No: 150/5200-31	✓		✓			
Water Rescue Plans, Facilities, and Equipment, FAA's Advisory Circular AC 150/5210-13	✓	✓	✓	✓		
Marine Radiotelephone Users Handbook	✓	✓	✓	✓		
Cospas-Sarsat Users Manual for U.S. RCCs	✓	✓	✓			
U.S. Air Force Foreign Clearance Guide	✓		✓			
NAVSEA SUBMISS/SUBSUNK Bill for Submarines and Manned Noncombatant Submersibles	✓	✓	✓			
Diving Accident Manual	✓	✓	✓	✓		
Incident Command System Manual/ Field Operational Guide	✓	✓	✓	✓		
Management and Operation of the Automated Mutual-assistance Vessel Rescue (Amver) System, COMDTINST 16122.2 (series)	✓	✓		✓		
Amver (Ship Reporting System) User's Manual	✓					
End User Manual for the Automated Mutual-assistance Vessel Rescue (Amver) System (Amver II Version 1.0, Phase IV) Vessel Arrivals Utility dated April 24, 1994 by Synetics	✓					
Admiralty List of Radio Signals, Volume 5, Global Maritime Distress and Safety System (GMDSS)	✓	✓	✓			
NIMA Publication 117 "Radio Navigational Aids"	✓	✓	✓			
"SAR Cooperation Plan for Passenger Ships" carried on board SOLAS-class passenger ships (cruise ships and passenger ferries on international voyages); copies provided from Coast Guard Headquarters	✓					
Coast Guard Air Operations Manual	✓	✓				
Coast Guard Rescue and Survival Systems Manual	✓	✓	✓	✓	✓	✓
Area/District Heavy Weather Plan	✓	✓	✓	✓		

	RCC	SCC	AIRSTA	STA	WMEC	WPB
Applicable Hurricane/Typhoon Operations Plan	✓	✓	✓	✓		
U.S. Army Corps of Engineers National Disaster Plan	✓	✓	✓	✓		
Local/subordinate SCC SOPs	✓	✓	✓	✓		✓
Coast Guard Auxiliary Flotilla Procedures	✓	✓	✓	✓		
Civil Air Patrol guidance documents, where applicable	✓	✓	✓	✓		
Fleet Guides	✓	✓	✓	✓		
U.S. Navy Operating Areas and Warning Area instruction	✓	✓	✓	✓		
Bridges Over Navigable Waters of the U.S.	✓	✓		✓		
Bowditch ("The American Practical Navigator", NIMA Publication 9)	✓	✓		✓		
Light List (for own AOR)	✓	✓	✓	✓		
Tidal Current Tables	✓	✓	✓	✓		
Tide Tables	✓	✓	✓	✓		
U.S. Coast Pilot	✓	✓		✓		
Waterway Guide	✓	✓		✓		
U.S. Navy Marine Climatic Atlas of the World (applicable volume(s))	✓	✓	✓			
World Atlas	✓	✓	✓			
Fish Guides (for own AOR)	✓	✓	✓	✓		
Road maps	✓	✓	✓	✓		

Appendix B
MISLE

Section B.1
MISLE System for SAR Data

This appendix prescribes the administrative requirements and responsibilities for submitting and processing Search and Rescue (SAR) operations data.

B.1.1 Purpose

B.1.1.1 The Marine Information for Safety and Law Enforcement (MISLE) system provides a case management tool and ready access to a wide range of data and information that is useful for conducting SAR case response and to:

(a) Measure unit workload and effectiveness;

(b) Determine resource utilization and needs;

(c) Justify budget requests to meet projected requirements;

(d) Analyze system operations for potential savings; and

(e) Promulgate policies and procedures to more effectively manage the overall SAR program.

B.1.2 Discussion

Proper case documentation is paramount. SAR case data captured in MISLE is utilized throughout the Coast Guard for reporting out SAR measurements (lives saved, lives lost, property saved, time entries for response assets, etc) to the Department of Homeland Security and for a variety of Congressional inquiries. It is essential that designated MISLE Case Reviewers thoroughly review the case prior to finalizing Coast Guard actions within a specific case.

B.1.2.1 MISLE has online user guides to assist users in performing data entry. The user guides give detailed instructions for entering SAR incident data and can be found at: http://mislenet.osc.uscg.mil/misle_user_guides.aspx

B.1.3 Recommendations for System Improvements

Comments or recommendations for improvements to the MISLE system for SAR should be entered in the MISLE Enhancement Request Tracking System (MERTS) located on the MISLENET home page (http://cgweb.comdt.uscg.mil/g-mr/MERTS/MainMenu.htm). All MISLE users are authorized and encouraged to make MISLE enhancement requests in MERTS. Once entered, the MISLE Configuration Control Board members will ensure the proper HQ Program comments on the request and will then prioritize the request if approved by the program.

Section B.2
Reporting Criteria

B.2.1 SAR Case

A SAR case shall be officially opened in MISLE for each instance the Coast Guard is specifically requested to render assistance. This requirement applies to those instances in which persons and/or property are subject to the risk of being injured, damaged, or lost, and shall include assistance rendered to other Coast Guard resources regardless of the unit assigned.

B.2.1.1 ***A SAR case shall be opened in MISLE when a Coast Guard resource(s) is dispatched to render assistance, including where non-Coast Guard resources are dispatched on behalf of or in lieu of the Coast Guard***.

B.2.1.2 ***A SAR case shall be opened in MISLE when notification of distress has been received, even when no resources were dispatched.***

B.2.1.3 Timeliness

(a) ***Units shall open a new MISLE case no later than one hour after notification***.

(b) Units are encouraged to use MISLE in a near real-time manner, recording entries, events, and other information as soon as possible. To facilitate near real-time entry, units are encouraged to open new MISLE cases within 15 minutes of notification.

B.2.2 SAR Sortie

A unit shall enter a SAR Sortie into MISLE each time one of its resources (assets or personnel) is dispatched to respond to a SAR incident, and for each subsequent movement of the resource in response to that SAR incident. The MISLE case controlling unit may enter all data for a case involving more than one unit, even if the SMC's unit launched no sortie. The definition of a sortie's start and end times is found in B.5.3.3 below.

B.2.3 Case/Sortie Details

For each incident, the responding (providing) unit shall complete a sortie and the SMC (same unit may fill in this portion even if not SMC in the event of a single unit case) shall enter the unique case details (Case/IMA).

B.2.4 Reporting Efforts for Case Coordination and Communications

An SMC should record all time spent coordinating a multi-unit response through appropriate entries in the Incident Management Activity. ***The Sortie Activity shall not be used to report coordination and communications efforts***.

B.2.5 Co-located Units

Where a station and sector are co-located, each should report the work done by its own resources under its own OPFAC. For sectors that provide the communications watch and/or OOD for the station, coordination and communications efforts should be reported as the sector.

B.2.6 Afloat Units

Afloat reporting units shall have their data entered by their Administrative Control (ADCON) Commander. If deployed, the controlling unit for the case may also enter the data.

B.2.7 Headquarters Units

Headquarters units (e.g. ATC Mobile and Training Center Yorktown) shall enter data directly into MISLE or by the SMC through prior arrangement with the SMC's unit.

B.2.8 SAR Mission Coordinator (SMC)

B.2.8.1 ***The SMC is responsible for ensuring completion of the entire set of SAR data for each case***. ***If the SMC is reassigned during a case, the designated SMC, upon termination of the case, shall fulfill these requirements***.

B.2.8.2 ***The SMC shall also ensure all sortie data, for non-Coast Guard resource, is accurately documented in the case.*** For local/state resources, a subordinate unit that works directly with the local/state agency may be delegated to do this.

B.2.9 Special Reporting Situations

B.2.9.1 ***Helicopters deployed aboard cutters for other than SAR purposes but which are utilized to prosecute a SAR incident shall be considered an extension of the cutter.*** This instance requires a Report utilizing the cutter's OPFAC.

B.2.9.2 Use of helicopter/shipboard operations for the specific purpose of prosecuting a SAR case constitutes a multi-unit case. This requires a separate Report from both the cutter and the helicopter's assigned Air Station.

B.2.9.3 ***Resources that are temporarily assigned duty (TAD) to another OPFAC shall report SAR cases under their own OPFAC.***

B.2.9.4 ***Resources deployed to a facility that does not have a Coast Guard OPFAC number, and is not under the operational control (OPCON) of another Coast Guard OPFAC, shall report SAR incidents under their own OPFAC.***

B.2.9.5 Bar conditions, frequently encountered in the Thirteenth District, are when the Coast Guard provides escort services for vessels desiring assistance when crossing the bar. Usually, more than one vessel is escorted on a single trip. In such instances, multiple vessels should be entered. The assisting unit should file only ONE sortie for each trip across the bar regardless of the number of vessels being escorted.

B.2.9.6 ***Amver vessel participation sorties shall be entered by the SMC. All uses of Amver vessels shall be documented as part of a case.*** Vessels other then Amver participants should also be entered subject to level of participation.

B.2.10 Auxiliary Reporting

B.2.10.1 When the Auxiliary is the only resource employed, an entire report (notification, incident management, case and sortie sections) will be completed for that case by the Coast Guard unit exercising operational control over the Auxiliarists.

B.2.10.2 When the Auxiliary is just one of several resources employed, the sortie section needs to be completed by the OPCON unit.

Section B.3
Responsibility

MISLE is the primary means of collecting and storing information relative to Coast Guard SAR operations. Accurate and complete entries are used in individual case reviews while aggregate information is used at the headquarters level to support programmatic goals. MISLE SAR entries are part of the legal record of a case and it is imperative that data entry is uniform, consistent, thorough, and accurate. ***All personnel must be diligent in their data entry, validation, and review to assure accuracy of the legal record***.

B.3.1 Mandatory versus Optional Computer Fields

Units shall consider every field for which they have data as mandatory for entry purposes. The system was designed to allow the most rapid entry of data by not requiring the user to visit every screen. To ensure several key data entries common to all cases is collected; some fields within the data entry system are designated as mandatory. Not completing these fields will result in an error and require entry before the record is complete. This mandatory designation is NOT indicative of the only information that is needed by the Coast Guard for proper analysis and support of this vital mission.

B.3.1.1 Responsibility to Ensure Complete MISLE Entry.

The SMC is responsible to ensure the entire set of required MISLE data has been entered for all SAR cases.

(a) This includes follow-up to ensure that other involved units complete their required MISLE data entry within the time allowed.

(b) SMC shall ensure that contact with other units, in order to expedite entry of MISLE data, should be documented by an entry in the SMC's IMA associated with that case.

B.3.2 Case Data Validation

Each Command shall designate in writing individuals with the authority to validate MISLE case information and change the status of the MISLE Incident Management Activity. These individuals must be familiar with the case and have message release authority. A case is validated when all appropriate MISLE entries have been made, and the information and timeline are correct, thorough, and accurately reflect the case.

B.3.2.1 Validation for Concluded Cases. ***Within 12 hours of the case conclusion the entire MISLE case shall be validated and the SMC's MISLE Incident Management Activity (IMA) status must be changed from "Open-In Progress" to "Open-Submitted for Review."***

(a) ***The status of all other IMAs associated with the case shall be changed by the owning units to "Closed-Agency Action Complete," "Open-Suspended" or other appropriate status at case conclusion***.

(b) ***The status of all sorties associated with the case shall be changed by the owning units to "Closed-Agency Action Complete."***

B.3.2.2 Validation for Open Cases. ***As part of the operations unit watch relief process, all open in progress cases shall be validated by the off going watch (generally every 8 or 12 hours).*** The off going watch is most familiar with what transpired and thereby is able to ensure the MISLE record is complete and accurate. ***An entry shall be placed in the Controlling Unit's IMA to indicate that the MISLE case has been validated. The oncoming watch shall also review all cases in progress as part of the watch relief.***

B.3.3 Case Data Review

Each Command shall designate in writing an individual or individuals tasked with completing the review of all MISLE activity at the unit. This individual will ensure the SAR case folder and MISLE information are accurate and completed IAW current policy/instructions.

B.3.3.1 This MISLE Review Officer will change the status of the IMA to "Closed-Agency Action Complete" or "Open-Suspended" after their final review.

B.3.3.2 ***During the case review process, the MISLE Review Officer shall ensure that all activities in the case are set to the proper status (B.3.2.1(a) and (b) above) prior to setting the final status of the case.*** The status of the case record should be changed at the same time if no other non-SAR activities are pending.

B.3.3.3 ***This final review shall be completed within five days of case conclusion for SAR.***

B.3.4 MISLE Training

Area/District Commanders, unit Commanding Officers and Officers-in-Charge shall:

(a) Training: ***Ensure that personnel assigned with preparation and processing of SAR information have completed available Computer Based Training (CBT) tutorials located on MISLENET, unit formal training and familiarity with the MISLE system.*** The MISLE Training site is highly recommended for new users to learn the capabilities and functionality of the MISLE Production site. Training received during the resident SAR courses at the National SAR School fill the training requirement. For SAR School graduates, it is highly recommended they review the materials on line as a refresher during their qualification process.

(b) System Passwords: ***Personnel shall follow the on-line instructions to obtain MISLE passwords.*** If difficulties are encountered, users should visit MISLENET first at http://mislenet.osc.uscg.mil/misle_tutorials.aspx. New users can view the online BCTs to assist/obtain a user account. For personal assistance the OSC helpdesk may be reached by phone (304) 264-2500 or email osc-customersupport@uscg.mil.

(c) Use of Online Guidance. ***Use the online user guides when performing data entry functions in support of the MISLE.***

B.3.4.1 Meeting Specific Reporting Criteria. ***Direct their unit's efforts to meet the specified reporting criteria set forth in Section B.2 and data entry and review criteria set forth in B.3.1 through B.3.3 above***.

Section B.4
Mandatory Fields

B.4.1 Guiding Principle

Although all available information for a SAR incident and response should be entered into MISLE, the following data fields are the minimum information required for each and every situation.

B.4.2 Mandatory Fields

The following listings detail the specific fields for data entry; Section B.5 provides, as needed, specific guidance on the data to be entered in these fields.

B.4.2.1 Notification Activity. These fields include:

(a) Incident Type;

(b) Notification Method;

(c) Specific Notification Problem (if any);

(d) Incident Date-Time;

(e) Notification Date-Time;

(6) General Location; and

(7) Reporting Source name and phone number.

B.4.2.2 Incident Management Activity (IMA). ***A unit shall not have more than one SAR IMA per command (e.g. three different watchstanders work a case over a thirty-six hour period, only one IMA shall be created by the unit and all watchstanders will make entries into this IMA)***. The IMA mandatory fields include:

(a) Activity Title,

(b) Activity Start Date,

(c) Activity Status; on changing status information contained on the Activity Details, Primary Location, Incident Classification and Incident Summary tabs are required:

(1) Activity Details to be completed:

a. Uninvestigated Cause;

b. False Alert Cause (if False Alert, Suspected or Actual Hoax);

c. Location Type;

d. Search Debrief (if a search is conducted and subject is located by other than search resources, outside the search area, or after the search is suspended); and

e. SAR System used.

(2) ***The Incident Summary shall be entered***.

(d) Initial weather, and

(e) Attachments (when additional case information is available in digital form).

B.4.2.3 MISLE Case. These fields include:

(a) SMC;

(b) ***Results; all cases shall have a result either in saving, losing or assisting persons and/ or property***;

(c) Case Status; and

(d) Team Members (Coast Guard and non Coast Guard members).

B.4.2.4 Resource Sortie Activity. These fields include:

(a) Resource used;

(b) Mission Type;

(c) Times and Positions that apply;

(d) Sortie Owner;

(e) Launch Delay (if greater then the B-0/30 minute launch requirement);

(f) Operational Risk Management Information;

(g) Target Location Method;

(h) Aborted (if sortie was aborted prior to arrival on scene or in the search area);

(i) Weather (all fields possible in both weather conditions and water conditions);

(j) Results for the sortie;

(k) Sortie Status;

(l) Sensors or Equipment (when significantly affects, positively or negatively, the results of the sortie);

(m) Rescue Personnel (when rescue swimmer or other non-conventional (e.g. PJ deployment) assets are required);

(n) Team Member (all Coast Guard and non Coast Guard members should be entered; large resources (cutters) with large crews may preclude entry; in those cases the commanding officer/officer in charge and any primary POC for the sortie should be listed); and

(o) Comments to briefly detail the actions taken by the SRU on this sortie.

Section B.5
Data Entry Guidelines

B.5.1 Entry Time Zone

All times entered shall be entered in Zulu.

B.5.2 Case Numbers for Reopened Cases

Data for a re-opened case shall be entered under its original case number and electronic file.

B.5.3 Time Entries

B.5.3.1 Notification Time Entries

(a) Incident Date-Time. Enter the time and date of the incident as provided by the reporting source if known. If not known, enter the time the Coast Guard was notified. For SARSAT incidents use the time the beacon was detected. If the information becomes available later, a Response Time Line entry should be made in the IMA to document the actual incident time.

(b) Notification Date-Time. Enter the time and date when the Coast Guard was first notified. DO NOT enter the time your unit was notified by another Coast Guard unit. For SARSAT incidents use the time the alert is received.

B.5.3.2 Incident Management Activity Time Entries. MISLE automatically allots 5 minutes as a default setting for each communications action (phone call, radio transmission, etc.) as entered in the IMA timeline when only a start time is entered. ***If communication action extends beyond 15 minutes, an end time shall be entered***.

B.5.3.3 Sortie Time Entries

(a) A SAR sortie begins when the resource is:

(1) An aircraft and is launched for SAR, or is already airborne and is diverted for response to a SAR incident; or

(2) A vessel and gets underway, or is already underway and is diverted for response to a SAR incident.

(b) A sortie is considered terminated when the resource:

(1) An aircraft lands and shuts down its engines upon return from a SAR incident, or is diverted from a SAR mission; or

(2) A vessel anchors or moors following involvement in a SAR mission, or is diverted from a SAR mission.

(c) ***A resource which diverts from another mission to respond to a SAR incident, or diverts away from a SAR incident to another mission, shall only report the time spent on the SAR mission in the sortie***.

(d) Time on sortie should equal only the actual time spent underway/airborne and NOT include any time spent in refueling, picking up supplies, layover, etc.

(e) The specific time entries within sortie are:

(1) **Requested Time** – enter the time the unit received the request for this sortie.

(2) **Launch/Start Time** – enter the time the resource departed on the sortie or diverted if already underway or airborne.

(3) **On Scene/CSP Time** – enter the time the resource arrived at the actual scene of the incident if no searching is involved; when searching is involved enter the time when the unit arrived at the CSP in the search area and commenced the search. This time must be the time at which the resource arrived at the latitude/longitude of the CSP. This information is required unless the resource was either diverted or sortie was aborted before arriving on scene or in the search area.

(4) **Target Located Time** – enter the time the resource first detected the search object. In some situations this time may be the same/coincidental with On Scene/CSP Time. ***For searches that do not locate the search object and sorties that are diverted or aborted no entry shall be made***.

(5) **Alongside/Overhead Time** – enter the time the resource is actually alongside or overhead the search object. In some situations this time may be the same/coincidental with On Scene/CSP Time and/or Target Located Time. ***For searches that do not locate the search object and sorties that are diverted or aborted no entry shall be made***.

(6) **Depart Time** – enter the time the resource departed the location of the located search object; or if a search is conducted without finding the search object enter the time the resource departs the search area; or if this sortie is diverted or aborted enter the time the resource is diverted or directed to abort. For search areas, this time must be the time at which the resource departed from the last latitude/longitude that was part of the assigned search pattern.

(7) **Sortie End Time** – enter the time the resource moors or lands; if sortie ended due to the resource being diverted to another mission, enter the time the resource actually diverted. When the sortie is a result of being diverted, this time may be the same or coincide with the Depart Time.

(8) **Multiple Search Patterns During A Single Sortie** – enter the time the resource arrived at the first CSP as the On Scene/CSP time and the time the resource departed from its last search pattern to proceed to the Sortie End Position as the Depart Time. Record in the comments section the CSP time and position, and the end search time and position for each pattern that was performed during the sortie.

(9) **Unassigned Patterns** – enter into the comments section a complete description of any search patterns performed in addition to or instead of the assigned search patterns. ***Note that resources shall not deviate from their assigned patterns without first informing the OSC and/or SMC and obtaining their concurrence. This is necessary to avoid conflicts with other resources that may be operating in area.***

B.5.4 Location/Position Entries

Locations may be entered in multiple screens within MISLE. The majority of these are latitude/longitude positions but some also include a narrative description of the location. For SAR incidents these positions are critical to documenting the best knowledge available at the time of incident locations and the SAR response; both of which aid in carrying out the response as effectively as possible. ***Where available both the narrative descriptor and the latitude/longitude position shall be entered.*** Positions and times must be consistent with one another as they form the three coordinates—latitude, longitude, and time—that define a specific point of interest in time and space.

B.5.4.1 Notification Position Entries

(a) Incident Positions may be provided through a variety of sources. Many times a precise position cannot be determined; in those instances a position that is representative of the area should be entered. ***As additional information on the incident location becomes available, that information shall be documented in the IMA***. Positions may be provided by:

(1) Distressed persons/vessels. Enter the position they provide or best position available based on their description of their location.

(2) Other reporting source. Enter the position they provide if they have one. In many cases all that may be known is the general area. A choice of position should be made to best represent the general location.

(3) SARSAT. Enter the SARSAT position that corresponds to the type of beacon alert as discussed in Section 3.4.4. ***Additional positions shall be documented within the IMA as they become available***.

(4) Digital Selective Calling. Use the provided GPS position if it is included with the alert.

(5) Radio Direction Finding. Multi-line fixes may provide a position that can be entered. For a single line a position central to the area developed around the line of bearing should be selected.

(b) No Position Available Situations. There are a number of situations where a position following an alert is not available. Unlocated SARSAT hits and HF/MF DSC alerts in particular will not have position information. Uncorrelated distress alerts on VHF-FM that can not be sufficiently narrowed to a reasonable search area will also not have the needed position information.

(1) ***For VHF-FM uncorrelated MAYDAY or automated distress no specific position shall be entered. A generalized area where the call originated shall be entered.***

(2) For SARSAT unlocated do not enter a location. Enter the word “unlocated” in the text box.

(3) For MF or HF unlocated do not enter a location. Enter the word “unlocated” in the text box.

(4) For DSC without position follow scheme for VHF-FM, MF or HF as appropriate.

(c) Locations of reporting sources are required any time the incident report is based on a visual sighting. This includes:

(1) Flare and other visual distress signal sightings;

(2) Sightings from a vessel of another vessel in distress;

(3) Sightings from shore of persons or vessels in distress; and/or

(4) Etc.

B.5.4.2 Incident Management Activity Position Entries. Positions may be entered within the IMA to correspond with every Response Log entry. Although not required in every situation, the ability to include position information is critical for entries such as:

(a) Initial position of the distress scene when the position was initially missing or unobtainable;

(b) Updated position of the distress scene as more accurate or changing situations provide new information;

(c) Updated SARSAT Alert positions; latest composite position for most cases and elementals for fast moving (drifting) situations;

(d) Positions of additional reporting sources (may also use additional notifications);

(e) Positions of possible assisting resources such as Amver vessels; and

(f) Planned positions of rendezvous points.

B.5.4.3 Sortie Position Entries. For each Time entry in the Response Sortie Activity (except Requested Time) a corresponding position is required.

(a) **Launch/Start Position** – enter the position from which the resource departed to begin the sortie. For most sorties this will be the unit's home position. For units with a position entered in the Unit section of the MISLE utilities, this position field will automatically fill. ***When diverted the position at the time of being diverted shall be entered. When departing from an alternate site, such as a refueling location closer to the search area than the resource's home base, the latitude and longitude of the alternate site shall be entered.***

(b) **On Scene/CSP Position** – enter the position where the resource arrived at the actual scene of the incident if no searching is involved; when searching is involved, enter the resource's position as of the Commence Search Time. For searches, it is important to enter the position (and time) at which the resource commenced its assigned search pattern.

(c) **Target Located Position** – enter the position of the resource when the search object was first detected. Note that this is the position of the search craft, not the search object. In some situations this time may be the same/coincidental with On Scene/CSP Position.

(d) **Alongside/Overhead Position** – enter the position of the resource when it is actually alongside or overhead the search object (single position here represents the location of both the search craft and the search object). In some situations this position may be the same/coincidental with On Scene/CSP Position and/or Target Located Position.

(e) **Depart Position** – enter the position of the resource when it departed the location of the search object; or if a search is conducted without finding the search object enter the position at the time the resource departs from the assigned search pattern to proceed to the sortie end position; or if this sortie is diverted or the sortie is aborted enter the position of the resource when it is diverted or directed to abort the sortie.

(f) **Sortie End Position** – enter the position of the resource when it arrives at the moorings or airfield; if sortie ended due to the resource being diverted to another mission, enter the position of the resource when it was directed to divert. For a divert, this position may be the same/coincident with the Depart Position. For most sorties this will be the unit's home position. For some sorties this may be a provisioning point away from home base. For units with a position entered in the Unit section of the MISLE utilities, this position field will automatically fill. ***When diverted or ending a sortie for fuel or other logistics, the position at the time of being diverted or the position where the resource stopped for logistics shall be entered***.

(g) **Multiple Search Patterns During A Single Sortie** – enter the position where the resource commenced its first search assignment as the On Scene/CSP Position and the position where the resource departed from its last assigned search pattern to proceed to the Sortie End Position as the Depart Position. Record in the comments section the CSP time and position, and the end search time and position for each pattern that was performed during the sortie.

(h) **Unassigned Patterns** – enter into the comments section a complete description of any search patterns performed in addition to or instead of the assigned search patterns, including commence search positions and times as well as end search positions and times for each. ***Resources shall not deviate from their assigned patterns without first informing the OSC and/or SMC and obtaining their concurrence (unless for safety reasons)***. This is necessary to avoid conflicts with other resources that may be operating in area, and to account for accurate coverage when determining Probability of Success.

B.5.4.4 Primary Location. The Primary Location serves as the central point for the events associated with any activity or case. ***Within each case and activity a primary location shall be selected except for those specific situations where a position can not be determined***.

B.5.5 Narrative Fields

Entries in open narrative fields in MISLE shall be in standard sentence format (e.g. upper/lower case). Narrative fields should contain sufficient information to recreate the described action. The required location for specified data is in fields provided (e.g. positions, weather, etc.), narrative entries for specified information is not appropriate.

B.5.6 Notification Method

B.5.6.1 Original Distress Alert Method to be Entered. ***The specific method used by the person in distress to alert the SAR System shall be entered.***

(a) ***If a distress alert is relayed, the method that shall be entered is the original method, not how the particular CG unit received the alert*** (e.g. a reporting source received a CB radio distress call and phoned the local CG station; the station then also relayed this info to the CG Sector. The Sector completes the MISLE Notification – Notification Method shall be "CB Radio", not "Telephone" for either the call by reporting source to Station or Station to Sector).

(b) ***Information regarding the method of relay notification method shall be documented in an IMA Response Log entry.***

B.5.6.2 SARSAT 406 MHz Notifications. For SARSAT incidents enter the beacon I.D. in the space provided following selection of "SARSAT 406 MHz" as the Notification Method.

B.5.7 Case Classification

SAR Watchstanders shall include a timeline entry to identify the emergency phase determined for the case (Alert, Uncertainty, Distress). Any changes in emergency phase shall be documented as additional timeline entries, and must include amplifying information that resulted in the change.

B.5.8 Case Results

B.5.8.1 Entering Lives data. ***Lives data shall include all persons involved in a case that are affected by the incident***. For passenger vessels this should include both crew and passengers when appropriate. ***For MEDEVACs and MEDICOs only the person actually benefiting from the medical assistance shall be counted***.

(a) **Case level.** Lives at the case level reflect the actual number of persons assisted by the Coast Guard. ***The lives in all categories must equal the total number of persons involved***. This data is used for reporting overall Coast Guard performance.

(b) **Sortie level.** Lives at the sortie level reflect the efforts expended by each unit involved. The lives within a single sortie in all categories cannot exceed the total number of persons involved. Lives accounted across a series of sorties within a single case can exceed the total number of actual persons involved. Sortie lives accounting permits multiple units or sorties to assist a single individual and get credit for their contribution. When examining the resulting data, it should not be added across units to reflect the number of persons saved, lost, missing or assisted by the Coast Guard in a particular region. Added data may be used to show level of effort and contribution by a number of units.

(c) **Lives saved** are those lives that would have been lost had the rescue action not been taken. This includes actually pulling a person from a position of distress or removing them from a situation that would likely have resulted in their death had the action not been taken.

(d) **Lives lost** are reported in several subcategories. ***To count a life as lost there must be a body recovered; otherwise it shall be entered within the Lives Unaccounted for category***.

(e) **Lives lost before notification** are those lives lost which to the best of the reporting unit's knowledge occurred before notification of the incident was made to the Coast Guard. This is not a legal declaration of death by a medical authority, but a judgment call to determine if response units could likely have affected the outcome.

(f) **Lives lost after notification** are those lives lost which occurred after notification was made to the Coast Guard. ***When known the appropriate additional lives lost categories shall be used to more clearly refine at what point in the rescue process the life was lost***. These include:

(1) **Lives lost after alongside** for lives lost after the assisting unit arrived on scene.

(2) **Lives lost after onboard assisting unit** for lives lost after the person was transferred to the assisting unit until the person was transferred to shoreside services (ambulance/medical personnel or hospital direct when delivered to hospital helo pad).

(3) **Lives lost after reaching shore facility** for lives lost after the assisting unit has transferred the person to shoreside services (ambulance/medical personnel or hospital direct when delivered to hospital helo pad).

(g) **Lives unaccounted for** are those known persons missing at the end of a SAR response. This includes those persons presumed as lives lost but no body was recovered. ***Only those persons who can be identified by name or by specific count of persons*** (persons on board count for a ferry, migrant vessel, etc.) ***shall be counted*** (lives unaccounted for entry is made in MISLE). ***Reports of probable person missing*** (e.g., someone "thought" they saw a surfer, nothing is found, but no persons are reported missing) ***shall NOT be counted*** (no lives entry is made in MISLE).

(h) **Lives assisted** are those persons who are provided assistance that did not meet the criteria for lives saved but did receive some assistance. An entry for type of assistance provided is required for every life entered under this category. Persons merely onboard a vessel that is provided assistance directed at the vessel (repairs, fuel, etc.) are not necessarily assisted.

B.5.8.2 **Entering Property Data**. Property values to be entered include the value of the vessel, aircraft, structure or other property category. ***For a fishing vessel, the value of catch on board shall be included in values entered as appropriate***. Property values in a single case may fall into one or more categories. To accurately reflect the Coast Guard's efforts, it is important that all categories that apply are used. ***For example, a portion of the property is damaged or lost and the remainder is saved, values of each shall be entered in the appropriate category***.

(a) **Vessel Values Calculator**. ***Vessel values shall be found by using the property value tool within MISLE***. Use of the tool ensures the consistent entry needed for the CG's property value measure.

(b) **Case level.** Property data at the case level reflects the actual value of property assisted by the Coast Guard. ***The property in all categories must equal the total value of property involved***. This data is used for reporting overall Coast Guard performance.

(c) **Sortie level.** Property data at the sortie level reflects the efforts expended by each unit involved. The property value within a single sortie in all categories cannot exceed the total value of property involved. Property values accounted across a series of sorties within a single case can exceed the total value of actual property involved. Sortie property accounting permits multiple units or sorties to assist the same property and get credit for their contribution. When examining the resulting data, it should not be added across units to reflect the amount of property saved, damaged, lost, missing or assisted by the Coast Guard in a particular region. Added data may be used to show level of effort and contribution by a number of units.

(d) **Property saved** is the estimated value of property that would have been lost had the rescue action not been taken. This includes actually removing property from a position of distress or providing aid to property in a situation that would have likely resulted in the property's loss had the action not been taken.

(e) **Property damaged** is the estimated value of damage to property resulting from the incident.

(f) **Property lost/totaled** is the estimated value of property that is either absolutely lost (not recovered) or is a constructive loss (beyond reasonable repair; no longer useful). ***Note: property observed or known to have sunk shall be included as property lost.***

(g) **Property Unaccounted for** is the estimated value of property that at the end of a SAR response remains missing. ***This category is to be used only for those cases where the fate of the property is unknown and shall not include property observed or known to have sunk***.

B.5.9 Distance Entries

B.5.9.1 ***Distance to scene shall be entered from the homeport if the resource is dispatched from there, or from the point diverted to the SAR sortie***.

B.5.9.2 ***Distance off shore shall be entered as the distance from the closest point of land to the incident location***.

B.5.10 Incident Classification

Incident classification is a relative measure of the severity of incident. There are three classification levels, Major, Medium and Minor. For some mission areas (MEP for example) there are specific statutory levels that drive the selection. For SAR the incident classification is related to the actual threat to lives & property. This information is used to screen for cases for notification up the SAR chain of command and to evaluate the SAR system. Entry of at least one mission area and incident classification is required.

B.5.10.1 Levels and criteria for selection. MISLE cases are required to be assigned one of three classifications: Major, Medium, or Minor. Life and property criteria found in Sections B.5.4 and B.5.5 respectively, should be used to determine the lives impact in assigning the classification. ***All units shall apply the following thresholds***:

(a) Major Case:

(1) Any case that involves loss of life, loss of property, lives saved, property saved, or unaccounted for lives or property.

(2) Any case that requires the use of SAROPS to calculate a drifted datum.

(3) Any case that has high media or political interest.

(4) Any case involving a shift of SMC to the next higher level.

(b) ***Medium Case: within the SAR Program the Medium classification shall not be used***.

(c) Minor case. Any other case that cannot be categorized as a major case IAW (a) above. This includes, but is not limited to cases such as:

(1) Probable false alerts.

(2) Cases with only assistance to lives or property.

(3) Cases that resolve on their own.

(4) Cases where the only Coast Guard involvement is a communications schedule.

B.5.10.2 Multiple mission selection. Multiple mission areas and separate classification levels for each mission area may be entered. It is appropriate in cases where SAR and other missions (LE, MEP, etc.) are involved to enter a classification level for each.

B.5.10.3 Case Details. Incident classification is displayed on the "Case Details" page within MISLE, but entered via the "Incident Management" page. Entry is made within the "Incident Summary" tab.

B.5.11 Selecting Involved Subjects

Whenever MISLE requires the input of a vessel or person, it shall be done by using the MISLE selection process. Free-form entry of vessel and person's names within MISLE is not searchable and does not make them a referential subject in MISLE (does not link a MISLE activity or notification to the subject for future searches).

B.5.11.1 ***Vessels and people being assisted shall be added as involved subjects***.

B.5.11.2 ***Units shall not use free-form vessel name entry when the vessel is available in the MISLE database***.

B.5.11.3 If a vessel is not available within the MISLE database, a new entry for that vessel should be made.

B.5.12 Risk Management

The results of all units' risk management assessments shall be documented in MISLE.

B.5.12.1 Resource Sorties. For mobile resources this is completed within the Resource Sortie Activity. ***In addition to selecting the GAR color and entering a score (as appropriate to the model employed), comments in the narrative section of the Resource Sortie Activity shall be entered to document any specific measures taken to reduce risk. The standard use of personal protective equipment or other standard procedures need not be documented; only those actions, equipment, additional personnel assigned, etc. specifically to mitigate the risk shall be documented***.

B.5.12.2 SAR Chain of Command. For SMCs and other levels within the chain of command risk assessments other then resource sorties are completed within the IMA. ***Response Log entries shall be made documenting required risk assessments and briefings. Documentation shall include models employed, scores, and any specific measures taken to reduce risk. SMCs shall ensure all required risk assessments are conducted and documented***.

B.5.13 Sensors, Equipment and Special Personnel

Within the Resource Sortie Activity the use, both successful and unsuccessful of sensors, equipment and special rescue personnel can be documented.

B.5.13.1 ***Any sensors or equipment that significantly affect the results of a sortie, either positively or negatively shall be included in the sortie***. Equipment standard on the platform (e.g. radar on a MLB) does not need to be added unless it fails to operate correctly or negatively affects the outcome of the case. ***Equipment that is not part of the platform, but is loaded for a specific case (e.g. pumps) shall be noted***.

B.5.13.2 ***Coast Guard Rescue swimmer and surface swimmer (from cutters and boats) deployments shall be noted***.

B.5.13.3 ***When other non-conventional assets (such as PJ deployment) are required, their use shall be recorded***.

B.5.14 Weather

Complete weather shall be entered for each sortie and the "area name or description" shall include the search area designation (i.e. A-1, A-2, etc.) to include all the information under both the weather and water condition tabs. Data for some weather fields may not be available to responding crews (e.g. sea/water currents or tidal state may not be available to an aircrew) and may be omitted in those circumstances. ***Other fields may call for best estimates and shall be completed (e.g. sea height, cloud ceiling, cloud coverage, etc.)***.

B.5.15 Attachments

MISLE provides for the attachment of digital files of any type to the MISLE Case via the IMA. ***All information available in digital form shall be included as an attachment (e.g. PSDA report, SAROPS export file, etc.)***. Other incident information in paper form should, when reasonable possible, be scanned and included as attachments.

B.5.16 Case Conclusion

One of the following timeline entries shall be documented at the conclusion of a SAR case:

(a) Case Closed for SAR; or

(b) ACTSUS Granted.

If a case conclusion is classified as ACTSUS, the following information shall be included as a timeline entry: Person (rank/name) granting ACTSUS, Probability of Success (POS) data, PSDA data, and any other supporting information pertinent in the ACTSUS decision making process.

Section B.6
Data Retrieval

B.6.1 SAR Statistics

The Office of Search and Rescue compiles summary data periodically. It is posted on the SAR Program Internet web site. (Home - CG-CVC-1 (uscg.mil))

B.6.2 Pre-Formatted Reports

Within Business Intelligence in CG Portal, Coast Guard personnel have the ability to examine a wide range of data for both case and sortie level SAR response data. SAR Data is found in the CGBI Cubes & Reports section and different "cubes" are used to access the data depending on the year.

B.6.2.1 FY 86 - 94: SARMIS 86-94 Response Data and SARMIS 86-94 Resource Data.

B.6.2.2 FY 95 – 99: SARMIS 95-99 Response Data and SARMIS 95-99 Resource Data.

B.6.2.3 FY 00 – 02: SARMIS II Case and SARMIS II Sortie.

B.6.2.4 FY 03 - Present: MISLE Response Cases and MISLE Response Sorties.

B.6.3 Ad Hoc Queries

To retrieve information that is not available from the CGInfo web site, the OSC MISLE staff should be contacted via the help desk.

B.6.4 Density Plots

The location of cases sorted for an individual request plotted on a digitized chart of any area of the globe. MISLE Geographic Information System (GIS) provides some ability to create density plots. The process is described in the on-line user guides for GIS and GIS Scatter Plots.

B.6.5 Release of SAR Data

As a federal agency, the Coast Guard is expected to provide the public with information regarding the performance of missions and in meeting published goals. In addition, various agencies, organizations, individuals and the media make requests for SAR data and SAR case information to answer specific questions on particular aspects of Coast Guard SAR response or particular cases.

B.6.5.1 Reference (k), discusses the release of information, including the authority to release SAR and LE information in computer records (including data and attachments) from the MISLE database.

B.6.5.2 Simple statistical data (number of cases, lives saved, etc.) for a unit or group of units may be provided without FOIA or Privacy Act concerns.

B.6.5.3 Release of the names of subjects involved in a particular SAR case is discussed in Section 1.4.1.1 of this addendum. This information is distinct from data and release conditions are very specific and limited by current Coast Guard policy and Reference (k).

B.6.6 Coast Guard Business Intelligence (CGBI) Use For Checking for Unmanned Adrift Vessels, Flotsam and Jetsam

Unmanned adrift vessels and other marine flotsam and jetsam are indicators of possible distress incidents and require an immediate response. Quickly determining if the reported unmanned adrift vessels or other flotsam and jetsam are related to a new distress incident or are indeed derelict is key to providing the appropriate response. MISLE cases that involved unmanned adrift vessels may be labeled with the SAR sub-category of "Adrift (Unmanned)." Additionally, MISLE records contain information on property outcomes associated with SAR incidents including indicators of when property is not recovered; either counted as 'Lost' or 'Unaccounted For' within the data. Through the use of the data mining capabilities of CGBI, MISLE data associated with SAR incidents involving property that was not recovered during response efforts or follow-on salvage efforts can be easily identified and accessed for comparison with newly received reports. This is accomplished by employing a combination of dimension filters, Custom Subsets, and the Drill Through (DT) function within CGBI. The process steps to find incident records which may contain information on unmanned adrift vessels and other marine flotsam and jetsam are provided in the following sub-sections.

Note: Although adrift objects may be contained within this data, due to data entry practices not ALL adrift objects will be present; if not located via this process, the appropriate SAR response is to treat the case as a notification of distress until the object(s) is specifically confirmed to not indicate a distress incident.

B.6.6.1 **Access CGBI.** The first step is to access MISLE Response Cases within CGBI.

B.6.6.2 **Create Custom Subsets.** Custom subsets narrow the vast amount of data within MISLE to a manageable level centered on the specific data in which a user is interested. When in the CGBI window for MISLE Response Cases, using the Custom Subset button create subsets for:

(a) Years – select desired time period; at a minimum up to a length of time where noticeable marine growth would be apparent to observers.

(b) Originating Departments – select departments representing the area you want to cover; should include all areas of responsibility where the object may have originated from for the given time period. Alternatively, the areas may be identified by selecting specific Captain of the Port (COTP) zones via the Originating CG Regions selection within Custom Subsets.

(c) Location Types – select the location types where the objects may have drifted from; this eliminates spurious data within the selected departments' areas which cannot possibly be associated with the observed drifting object (e.g. offshore location cannot be associated with land incident).

B.6.6.3 **Filter data.** By using filters the data selection will be further refined to the information desired. Filter (with the mouse, right click on desired element and select it as a filter) on the following:

(a) Expand the False Alarm Types dimension and filter on the ‘Unspecified’ value; this value equates to actual alerts/real incidents; false alerts and hoaxes should have no property implications and may be safely eliminated from consideration.

(b) Expand the Property At Risk dimension and filter on the ‘> $0’ sub-dimension. All property not recovered at the end of a SAR response should be accounted for in the data and, depending on the situation, counted as having either been lost or remaining unaccounted for.

B.6.6.4 Conduct Drill Through. Performing a drill through on the remaining data in the on screen table will produce a spreadsheet which will contain the data of interest.

(a) The drill through is accomplished by clicking on/highlighting the cell on the table on screen containing the sum of remaining cases after applying Custom Subset and Filter actions; then clicking the Drill Through button on the screen.

(b) On the next screen presented, select of MISLE Response Case Drill Through (DT).

B.6.6.5 Examine Resulting Spreadsheet for applicable property.

(a) The resulting spreadsheet will contain the data of interest as well as some that may be discarded. Due to the filtering of the data for Property At Risk, some of the data will reflect Property Saved. If a large amount of data is present, a sort on the columns for Property Lost and Property Unaccounted For may be conducted. Where both of these columns contain a zero in a particular row, the row may be deleted or ignored in the remaining review.

(b) An examination of remaining rows of data should be conducted to identify cases where the property matches in whole or part, the received unmanned adrift vessel or flotsam and jetsam report.

(1) Links to individual cases within MISLE are contained in the spreadsheet, which allows quick access to the full data of the case (through MISLE) and associated property identification and information.

(2) In the case of referential vessels within MISLE, full details will be available in the vessel record linked to the vessel.

(3) For other vessels and floating objects, closer methodical examination of the case data may be required to confirm or disprove a possible link.

B.6.7 Coast Guard Business Intelligence (CGBI) Use For Case and Data Management

Through the use of the data mining capabilities of CGBI, data associated with key aspects of entry for SAR cases and external reporting can be monitored for completeness and accuracy. Personnel with SAR case review responsibilities should become familiar with using CGBI to access data for SAR. By employing a combination of dimension filters, using Custom Subsets and the Drill Through function within CGBI, cases needing data review can be easily identified and accessed.

B.6.7.1 SAR Data Systems. As provided in B.6.2 above, SAR data may be examined in associated databases, based on the series of years. Available data under each of the data systems varies;

what may be available through one system may not be available with another. For data held within the current MISLE database, the choices for case, case involvement or sorties as the entry point within CGBI is driven by particular data interest.

(a) **Case** data is primarily for the incident level, and for SAR, reflects data according to SMC. Units not performing SMC (i.e. not case owners) will have little or no data associated specifically with their unit.

(b) **Case Involvement** is a specialized view that shows data associated with units based on having at least one activity within a case. This is in essence a means to count unit responses/cases; one per unit per case in which they are involved. For each Case there can be one or more Case Involvements.

(c) **Sortie** data is primarily for a sortie level view and reflects data according to units actually performing sorties. For each Case Involvement there can be one or more Sorties.

B.6.7.2 Basics for looking at data sets for SAR. To ensure the data being viewed includes only the data desired, several basic data dimension selections must be made. These selections are made via the dimension tree structure on the left of the page, via the dimension listing at the top of the page, or via the Custom Subsets button at the bottom of the page. See Figure B-1 for an example.

(a) **Dates.** Via one of the dimension selection methods select the period of dates desired. Dates may be selected as Fiscal Year (FY), FY quarter, month, week or specific date. In Figure B-1 “FY 2011” is selected.

(b) **Unit.** Several dimensions exist for selecting the appropriate unit including “Originating”, “Owner” and “SMC” as well as further selection by either “Department” or “Region”. These choices provide flexibility based on the role each unit fulfilled in the MISLE data entry process. Note that the data for a unit under each of the selections might be different. This is a result of the unit’s particular MISLE role for the set of cases being utilized in the data collection. In Figure B-1 no specific unit is selected and defaults to “All” for each of the possible dimensions.

(c) **Incident Type.** When looking at SAR cases, it is critical to ensure that “SAR” is the chosen Incident Type within the dimensions. More specific SAR Incident Types (e.g. capsizing, PIW, overdue, etc.) can be chosen individually if desired, or with Custom Subsets in any combination desired. Figure B-1 shows the Incident Type “SAR” is selected.

B.6.7.3 Data Viewed Selection. Most data viewed for review in each of the data dimensions is best displayed with Response Cases as values; the default view. Filtering by all dimensions except Measures will result in the numbers being the count of cases. When data is filtered by specific Measures, the data will be presented in terms of that measure. For example, filtering by Lives Saved will result in the numbers displayed representing the actual number of lives saved within the selected data set (as defined in filtering by all other dimensions). The data being displayed is indicated by the text in the upper left corner of the data display. Figure B-2 shows this display and the relationship between filtering and data displayed.

B.6.7.4 Available Dimensions for Data Review. Tables B-1, B-2 and B-3 provide a listing of available CGBI MISLE Response dimensions and recommended use in the review of SAR case, case involvement and sortie data.

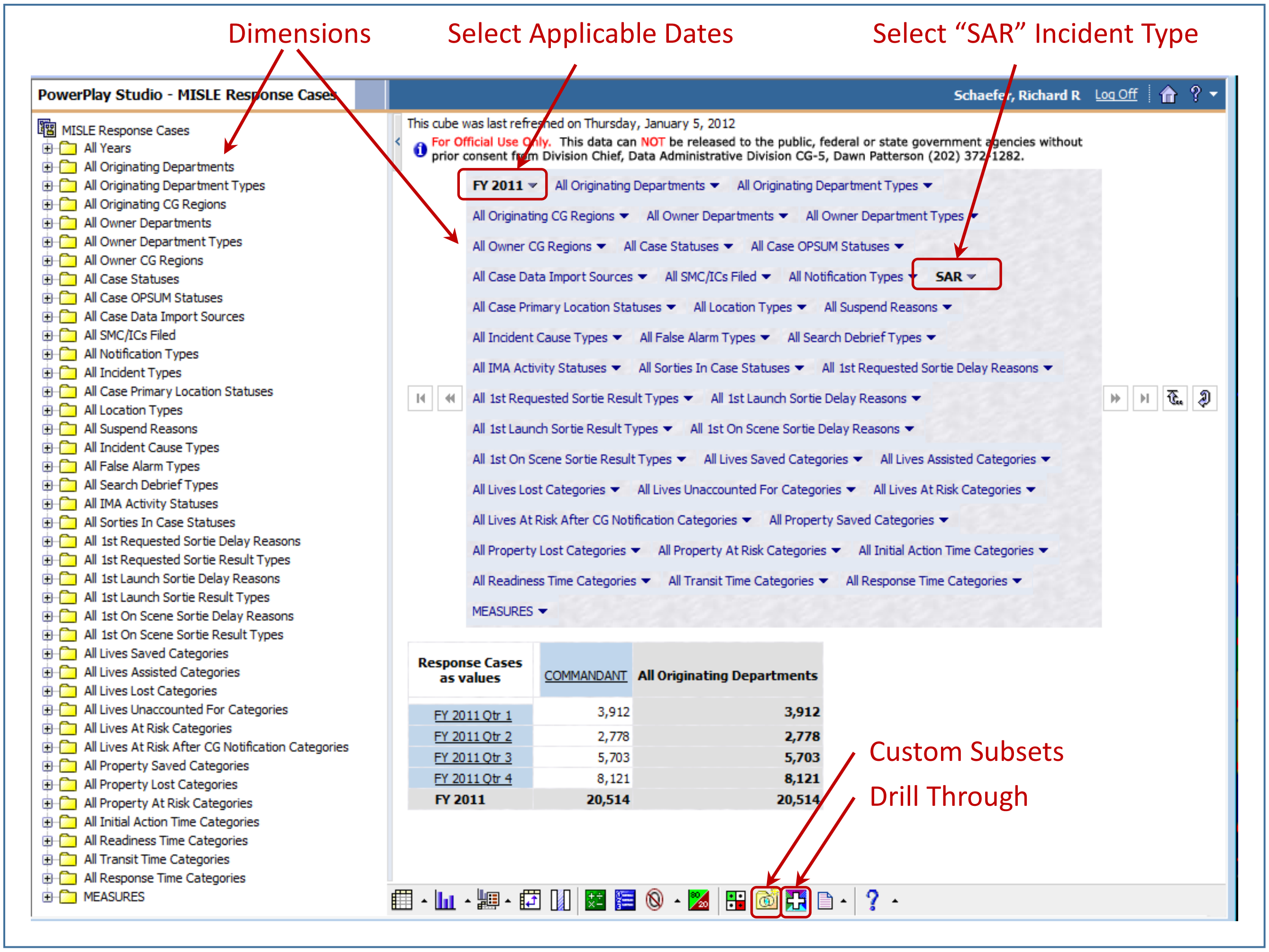


Figure B-1 CGBI Data Basics; Data Selection

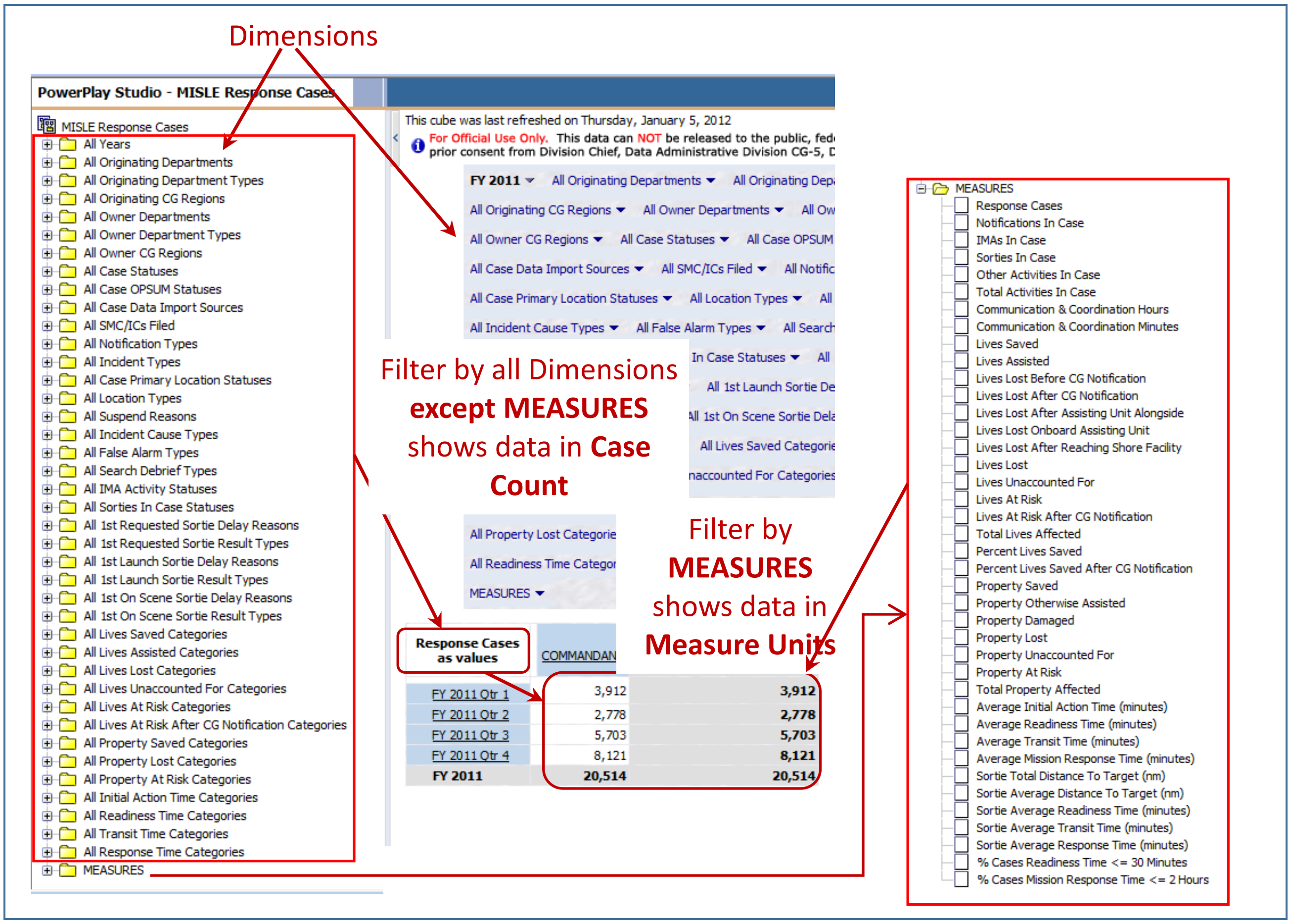


Figure B-2 CGBI Data Basics; Data Displayed

B.6.7.5 Checking case status completion. MISLE for SAR data entry is designed to ensure critical case data is entered upon completing data entry. That completion is indicated by a change in case status to any closed status or the Open - Suspended status. Regular checks of Case, IMA and Sortie Status via CGBI will help to ensure case data entry timeliness and completeness. Figure B-3 shows an expanded view of the CGBI screen for Case Status. Similar screens exist under both MISLE Response Case Involvement and MISLE Response Sortie. Figure B-4 shows a typical week's review with number of cases within each status.

(a) **Closed – Agency Action Complete** is the most common closed status for SAR case files and indicates data entry is complete for the case.

(b) **Open – In Progress** in general indicates SAR cases that are still in progress; when this status appears any time after the policy deadline for data entry, the cases need to be viewed and action taken to complete data entry and move them to either closed or Open – Suspended status.

(c) **Open – Submitted for Review** is used for SAR cases that have been submitted to the reviewing official for the unit. When it appears any time after the policy deadline for data entry, the cases need to be viewed and action taken to move them to either a closed or Open-Suspended status.

(d) Open – Suspended is the second most common status for SAR case files that are complete.

(e) Other Statuses. Cases may have other mission impacts that will drive the status of the case. When this is the situation, other open or closed case statuses may be present. At the case level, this is generally acceptable. For IMA's associated with SAR cases, the status generally should be with Closed – Agency Action Complete or Open – Suspended when SAR data entry is complete.

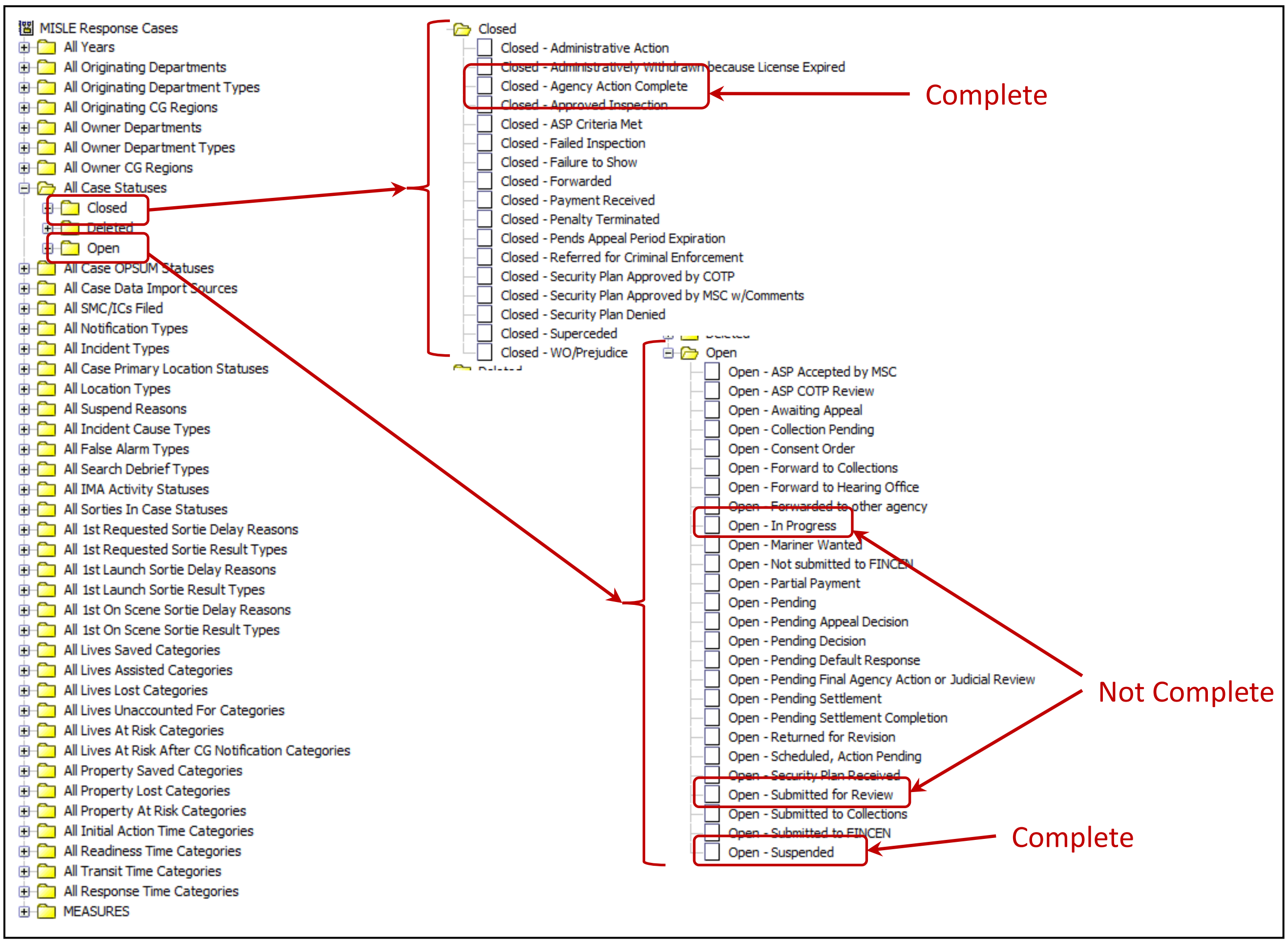


Figure B-3 MISLE Case Status Dimension

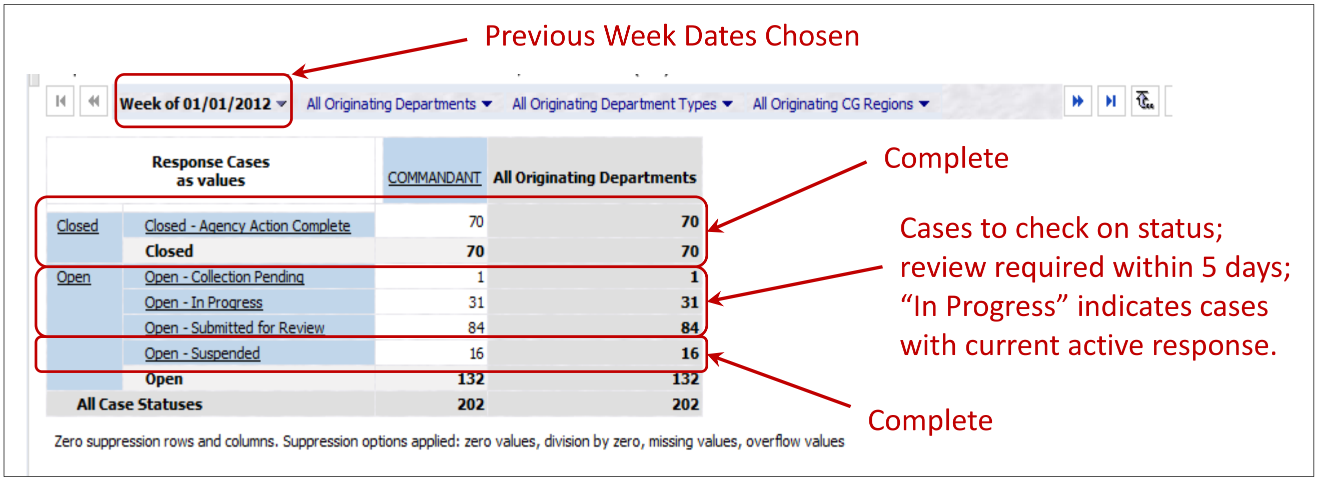
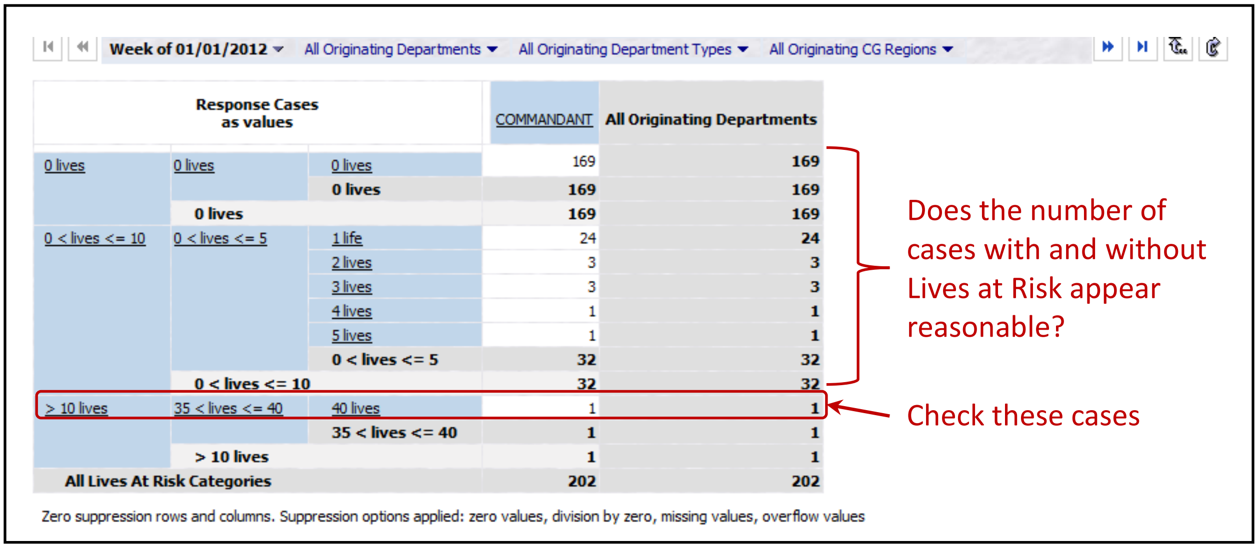


Figure B-4 MISLE Case Status Data

B.6.7.6 Checking for possible case data entry errors. A check of data presentation for any of the dimensions in CGBI MISLE Response listed in Tables B-1, B-2 and B-3 can rapidly show where data may be missing or entered in error by cross checking with another dimension. For example, replacing rows with All Lives at Risk Categories and replacing columns with All False Alarm Types will reveal errors in entering lives at risk (lives saved, lost or unaccounted for). Any column in this sorting with a result other than '0' for lives at risk, except for those under the 'Unspecified' (under All False Alarm Types is the column indicating Actual Alerts), indicate entry errors.

B.6.7.7 Checking for possible errors in reporting data. All SAR data is important, but special attention is needed for those data entries that form the basis of Coast Guard performance reporting to the Administration, Congress and the American public. Currently this includes lives, property and response time data.

(a) Checking lives and property data. Critical lives data can be checked through the All Lives At Risk Categories dimension. Figure B-5 shows a sort for lives at risk for a week's period of SAR for the entire Coast Guard. Unusually high numbers of cases for any given level in the lives at risk category would be cause to check the cases involved via a drill through. A check on reasonableness for numbers for a particular CG unit can be made by comparing across time periods and units; spikes in numbers are a clear indicator that checks need to be made. For cases with more than 10 lives at risk, each should be examined to ensure it is a valid incident and not an error in data input. Property is examined in the same way using the All Property At Risk Categories dimension. Similar checks for reasonableness of the data should be conducted. For cases with more than $2 million at risk, each should be examined to ensure it is a valid incident and not an error in data input.



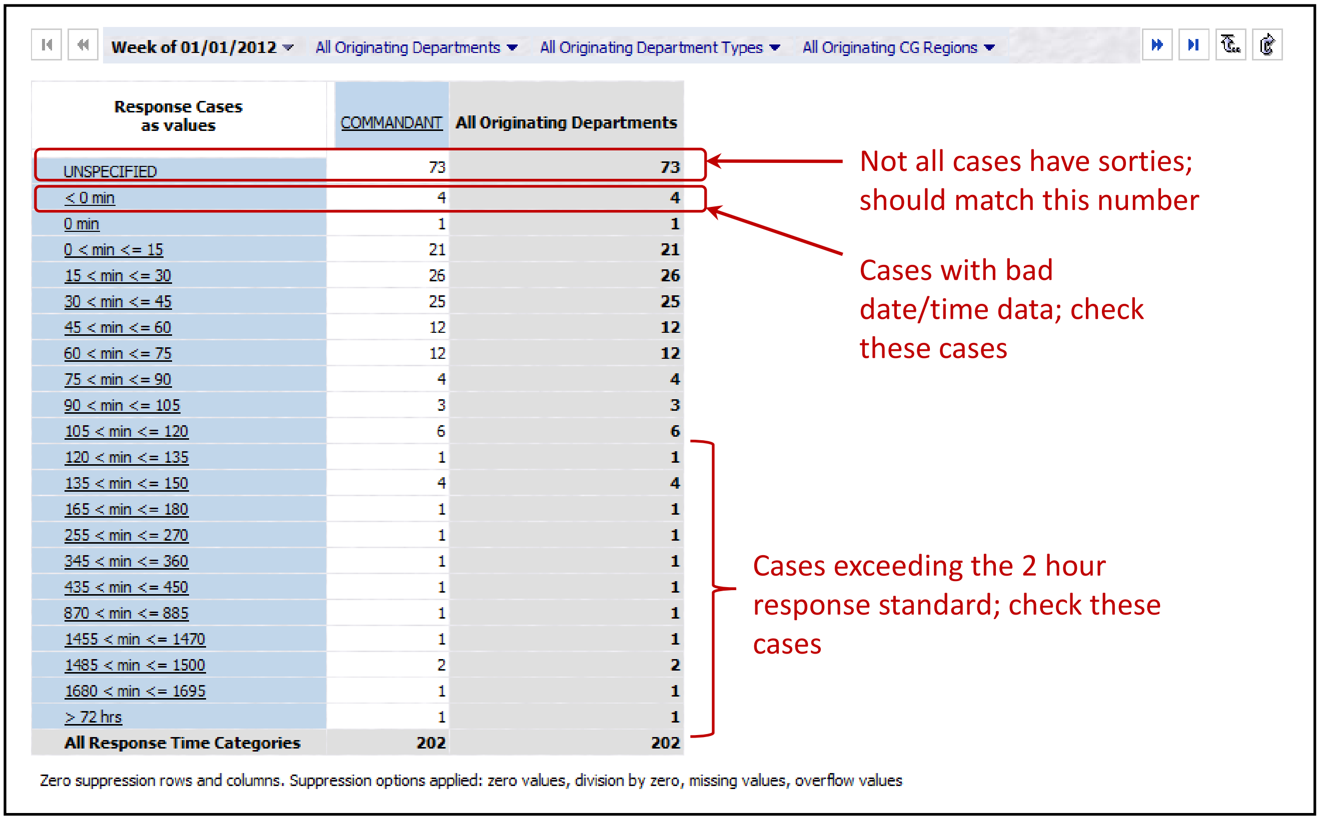
Week of 01/01/2012 | All Originating Departments | All Originating Department Types | All Originating CG Regions

Response Cases as values			COMMANDANT	All Originating Departments
0 lives	0 lives	0 lives	169	169
		0 lives	169	169
	0 lives		169	169
0 < lives <= 10	0 < lives <= 5	1 life	24	24
		2 lives	3	3
		3 lives	3	3
		4 lives	1	1
		5 lives	1	1
		0 < lives <= 5	32	32
	0 < lives <= 10		32	32
> 10 lives	35 < lives <= 40	40 lives	1	1
		35 < lives <= 40	1	1
	> 10 lives		1	1
All Lives At Risk Categories			202	202

Zero suppression rows and columns. Suppression options applied: zero values, division by zero, missing values, overflow values

Figure B-5 Lives At Risk Data Check

(b) **Checking for response time errors.** MISLE date/time entries for events occurring during the incident are set up to represent the chronological order in which those events occur. The notification should be the earliest date/time followed by time units are directed to respond (resource requested time) and then the sequence of their response – launch, arrive on scene/in the search area, target located, alongside/overhead, depart and sortie end times. Response time is measured from the time the first resource is requested until the first resource arrives on scene or in the search area (note these need not be the same sortie, i.e. the resource associated with the first requested resource time may not be the first to arrive on scene). Incorrect times entered for these will skew the data or result in bad data. Figure B-6 shows one week of SAR data for the All Response Time Categories dimension. As shown in the figure, four cases have negative (<0) time results indicating date/time entry errors. A drill through to those cases should be conducted to find and correct those date/time entry errors. Data showing results greater than the 120 minute SAR response standard should also be examined to ensure no errors were present, particularly those with very long times. In the figure there are several with more than six hours (360 minutes). An examination of sortie delay reasons may help in verifying the delays as legitimate. Finally, there are 73 cases indicated with unspecified response times; in most cases this means no sorties were associated with the case. However, these should be verified and can be done so by sorting with the All Sorties in Case Statuses dimension. All should align in the ‘No Sorties’ category; any that align with ‘One or More Sorties’ should be examined as this is an indication there are missing date/time data entries.



Response Cases as values	COMMANDANT	All Originating Departments
UNSPECIFIED	73	**73**
< 0 min	4	**4**
0 min	1	**1**
0 < min <= 15	21	**21**
15 < min <= 30	26	**26**
30 < min <= 45	25	**25**
45 < min <= 60	12	**12**
60 < min <= 75	12	**12**
75 < min <= 90	4	**4**
90 < min <= 105	3	**3**
105 < min <= 120	6	**6**
120 < min <= 135	1	**1**
135 < min <= 150	4	**4**
165 < min <= 180	1	**1**
255 < min <= 270	1	**1**
345 < min <= 360	1	**1**
435 < min <= 450	1	**1**
870 < min <= 885	1	**1**
1455 < min <= 1470	1	**1**
1485 < min <= 1500	2	**2**
1680 < min <= 1695	1	**1**
> 72 hrs	1	**1**
All Response Time Categories	**202**	**202**

Zero suppression rows and columns. Suppression options applied: zero values, division by zero, missing values, overflow values

Figure B-6 Response Time Data Check

Table B-1 CGBI MISLE Response Cases Dimensions and Data Checking

Dimension	***Use***
All Years	• Sort for dates of interest • Check on incident dates entered incorrectly (e.g. future years)
All (Originating/Owner) Departments, All (Originating/Owner) Department Types, All (Originating/Owner) Department Regions	• Sort for specific CG unit of interest in data checking
All Case Statuses	• Check on data entry completion per policy • Check on appropriate entry in conjunction with **All Suspend Reason** entries • Check on appropriate entry in conjunction with **All IMA Activity Statuses**
All SMC/ICs Filed	• Check on appropriate SMC in conjunction with CG unit of interest
All Notification Types	• Check on required entries; ALL cases should have some form of notification (Note: this is notification to the SAR system not necessarily how the reporting unit was informed) • Check on proper entry in conjunction with **All False Alarm Types**

Dimension	***Use***
All Incident Types	• Sort for SAR
All Case Primary Location Statuses	• Check on cases missing a primary location to ensure those required are added
All Location Types	• Check required entries • Check to see if correspond to CG unit AOR
All Suspend Reasons	• Check to see if appropriate entry in conjunction **with All Case Statuses, All IMA Activity Statuses**, and **All False Alarm Types**
All Incident Cause Types	• Check on appropriate entry in conjunction with **All Incident Types**
All False Alarm Types	• Check on appropriate entry in conjunction with **All Case Statuses, All IMA Activity Statuses,** and **All Suspend Reasons**
All Search Debrief Types	• Check on appropriate entry in conjunction with **All Case Statuses** and **All IMA Activity Statuses**
All IMA Activity Statues	• Check on data entry completion per policy • Check on appropriate entry in conjunction with **All Suspend Reason** entries • Check on appropriate entry in conjunction with **All Case Statuses**
All Sorties in Case Statuses	• Check to ensure cases with *No Sorties* listed actually had no sorties associated with the case
All 1st (Requested/Launch/On Scene) Sortie Delay Reasons, All 1st (Requested/Launch/On Scene) Sortie Result Types	• Check for proper entry in conjunction with **All Readiness Time Categories, All Transit Time Categories** and **All Response Time Categories**
All Lives (Saved/Assisted/Lost/Unaccounted For/At Risk/At Risk After CG Notification) Categories	• Check for appropriate entry in conjunction with **Incident Types**, **Suspend Reasons**, and **False Alarm Types** • Check on cases with >*10 lives* at risk to identify entry errors (Note: done once with **All Lives At Risk Categories** in lieu of individually with saved/lost/unaccounted for/at risk dimensions)
All Property (Saved/Lost/At Risk) Categories	• Check for appropriate entry in conjunction with **Incident Types**, **Suspend Reasons**, and **False Alarm Types** • Check on cases with > *$ 2 million* property at risk to identify entry errors (Note: done once in lieu of individually with saved/lost/at risk for dimensions)
All Initial Action Time Categories	• Check cases with *Invalid Data*; results from results from incorrect date/time entries or entries being out of chronological order

Dimension	*Use*
All Readiness Time Categories	• Check cases with *Invalid Data*; results from incorrect date/time entries or entries being out of chronological order • Check on cases with > *30 min* in conjunction with **All 1st Launch Sortie Delay Reasons** to identify entry errors
All Transit Time Categories	• Check cases with *Invalid Data*; results from incorrect date/time entries or entries being out of chronological order • Check on cases with > *90 min* in conjunction with **All 1st On Scene Sortie Delay Reasons** to identify entry errors
All Response Time Categories	• Check cases with *Invalid Data*; results from incorrect date/time entries or entries being out of chronological order • Check on cases with > *2 hrs* in conjunction with **All 1st On Scene Sortie Delay Reasons** to identify entry errors

Table B-2 CGBI MISLE Response Case Involvement Dimensions and Data Checking

Dimension	*Use*
All Years	• Sort for dates of interest • Check on incident dates entered incorrectly (e.g. future years)
All Involved Departments, All Involved Department Types, All Involved Department Regions	• Sort for specific CG unit of interest in data checking
All Originating Departments, All Originating Department Types, All Originating CG Regions	• Sort for specific CG unit of interest in data checking
All Case Statuses	• Check on data entry completion per policy • Check on appropriate entry in conjunction with **All Suspend Reason** entries • Check on appropriate entry in conjunction with **All IMA Activity Statuses**
All SMC/ICs Filed	• Check on appropriate SMC in conjunction with CG unit of interest
All Notification Types	• Check on required entries; ALL cases should have some form of notification (Note: this is notification to the SAR system not necessarily how the reporting unit was informed)

Dimension	*Use*
	• Check on proper entry in conjunction with **All False Alarm Types**
All Incident Types	• Sort for SAR mission
All Location Types	• Check required entries • Check to see if correspond to CG unit AOR
All Suspend Reasons	• Check to see if appropriate entry in conjunction **with All Case Statuses, All IMA Activity Statuses**, and **All False Alarm Types**
All Incident Cause Types	• Check on appropriate entry in conjunction with **All Incident Types**
All False Alarm Types	• Check on appropriate entry in conjunction with **All Case Statuses, All IMA Activity Statuses,** and **All Suspend Reasons**
All Search Debrief Types	• Check on appropriate entry in conjunction with **All Case Statuses** and **All IMA Activity Statuses**
All IMA Activity Statues	• Check on data entry completion per policy • Check on appropriate entry in conjunction with **All Suspend Reason** entries • Check on appropriate entry in conjunction with **All Case Statuses**

Table B-3 CGBI MISLE Response Sortie Dimensions and Data Checking

Dimension	*Use*
All Years	• Sort for dates of interest • Check on incident dates entered incorrectly (e.g. future years)
All (Originating/ Owner/ Requesting/ Resource) Departments, All (Originating/ Owner/ Requesting/ Resource) Department Types, All (Originating/ Owner/ Requesting/ Resource) Department CG Regions	• Sort for specific CG unit of interest in data checking
All Case Statuses	• Check on data entry completion per policy • Check on appropriate entry in conjunction with **All Suspend Reason** entries • Check on appropriate entry in conjunction with **All IMA Activity Statuses**

Dimension	***Use***
All SMC/ICs Filed	• Check on appropriate SMC in conjunction with CG unit of interest
All Notification Types	• Check on required entries; ALL cases should have some form of notification (Note: this is notification to the SAR system not necessarily how the reporting unit was informed) • Check on proper entry in conjunction with **All False Alarm Types**
All Incident Types	• Sort for SAR
All Case Primary Location Statuses	• Check on cases missing a primary location to ensure those required are added
All Location Types	• Check required entries • Check to see if correspond to CG unit AOR
All Suspend Reasons	• Check to see if appropriate entry in conjunction **with All Case Statuses** and **All False Alarm Types**
All Incident Cause Types	• Check on appropriate entry in conjunction with **All Incident Types**
All False Alarm Types	• Check on appropriate entry in conjunction with **All Case Statuses,** and **All Suspend Reasons**
All Search Debrief Types	• Check on appropriate entry in conjunction with **All Case Statuses**
All Activity Statues	• Check on data entry completion per policy • Check on appropriate entry in conjunction with **All Suspend Reason** entries • Check on appropriate entry in conjunction with **All Case Statuses**
All Involved Resources, All AOPS Resource Types, All Resource Agencies, All Resource Origins	• Sort help for specific resource, agency or unit of interest in data checking
All Target Location Method Types	• Check for proper entry in conjunction with **All Sortie Result Types**; for sortie result type *Searched/Located* should have a location method, all others should have location method type of *UNSPECIFIED*.

Dimension	***Use***
All Distance to Target Categories (nm)	• Check for proper entry in conjunction with **All Sortie Result Types** and **All Target Location Method Types**; for sortie result type *Searched/Located* should have a distance to target type entry and a target location method type entry other than *UNSPECIFIED*.
All Sortie Result Types	• Check for proper entry in conjunction with **All Target Location Method Types**, **All Distance to Target Categories** and **All Aborted Reason Types**.
All Weather Types, All Visibility Types, All Sky Condition Types	• Check for proper entry in conjunction with **All Delayed Reasons** and **All Aborted Reasons** where weather is indicated as the cause for either, appropriate entries should be present.
All Assist Reasons	• Check on proper entry in conjunction with **All Lives at Risk Categories** and **All Property at Risk Categories**; where both have *zero* an assist reason other than *UNSPECIFIED* should be present.
All Delayed Reasons	• Check for proper entry in conjunction with **All Readiness Time Categories**; any entry of a delay reason should have a readiness time *>30 min*; any sorties with a delay reason other than *Launch Not Delayed* associated with other time results should be checked. • Sort help for checking **All Readiness Time Categories** and **All Response Time Categories.**
All Aborted Reasons	• Check for proper entry in conjunction with **All Target Location Method Types**, **All Sortie Result Types** and **All Distance to Target Categories**. Abort reasons other than *UNSPECIFIED* should have location method and distance to target as *UNSPECIFIED*, and a result type *Aborted (unable to complete mission)*.
All GAR Assessment Types	• Check for proper entry; all sorties should have entries; all *UNSPECIFIED* entries require a drill through to identify the sorties which should be checked and entry corrected.

Dimension	*Use*
All Search Statuses	• Check for proper result in conjunction with **sortie All Sortie Result Types**; where search status is *Search*, the sortie result should be either *Searched/failed to locate* or *Searched/located*. A search status of *No Search* in conjunction with either sortie result type including search indicates missing or incorrect sortie date/time entries requiring those sorties be checked and corrected.
All 1st (Requested/Launch/On Scene) Sortie Delay Reasons, All 1st (Requested/Launch/On Scene) Sortie Result Types	• Check for proper entry in conjunction with **All Transit Time Categories** and **All Response Time Categories**
All Lives (Saved/ Assisted/ Lost/ Unaccounted For/ At Risk/ At Risk After CG Notification) Categories	• Check for appropriate entry in conjunction with **Incident Types**, **Suspend Reasons**, and **False Alarm Types** • Check on sorties with *>10 lives* at risk to identify entry errors (Note: done once with **All Lives At Risk Categories** in lieu of individually with saved/lost/unaccounted for/at risk dimensions)
All Property (Saved/ Lost/ At Risk) Categories	• Check for appropriate entry in conjunction with **Incident Types**, **Suspend Reasons**, and **False Alarm Types** • Check on sorties with *> $ 2 million* property at risk to identify entry errors (Note: done once in lieu of individually with saved/lost/at risk for dimensions)
All Readiness Time Categories	• Check sorties with *Invalid Data*; results from incorrect date/time entries or entries being out of chronological order • Check on sorties with *> 30 min* in conjunction with **All Delayed Reasons** to identify entry errors
All Transit Time Categories	• Check sorties with *Invalid Data*; results from incorrect date/time entries or entries being out of chronological order • Check on sorties with *> 90 min* in conjunction with **All Delayed Reasons** to identify entry errors
All Response Time Categories	• Check sorties with *Invalid Data*; results from incorrect date/time entries or entries being out of chronological order • Check on sorties with *> 2 hrs* in conjunction with **All Delayed Reasons** to identify entry errors

Appendix C
Standard CG SAR Messages

Section C.1
Situation Report (SITREP)

C.1.1 Overview

A standard SITREP ensures the information needed to properly conduct a search and rescue mission is available and the SAR chain of command is fully aware of the situation. The standard SITREP:

C.1.1.1 Allows the reader to quickly find information by knowing where it is always located in the report,

C.1.1.2 Facilitates review by drafters and reviewers to quickly recognize if information is missing, and

C.1.1.3 Lets drafters of SITREPs learn the format once and no regardless of unit, produce the proper message with the required information.

C.1.2 Standard Format

The format is provided in the following paragraphs in a short form as an overview and rapid reminder for experienced SITREP drafters and in a longer form with section by section description of content. At the end of this section a sample is provided to demonstrate how an actual SITREP would appear.

C.1.2.1 Standard SITREP format overview

P
FM
TO
INFO
BT
UNCLAS//N16130//
SUBJ: EMERGENCY PHASE; SITREP #; NAME/DESCRIPTION OF SUBJECT OF INCIDENT; ABBREVIATED NATURE OF DISTRESS; GENERAL GEOGRAPHIC LOCATION
PERIOD: (DTG) TO (DTG)
1. SITUATION:
A. CURRENT STATUS OF SAR CASE.
B. NOTIFICATION:
C. NARRATIVE:
D. DESC:
E. POB INFO:
F. ADDITIONAL POC:
G. WX:
2. ACTION TAKEN:
CHRONOLOGICAL RECORD OF WHAT WAS DONE, SRUs USED, SEARCH METHOD(S), SIGHTINGS OR FINDINGS, AREAS COMPLETED, POS.
3. FUTURE PLANS AND RECOMMENDATIONS:

4. AMPLIFYING INFO:
A. CASE INFORMATION.
B. RESULTS OF BOARDINGS.
C. STATUS OF AIDS TO NAVIGATION IN AREA OF INCIDENT.
D. POLLUTION.
E. MEDIA INTEREST.
5. CASE STATUS:
A. CASE CLOSED.
B. SORTIE DATA:
C. CASE NUMBER(S).
BT

C.1.2.2 Explanation by section

P
FM **(1)**
TO **(2)**
INFO **(3)**
BT
UNCLAS//N16130
SUBJ: **(4)** EMERGENCY PHASE **(5)**; SITREP **(6)**; NAME/DESCRIPTION OF SUBJECT OF INCIDENT **(7)**; ABBREVIATED NATURE OF DISTRESS **(8)**; GENERAL GEOGRAPHIC LOCATION **(9)**
PERIOD: (DTG) TO (DTG)

(1) SRU, OSC, SMC, SC (Area/COMDT SITREPs)

(2) OSC, SMC, SC, Area/COMDT

(3) Other interested/involved units/agencies. If OSC assigned, SRU send to OSC, DO NOT SEND to SMC. If not, send directly to SMC.

(a) When incident involves pollution or threat of pollution message should go to SCC, EPA, and/or state pollution agency as appropriate.

(b) When incident involves commercial vessel message should go to SCC/MIO/OCMI as appropriate.

(c) When incident involves deaths should go to SCC/MIO/OCMI and/or state/local agency as appropriate.

(d) When incident involves civilian aircraft mishap message should go to FAA.

(e) When incident involves or results in obstruction to navigation message should go to Army Corps of Engineers as appropriate.

(4) UNCERTAINTY, ALERT or DISTRESS (Not in final SITREP.)

(5) SITREP ONE, TWO, THREE... when incident is being closed use SITREP # AND FINAL

(6) Use NAME, REGISTRATION/DOCUMENT NUMBER, SIZE, and/or TYPE of craft (vessel, boat, aircraft, sailboard, etc.).

(7) Use SINKING, SUNK, AGROUND, TAKING ON WATER, ON FIRE, DISABLED, ADRIFT, COLLISION, ON BREAKWALL, DISORIENTED, LOST, OVERDUE, EXPLOSION, MEDEVAC, MEDICO, MAN OVERBOARD, PIW, EPIRB, ELT, CRASHED, etc., or combination as situation indicates.

(8) Use location from prominent landmark or point of land, location in body of water, or over prominent undersea feature (examples: NM SOUTH OF CITY PIER; 10 NM WEST OF SAN DIEGO; SOUTHERN CASCO BAY; EASTERN LAKE SUPERIOR; GRAND BANKS; FLORIDA STRAITS.

(9) Period of time covered by this report given as start date-time-group to end date-time-group

1. SITUATION:		**(10)**
A.	CURRENT STATUS OF SAR CASE	**(11)**
B.	NOTIFICATION	**(12)**
C.	NARRATIVE	**(13)**
D.	DESC	**(14)**
E.	POB INFO	**(15)**
F.	ADDITIONAL POC	**(16)**
G.	WX	**(17)**

(10) Use only the subparagraphs needed and renumber as appropriate. With the exception of Subparagraph A, provide only information that is a change from previous SITREP or is new information. Subparagraph A is to be used on all SITREPS. When adding a new addressee it will be necessary to report all situation information.

(11) A short statement about status of object or subject condition such as: VESSEL STILL MISSING; PIW REMAINS UNLOCATED; SUBJECT LOCATED; F/V SUNK; etc. (Required for every SITREP).

(12) Provide:

(a) TIME of notification;

(b) by WHOM notified (name, phone number/other means of contact, relation to subject); AND

(c) HOW notified (radio, phone, cellular phone, in person, relay through other vessel/person, etc.)

(13) Provide description of incident:

(a) Amplification of what occurred, chain of events leading to situation;

(b) Most probable location (last know position/DATUM) of incident;

OR

(c) Route for overdue;

(d) Reason suspect overdue (missed appointment, float/flight plan, etc.).

(14) Describe the craft (vessel, aircraft, surfboard, etc.). Include TYPE, MAKE, MODEL, LENGTH, WIDTH, HEIGHT, ENGINE #/TYPE, MASTS, COLOR, SAILS #/COLOR, REGISTRATION/DOCUMENT NUMBER, DISTINCTIVE FEATURES. Also include:

(a) Communications gear (UHF, VHF, Cellular Phone & No., SATCOM, etc.)

(b) Electronics (RADAR, depth finder, SATNAV, GPS, etc.)

(c) Survival gear (PFDs, survival/exposure suits, liferafts, lifeboats, parachutes, flares, signal/strobe lights, dye markers, mirrors, EPIRB/ELT, etc.); AND

(d) Other gear (Anchors, food, water, first aid kit, fuel supply, etc.).

(15) Provide information about people on board/involved:

(a) Number of persons on board as "# POB";

(b) Names, ages, addresses, phone #s, experience level (in general & in subject craft); AND

(c) Health to include only those items important to the immediate care of the subject or that may impact the conduct of the response.

(16) List other people that have knowledge about subject or may provide additional information.

(17) Give on scene weather, winds, seas, swells, air temp, sea temp, clouds, ceiling, precipitation, visibility, tide, ice cover, etc.

2.	ACTION TAKEN	**(18)**
	CHRONOLOGICAL RECORD OF WHAT WAS DONE	**(19)**
	SRUs USED	**(20)**
	SEARCH METHOD (S)	**(21)**
	SIGHTINGS OR FINDINGS	**(22)**
	AREAS COMPLETED	**(23)**
	POS	**(24)**

(18) For SITREPS detailing actions taken in response to a search action plan, report search execution details ONLY if they DEVIATE from the search action plan.

(19) List actions by DTG, include: Notification by reporting source; SRU movements & actions; DMB insertions/relocations; other significant events.

(20) To describe SRUs, use type and hull/tail number. Hull/tail number is sufficient for subsequent entries in same message.

(21) Visual, electronic (radar, DF, IR, etc.), listening, etc.

(22) List all sightings/findings, including debris. ***If none, and you feel you must say so, use "NO SIGHTINGS"***

(23) If part of search action plan give area designation (e.g. B-4). If only part of search action plan area searched give description of portion of area searched. If NOT part of search action plan give description of area searched, track spacing, pattern, search object.

(24) Give actual POS for completed areas (not PLANNED POD), or for partial areas if search discontinued mid-search.

3.	FUTURE PLANS AND RECOMMENDATIONS	**(25)**

(25) Describe actions planned for future execution. Include any recommendations and, if needed, a request for additional assistance/resources.

4.	AMPLIFYING INFO	**(26)**
	A. CASE INFORMATION	**(27)**
	B. RESULTS OF BOARDINGS	**(28)**
	C. STATUS OF AIDS TO NAVIGATION IN AREA OF INCIDENT	**(29)**
	D. POLLUTION	**(30)**
	E. MEDIA INTEREST	**(31)**

(26) Use only as needed.

(27) Any additional information relative to the case not covered in prior paragraphs: Use of Amver and/or SAROPS; results of SLDMB/DMB drift; debriefs; etc.

(28) Information about boardings where boardings may reveal information for further incident prosecution.

(29) Statement regarding aids to navigation in the vicinity of the incident when the incident include is one of following: grounding, collision, striking of aid. Statement should remark as to station and watch of aids to navigation.

(30) In cases of collision, grounding, fire, explosion, crash, sinking, capsizing, or others where pollution may result. Information about type and amount of possible pollutant onboard, signs of or potential for leakage, any action taken to prevent or stop leakage, any action taken to contain spill (if information not included in prior paragraphs).

(31) Indicate level of interest, negatives not required. If not included in FUTURE PLANS AND RECOMMENDATIONS, need for assistance with public affairs may be requested here.

5.	CASE STATUS	**(32)**
	A. CASE INFORMATION	**(33)**
	B. SORTIE DATA	**(34)**

C. CASE NUMBER (S)	**(35)**

(32) CASE STATUS provides the status of the case at the time of the SITREP and data associated with the case.

(33) CASE CLOSED only if incident resolved. DO NOT USE "CASE PENDS". ACTIVE SEARCH SUSPENDED PENDING FURTHER DEVELOPMENTS when granted by SAR Coordinator (SMC use only). If none of these categories USE NOTHING!!

(34) List by unit for period of report. Data for sorties in progress during report are to be reported in SITREP covering period when sortie complete.

(35) List multi-unit and unit case numbers.

C.1.2.3 Example message:

E X A M P L E S I T R E P

P 121830Z DEC 00
FM COMCOGARD SECTOR SAULT STE MARIE MI
TO CCGDNINE CLEVELAND OH
INFO
USCGC BISCAYNE BAY
BT
UNCLAS //N16230//
SUBJ: DISTRESS SITREP ONE 30FT P/C ORION COLLISION WITH DRUMMOND ISLAND FERRY DETOUR PASS
PERIOD 121600Z - 121830Z DEC 00
1. SITUATION
A. P/C ORION SUNK, 1 PIW RECOVERED, 3 PIW REMAIN MISSING.
B. NOTIFICATION. AT 121600Z DEC 00 CAPT I.B. JINCSD, PILOT OF DRUMMOND ISLANDER VIA CH 16/22 VHF-FM.
C. NARRATIVE: CAPT JINCSD REPORTED WHILE ON OUTBOUND RUN TO ISLAND, P/C ORION CROSSED HIS BOW. AT 121535Z BOW OF FERRY CLIPPED PORT QUARTER OF P/C WHICH IMMEDIATELY BEGAN TO SINK. FERRY RETURNED TO SCENE AND PICKED UP 01 PERSON, O/O MR. SCHAEFER, WHO REPORTED 03 OTHER POBS. POB WERE WEARING PFDS. COLLISION OCCURRED 095 DEG T, 0.5 NM FROM MAINLAND FERRY DOCK IN DETOUR, MI. NO DAMAGE TO FERRY.
D. DESC: P/C ORION, 30 FT, BAYLINER, CABIN, OPEN BRIDGE, WHITE WITH BLUE STRIPE, WHITE SEAT CUSHIONS, SINGLE 300 HP I/O, FIBERGLASS CONSTRUCTION, MICHIGAN REG MC 1111 AD, GPS, VHF-FM 6 BLUE TYPE 3 PFDS, FLARE KIT (TYPE UNK), 20 LB DANFORTH ANCHOR, 150 FT ANCHOR LINE, 50 GALS GASOLINE; FERRY DRUMMOND ISLANDER, 84.5 FT, BEAM 30 FT, DRAFT 8 FT 2 IN, OIL FIRED, CAR FERRY (10 AUTOS), O/O BY EASTERN UPPER PENINSULA TRANSPORTATION AUTHORITY.
E. POB INFO: P/C ORION 4 POB; O/O RICH SCHAEFER, 45 YOA MALE, 007 SPY WAY, KINCHELOE MI, PH. 906-555-1991, 30 YRS BOATING, 1 YR WITH THIS VSL; REGINA MCNAMARA, 34 YOA FEMALE, FRIEND OF O/O, POOR SWIMMER; GREG PURVIS, 36 YOA MALE, FISHING BUDDY OF O/O, APT M1, SUNNYDALE FARM, TUCZON

ARIZONA, NO PHONE, RECENT RECOVERY FROM HEART ATTACK, GOOD SWIMMER, NO EXPERIENCE ON BOATS; KATHRYN EBNER, 35 YOA FEMALE, CO-WORKER OF O/O, 501 BLUE JEANS AVE, RUDYARD MI, PH. 906-555-0000, 9 YRS BOATING/SAILING EXPERIENCE, EXCELLENT SWIMMER. FERRY DRUMMOND ISLANDER, CAPT I.B. JINCSD, 58 YOA MALE, BOX 20 RTE 3, DETOUR, MI, 906-555-1991, 38 YRS EXPERIENCE, 15 ON DRUMMOND ISLANDER.

F. ADDITIONAL POC: MR. FULL A. BALONEY, WATERFRONT STREET, DETOUR MI, 906-555-3474; OBSERVED COLLISION WHILE LOADING BOAT FOR FISHING TRIP.

G. WX: FOG, WINDS 350 DEG T/15 KTS, SEAS 180 DEG T/2 FT, VIS 0.5 NM, OVCST, A/T 28 DEG F, W/T 33 DEG F, SHORE ICE OUT 100 YDS.

2. ACTION TAKEN:

A. 121600Z DEC 00 SCC SAULT RCVD REPORT OF COLLISION.

B. 1605Z STA SAULT UTB CG41378 U/W.

C. 1620Z RCVD RPT THAT ONLY 1 POB RECOVERED, 3 PIW.

D. 1715Z CG41378 O/S COMMENCING SS SEARCH, 0.1 NM TRACK SPACING, SEARCH OBJECT PIW.

E. 1720Z A/S TRAVERSE CITY HH-65 O/S.

E. 1723Z CG41378 LOCATED/RECOVERED 2 YELLOW TYPE 3 PFDS.

F. 1820Z CG41378 DIRECTED BY SMC TO DISCONTINUE SS SEARCH TO CONDUCT CS SEARCH DOWN DRIFT LINE.

3. FUTURE PLANS AND RECOMMENDATIONS:

A. COMPLETE CS SEARCH.

B. RECOMMEND SHORELINE SEARCH.

C. RECOMMEND CGC BISCAYNE BAY CURRENTLY IN TRANSIT BE DIRECTED TO ASSIST IN SEARCH/ASSUME OSC.

4. AMPLIFYING INFO:

A. SEVERAL PASSENGERS ON FERRY REPORTED TWO PERSONS JUMPED INTO WATER OFF BOW OF P/C WITH PFDS. OTHER PERSON NOT SEEN.

B. RECOVERED PIW, MR. SCHAEFER TAKEN ASHORE BY FERRY AND MET BY AMBULANCE. ENROUTE TO STRAITS AREA HOSPITAL IN ST IGNACE. REPORTED BY FERRY CREW AS HYPOTHERMIC. CG REP SHOULD DEBRIEF MR. SCHAEFER.

C. ALL AIDS TO NAVIGATION IN AREA ON STATION AND WATCHING PROPERLY.

D. POLLUTION: LIGHT SHEEN IN VICINITY OF COLLISION/SINKING. DISSAPATING QUICKLY IN SEA ACTION. APPEARS TO BE GASOLINE.

E. MEDIA INTEREST: LOCAL REPORTER WAS ONBOARD FERRY AND TOOK PHOTOS IMMEDIATELY FOLLOWING COLLISION, INCLUDING SHOT OF P/C SINKING. SEVERAL PHONE CALLS RECEIVED FROM RADIO AND PRINT MEDIA. REFERRED CALLS TO SECTOR PAO AS DIRECTED BY SECTOR COMMAND CENTER.

5. CASE STATUS:

A. SORTIE DATA: STA SAULT 1 SORTIE/2.5 HRS

B. CASE NUMBER 123456

BT

E X A M P L E   S I T R E P

Section C.2
Search Action Plan (SAP)

C.2.1 Overview

A standard SAP allows the reader to quickly find critical information by knowing that it will always be in a certain place and to identify vital information that is missing. Equally as important, the DRAFTER of the SAP only needs to learn the format once, since it is now standardized throughout the Coast Guard.

C.2.1.1 Benefits of this standardized format include:

(a) Time saved in preparing the message;

(b) Fewer calls looking for missing information; and

(c) Time saved finding information critical to executing the mission.

C.2.2 Standard Format

The format is provided in the following paragraphs in a short form as an overview and rapid reminder for experienced SAP drafters and in a longer form with section by section description of content. At the end a sample is provided to demonstrate how an actual SAP would appear.

C.2.2.1 Standard SAP format overview

```
O
FM
TO
INFO
ACCT
BT
UNCLAS//N16130//
SUBJ:  (PHASE) – NAME/DESCRIPTION OF SUBJECT OF INCIDENT –
NATURE/LOCATION – DATE/TIME SAP INTENDED FOR (AM/PM)
1.  SITUATION
A.  CURRENT STATUS OF SAR CASE.
B.  DESC:
C.  POB:
D.  SEARCH OBJECT:          PRIMARY:          SECONDARY:
E.  FORECAST WX:
F.  ADDITIONAL INFORMATION:
2.  ACTION:
A.  FOR (APPROPRIATE UNIT)
B.  FOR (APPROPRIATE UNIT)
3.  SEARCH AREA
AREA SIZE   NW CNR     NE CNR     SE CNR     SW CNR
4.  EXECUTION:
AREA UNIT   PARENT     PATT  CRP     ALT    MAJOR AXISCSP    TS
```

5. COORDINATION:
A. SMC IS
B. OSC IS
C.
D.
E.
F.
6. COMMUNICATIONS:
A.
B.
7. REPORTS:
A.
B.
C.
D.
E.
F.
BT
NNNN

C.2.2.2 Explanation by section

O	
FM	(1)
TO	(2)
INFO	(3)
ACCT	
BT	
UNCLAS//N16130//	
SUBJ: (PHASE) (4) – NAME/DESCRIPTION OF SUBJECT OF INCIDENT (5) – NATURE/LOCATION (6) – DATE/TIME SAP INTENDED FOR (7)	

(1) SMC

(2) OSC, SRUs

(3) Other interested/involved units/agencies.

(a) When incident includes the pollution or threat of pollution message should go to SCC/COTP, EPA, and/or state pollution agency as appropriate.

(b) When incident involves commercial vessel message should go to SCC/MIO/OCMI as appropriate.

(c) When incident involves deaths should go to SCC/MIO/OCMI and/or state/local agency as appropriate.

(d) When incident involves civilian aircraft mishap messages should go to the FAA.

(e) When incident involves or results in obstruction to navigation message should go to

COTP and/or Army Corps of Engineers as appropriate.

(f) When incident involves COSPAS/SARSAT message should go to USMCC Suitland, MD.

(g) When incident involves an Amver vessel as distressed craft or when acting as SRU message should go to Amver Maritime Relations Officer in New York, NY.

(4) UNCERTAINTY, ALERT or DISTRESS

(5) Use NAME, REGISTRATION/DOCUMENT NUMBER, SIZE, and/or TYPE of craft (vessel, boat, aircraft, sailboard, etc.).

(6) Use SINKING, SUNK, AGROUND, TAKING ON WATER, ON FIRE, DISABLED, ADRIFT, COLLISION, LOST, OVERDUE, EXPLOSION, MAN OVERBOARD, PIW, EPIRB, ELT, CRASHED, ETC., or combination as situation indicates.

(7) Use date and time or DTG, which corresponds to the DATE/TIME SAP intended for, commence search time.

1.	SITUATION			(8)
A.	CURRENT STATUS OF SAR CASE.			(9)
B.	DESC:			(10)
C.	POB:			(11)
D.	SEARCH OBJECT:	PRIMARY:	SECONDARY:	(12)
E.	FORECAST WX:			(13)
F.	ADDITIONAL INFORMATION:			(14)

(8) Use only the subparagraphs needed and renumber as appropriate. With the exception of Subparagraph A, provide only information that is a change from previous SAP's and is new information. Subparagraph A is to be used on all SAPs. When adding a new address it will be necessary to report all situation information.

(9) A short statement about status of object or subject condition such as: VESSEL STILL MISSING; PIW REMAINS UNLOCATED; F/V SUNK; etc. (Required for every SAP).

(10) Describe the craft (vessel, aircraft, surfboard, etc.). Include TYPE, MAKE, MODEL, LENGTH, WIDTH, HEIGHT, ENGINE #/TYPE, MASTS, COLOR, SAIL #/COLOR, REGISTRATION/DOCUMENTATION NUMBER, DISTINCTIVE FEATURES. Also include:

(a) Communications gear (UHF, VHF, Cellular Phone & No., SATCOM, etc.);

(b) Survival gear (PFDs, survival/exposure suits, life rafts, lifeboats, parachutes, flares, signal/strobe lights, dye markers, mirrors, SART, EPIRB/ELT, etc.); and

(c) Other gear (Anchors, food, water, first aid kit, fuel supply, etc.).

(11) Provide information about people on board/involved:

(a) Number of persons on board "# POB"; and

(b) Names, ages, addresses, phone #s, experience level (in general & in subject craft)/health.

(12) The SMC's determination of what the SRUs should primarily and secondarily look for while on scene.

(13) Give on scene weather, winds, seas, swells, air temperature, sea temperature, clouds, ceiling, precipitation, visibility, tide, ice cover, etc.

(14) Any additional information not yet described.

2. ACTION:	(15)
A. FOR (APPROPRIATE UNIT)	(16)
B. FOR (APPROPRIATE UNIT)	(17)

(15) Use only as needed.

(16) Describe individual SRU on scene times and other pertinent information or guiding instructions.

(17) Same as #16.

3.	SEARCH AREA					(18)
	AREA SIZE	NW CNR	NE CNR	SE CNR	SW CNR	(19)

(18) Use only as needed.

(19) From SAROPS, list all parameters with regards to length and width of search area and detail all corner points.

4. EXECUTION:	(20)
AREA UNIT PARENT PATT CRP ALT MAJOR AXISCSP TS	(21)

(20) Use only as needed.

(21) Detail all information as per example;

AREA	UNIT	PARENT	PATT	CRP	ALT	MAJOR AXISCSP	TS
A-1	HC-130	A.EC	PS	167	1000	07736-18N/075-40W	2
A-2	HH-60	A.EC	PS	167	500	07736-26N/075-07W	1.5
A-3	P3	NAVY	PS	167	1000	07736-24N/075-47W	2

5.COORDINATION:	(22)
A.	(23)
B.	(24)
C.	(25)
D.	(26)
E.	(27)

F.	(28)

(22) Use only as needed.

(23) Identify unit/person designated as SMC.

(24) Identify unit designated as OSC.

(25) Include the following statement verbatim or some variation; "OSC ADJUST TRACK SPACING (TS) AND ACFT UTILIZATION TO ATTEMPT COMPLETION OF ALL AREAS. OSC REVISE TS FOR TRAFFIC SEPARATION IF REQUIRED".

(26) Identify the time units are to be on scene, whether it be first light or some other specified time. Also include the statement; "ALL UNITS CONTACT OSC WHEN O/S AND PRIOR TO DEPARTING SCENE".

(27) State; "ALL ACFT PARENT COMMANDS OBTAIN CLEARANCES INTO WARNING AREAS. NOTIFY SMC OF ANY DIFFICULTY IN OBTAINING CLEARANCES".

(28) Identify any special instructions such as which units are to insert DMB in specific positions and how drift data should be passed to SMC prior to departing scene.

6. COMMUNICATIONS:	(29)
A.	(30)
B. ON SCENE FREQS: HF UHF VHF(ACFT) VHF(MARINE)	(31)

(29) Use only as needed.

(30) Identify specific air to ground controlling frequencies to be use as per regionally established communications plans.

(31) Identify specific on scene frequencies if units participating in search not from CG regional organization, e.g. DOD, other federal agencies, state/local agencies, other nationalities.

7.REPORTS:	(32)
A.	(33)
B.	(34)
C.	(35)
D.	(36)
E.	(37)
F.	(38)

(32) Use only as needed.

(33) Include the following statement; "OSC SUBMIT SITREP UPON ARRIVAL WITH WX. NOTIFY SMC TWO HOURS PRIOR TO DEPARTURE FM SEARCH AREA AND OF SIGNIFICANT DEVELOPMENTS".

(34) Include the following statement verbatim or some variation; "PARENT UNITS NOTIFY SMC WHEN AIRCRAFT LAUNCHES AND IF LAUNCH IS TO BE DELAYED BY MORE THEN 30 MINUTES".

(35) Include the following statement verbatim or some variation; “SRU’S REPORT NUMBER OF SORTIES, HRS SEARCHED, HRS FLOWN, TRACK SPACE, ALTITUDE, PCT OF SEARCH AREA COMPLETED OR NUMBER OF TRACK LEGS COMPLETED, AND ACTUAL O/S WEATHER ENCOUNTERED AT CONCLUSION OF THE DAY’S SEARCH BY LANDLINE OR MOST RAPID MEANS”.

(36) Include the following statement verbatim or some variation; “AIRCRAFT COMMANDERS VERBALLY DEBRIEF SMC WITHIN ONE HOUR OF COMPLETION OF DAYS SEARCH”.

(37) Include the following statement verbatim or some variation; “OSC SUBMIT ONE SITREP DAILY AT THE CONCLUSION OF AIR SEARCHES. NOTIFY SMC OF ANY SIGNIFICANT EVENTS IMMEDIATELY VIA SATCOM NET”.

(38) Include the following statement; “MAKE NOROPS REPORTS. REPORT ALL SIGHTINGS TO OSC/SMC AS APPROPRIATE”.

C.2.2.3 Example message:

E X A M P L E S A P

O
FM CCGDFIVE PORTSMOUTH VA
TO COGARD AIRSTATION ELIZABETH CITY NC
COMPATWING FIVE BRUNSWICK ME
COGARD STA PORTSMOUTH VA
COGARD STA LITTLE CREEK VA
INFO COMCOGARD SECTOR HAMPTON ROADS VA
COMNAVAIRLANT NORFOLK VA
COMNAVSECFLT NORFOLK VA
ACCT
BT
UNCLAS//N16130//
SUBJ: DISTRESS – F/V MAE DORIS OVERDUE – 60NM SE OF CAPE HENRY VA – XX OCT XX – 0800(ZONE DESCRIPTION OBSERVED) ALPHA SEARCH
1. SITUATION
A. CURRENT STATUS OF SAR CASE: COMMSTA CHESAPEAKE RCVD CALL FM F/V STATING THEIR ENGINES WERE INOPERABLE AND WERE TAKING ON WATER FROM UNKNOWN SOURCE. MASTER STATED CREW MAKING PREPARATIONS TO ABANDON SHIP AS THEY CANNOT CONTROL FLOODING.
B. DESC: F/V MAE DORIS, 75FT WESTERN RIG TRAWLER, BLACK STEEL HULL, WHITE S/S, DOC#75902, H.P. NEW BEDFORD, MA, 4 MAN LIFERAFT, 406 EPRIB.
C. POB: (04) O/O: JOHN DALY 431 CRAWFORD ST, PORTSMOUTH VA HM PHONE# (757)398-1234
CR: BILL MEESE: SAME ADDRESS AND PHONE.
CR: WES PULVER: SAME ADDRESS AND PHONE.
CR: SCOTT DECKER: SAME ADDRESS AND PHONE.
D. SEARCH OBJECT: PRIMARY: RAFT SECONDARY: PIW
E. FORECAST WX: VIS 5NM, CLOUD COVER 9/10, WIND 225T/35KTS, SEAS 225T/5-8FT, AIR TEMP 55F, WATER TEMP 56F, CEILING 1500FT, SUNRISE 1100Z, SUNSET 2200Z.
F. ADDITIONAL INFORMATION: MASTER AND CREW ALL ETREMELY EXPERIENCED FISHERMAN AND EXPERIENCE O/B MAE DORIS.

2. ACTION:
A. FOR A.EC HC-130 AS DISCUSSED WITH D5CC WATCH: CONDUCT SEARCH OF AREA A-1.
B. FOR A.EC HH-60 AS DISCUSSED WITH D5CC WATCH: CONDUCT SEARCH OF AREA A-2.
C. FOR P3: CONDUCT SEARCH OF AREA A-3 AS PER THIS PLAN.
3. SEARCH AREA

AREA	SIZE		
A-1	92X26	NW CORNER 36-18.N/075-39.9W	NE CORNER 36-14.2N/073-43.0W
		SE CORNER 35-53.5N/075-34.2W	SW CORNER 36-18.8N/075-41.4W
A-2	60X5	NW CORNER 36-44.1N/073-56.2W	NE CORNER 36-39.2N/073-54.8W
		SE CORNER 36-25.7N/075-07.6W	SW CORNER 36-30.6N/075-09.0W
A-3	92X26	NW CORNER 37-09.1N/074-03.6W	NE CORNER 36-43.8N/073-56.3W
		SE CORNER 36-23.1N/075-48.2W	SW CORNER 36-48.4N/075-55.5W

4. EXECUTION:

AREA	UNIT	PARENT	PATT	CRP	ALT	MAJOR AXIS	CSP	TS
A-1	HC-130	A.EC	PS	167	1000	077	36-18.1N/075-39.9W	2
A-2	HH-60	A.EC	PS	167	500	077	36-26.6N/075-06.9W	1.5
A-3	P3 AW FIVE		PS	167	1000	077	36-24.3N/075-47.3W	2

5. COORDINATION:
A. CCGD5 IS SAR MISSION COORDINATOR (SMC).
B. RESCUE 1500 IS ON SCENE COORDINATOR (OSC).
C. OSC ADJUST TRACK SPACING (TS) AND ACFT UTILIZATION TO ATTEMPT COMPLETION OF ALL AREAS. OSC REVISE TS FOR TRAFIC SEPARATION IF REQUIRED.
D. ALL SEARCH UNITS O/S BY XX1100Z. ALL UNITS CONTACT OSC WHEN O/S AND PRIOR TO DEPARTING SCENE.
E. ALL ACFT PARENT COMMANDS OBTAIN CLERANCES INTO WARNING AREAS. NOTIFY SMC OF ANY DIFFICULTY IN OBTAINING CLEREANCES.
F. RESCUE 1500 INSERT DMB IN POSITION 36-30.4N/074-53.7W AND PASS DRIFT DATA TO SMC PRIOR TO DEPARTURE FROM SCENE.
6. COMMUNICATIONS:
A. AIR/GROUND COMMS VIA COGARD CAMMSLANT PORTSMOUTH (PRIMARY 5696KHZ, SECONDARY 8983KHZ).
B. ON SCENE FREQS:

	HF	UHF	VHF(ACFT)	VHF(MARINE)
PRIMARY	5680KHZ	282.8MHZ	123.1MHZ	157.075-CH81
SECONDARY	2181KHZ	243.0MHZ	121.5MHZ	156.8MHZ-CH16
TERTIARY	NOT IDENTIFIED			

7. REPORTS:
A. OSC SUBMIT SITREP UPON ARRIVAL WITH WX. NOTIFY SMC TWO HOURS PRIOR TO DEPARTURE FM SEARCH AREA AND OF SIGNIFICANT DEVELOPMENTS.
B. PARENT UNITS NOTIFY SMC WHEN AIRCRAFT LAUNCHES AND IF LAUNCH IS TO BE DELAYED BY MORE THEN 30 MINUTES".
C. SRUS REPORT NUMBER OF SORTIES, HRS SEARCHED, HRS FLOWN, TRACK SPACE, ALTITUDE, PCT OF SEARCH AREA COMPLETED OR NUMBER OF TRACK LEGS COMPLETED, AND ACTUAL O/S WEATHER ENCOUNTERED AT CONCLUSION OF THE DAYS SEARCH BY LANDLINE OR MOST RAPID MEANS.
D. AIRCRAFT COMMANDERS VERBALLY DEBRIEF SMC WITHIN ONE HOUR OF COMPLETION OF DAYS SEARCH.
E. OSC SUBMIT ON SITREP DAILY AT THE CONCLUSION OF AIR SEARCHES. NOTIFY SMC OF ANY SIGNIFICANT EVENTS IMMEDIATELY VIA SATCOM NET.

F.   MAKE NOROPS REPORTS. REPORT ALL SIGHTINGS TO OSC/SMC AS APPROPRIATE.
BT
NNNN

E X A M P L E   S A P

Section C.3
Sample DSC False Alert Message Format

O
FM **RCC NORFOLK//ACC//**
TO EASYLINK
NTF PRI
WUW 804 **(TELEX NUMBER)**
ZEN/M/V **(SHIP'S NAME)/(CALL SIGN)/(TELEX #)**
BT
UNCLAS//N16130//
((IMMEDIATE FM **RCC NORFOLK**))
SUBJ: FALSE DSC DISTRESS ALERT
AT **MMHH UTC DD MON** (DISTRESSED VESSEL'S DISTRESS TIME), A DISTRESS MESSAGE WAS SENT BY YOUR DSC EQUIPMENT AND RECEIVED AT **RCC NORFOLK**. **NORFOLK** HAS LEARNED THAT YOUR VESSEL WAS NOT IN DISTRESS. THE FOLLOWING INFORMATION WAS INCLUDED IN THE DSC DISTRESS ALERT:
DISTRESSED VESSELS'S MMSI: **XXXXXXXXX**
TIME OF DISTRESS: **HHMM UTC**
DISTRESSED VESSEL'S POSITION: **XX-XXX, XX-XXX**
NATURE OF DISTRESS: **XXXXXX (IF LISTED)**
IN AN EFFORT TO IMPROVE THE DSC ALERTING SYSTEM WORLDWIDE, RCC **NORFOLK** REQUESTS YOU PROVIDE THE FOLLOWING INFORMATION VIA TELEX:
A. ACTUAL POSITION OF YOUR VESSEL WHEN ALERT WAS SENT:
B. MAKE AND MODEL OF YOUR DSC EQUIPMENT:
C. REASON FOR DSC DISTRESS ALERT BEING SENT WHEN VESSEL WAS NOT IN DISTRESS (CHOOSE ONE FROM THE FOLLOWING LIST):
1. ACCIDENTAL/TEST – WHILE ATTEMPTING TO SEND TEST MESSAGE, ACCIDENTALLY SENT DSC DISTRESS MESSAGE.
2. ACCIDENTAL/NON-DISTRESS COMMUNICATIONS – WHILE USING EQUIPMENT FOR NON-DISTRESS COMMUNICATIONS, ACCIDENTALLY SENT DSC DISTRESS MESSAGE.
3. ACCIDENTAL/OPERATOR ERROR – WHILE ATTEMPTING TO CLEAR OLD MESSAGE QUEUE OR PERFORM OTHER ADMINISTRATIVE FUNCTION ON SYSTEM, ACCIDENTALLY SENT DSC DISTRESS MESSAGE.
4. EQUIPMENT MALFUNCTION – DSC DISTRESS ALERT SENT IN ERROR DUE TO KNOWN EQUIPMENT MALFUNCTION.
5. UNKNOWN REASON/KNOWN SENT – REASON FOR DSC DISTRESS ALERT SENT IS UNKNOWN, BUT OPERATOR AWARE MESSAGE WAS SENT.
6. UNKNOWN REASON/UNKNOWN SENT – REASON FOR DSC DISTRESS ALERT SENT IS UNKNOWN, AND OPERATOR UNAWARE MESSAGE WAS SENT.
7. OTHER – PLEASE PROVIDE ANY INFORMATION THAT CAN HELP DETERMINE THE CAUSE FOR THIS ALARM.
YOUR WILLINGNESS TO PROVIDE THIS INFORMATION WILL HELP THE INTERNATIONAL SAR COMMUNITY AS WE STRIVE TO SORT ACTUAL DISTRESS CALLS FROM FALSE ALERTS AND IMPROVE DISTRESS ALERTING.

REGARDS: **RCC NORFOLK**
TELEX: **127775**, PHONE **(757) 398-6231**.
BT
NNNN

Section C.4
SafetyNET

C.4.1 Example message text to vessel reporting a distress

1. RCC NORFOLK HAS RECEIVED A DISTRESS ALERT REPORT FROM YOUR VESSEL WITH NO AMPLIFYING INFORMATION. REQUEST TO KNOW THE NATURE OF YOUR DISTRESS, IF ANY. IF YOUR VESSEL IS IN DISTRESS, REQUEST THE ADDITIONAL FOLLOWING INFORMATION:
   A. DESCRIPTION OF VESSEL
   B. EXACT NATURE OF DISTRESS
   C. CURRENT POSITION, COURSE, AND SPEED
   D. ON SCENE WEATHER: SEA DIRECTION AND HEIGHT, WIND DIRECTION AND SPEED, VISIBILITY AND BAROMETRIC PRESSURE, RISING OR FALLING.
   E. NUMBER OF PERSONS ON BOARD
   F. LIFE SAVING EQUIPMENT ON BOARD
   G. VESSELS INTENTIONS AND TYPE OF ASSISTANCE REQUIRED
   H. COMMUNICATIONS AND FREQUENCIES REQUIRED
2. REGARDS: RCC NORFOLK TELEX:127775, PHONE:(757) 398-6231, FAX:(757) 398-6392, INM-C (AOR-W): 430370680.

C.4.2 Example marine broadcast text

1. DISTRESS ALERT WAS TRANSMITTED IN POSITION XX-XXN, XXX-XXX. MARINERS TRANSITING THROUGH THIS AREA ARE REQUESTED TO KEEP A SHARP LOOKOUT AND MAKE FURTHER REPORTS TO RCC NORFOLK. RCC NORFOLK: PHONE 757-398-6231, FAX: 757-398-6392, INM-C 581 OR 584 430370670. TELEX 127775.//

C.4.3 Example cancellation text

1. THE M/V SUNFISH DISABLED AT POSITION XX-XXN, XXX-XX HAS BEEN ASSISTED AND NO LONGER REQUIRES ASSISTANCE. CANCEL RCC NORFOLK

Section C.5
Passing SAR Patterns over the Radio Templates

C.5.1 HC-130 Hercules: Parallel (PS) and Creeping Line (CS) Search Pattern Template

Passing SAR Patterns over the Radio

HC-130 Hercules

Parallel (PS) and Creeping Line (CS) Search Patterns

Directions: Fill in blanks as described; make selection where choice ("/") exist; when passing to SRU read across each line, do NOT read highlighted areas with italic typed instructions.

Search Pattern Type:	Parallel / Creeping Line			*(state which one)*		
Commence Search Point:	Latitude	[ ]	Degrees	[ ]	Minutes	N / S
	Longitude	[ ]	Degrees	[ ]	Minutes	W / E
	(Lat/Long in degrees, minutes and tenths of minutes)					
Center Point:	Latitude	[ ]	Degrees	[ ]	Minutes	N / S
	Longitude	[ ]	Degrees	[ ]	Minutes	W / E
	(Lat/Long in degrees, minutes and tenths of minutes)					
Search Area Dimensions:	Length	[ ]	NM	Width [ ]	NM	
	(Search area rounded to the nearest mile)					
Major Axis:		[ ]	Degrees True			
Creep Direction:		[ ]	Degrees True			
Track Spacing:		[ ]	NM	*(Rounded to the nearest mile)*		
	(keep in mind that the standard turn radius for a C-130 is 2 miles, so anything less than that for track spacing (S) will cause teardrop patterns at the end of each leg)					
Optional, if Time and Comms Permit:						
Corner Points	*(Lat/Long in degrees, minutes and tenths of minutes)*					
#1:	Latitude	[ ]	Degrees	[ ]	Minutes	N / S
	Longitude	[ ]	Degrees	[ ]	Minutes	W / E
#2:	Latitude	[ ]	Degrees	[ ]	Minutes	N / S
	Longitude	[ ]	Degrees	[ ]	Minutes	W / E
#3	Latitude	[ ]	Degrees	[ ]	Minutes	N / S
	Longitude	[ ]	Degrees	[ ]	Minutes	W / E
#4	Latitude	[ ]	Degrees	[ ]	Minutes	N / S
	Longitude	[ ]	Degrees	[ ]	Minutes	W / E
Number of Legs:		[ ]				
Total Track Miles		[ ]	NM			

C.5.2 HC-130 Hercules: Sector (VS) Search Pattern Template

Passing SAR Patterns over the Radio

HC-130 Hercules

Sector (VS) Search Pattern

Directions: Fill in blanks as described; make selection where choice (“/”) exist; when passing to SRU read across each line, do NOT read highlighted areas with italic typed instructions.

Search Pattern Type:	Sector					
Commence Search Point:	Latitude		Degrees		Minutes	N / S
	Longitude		Degrees		Minutes	W / E
	(Lat/Long in degrees, minutes and tenths of minutes)					
Radius:			NM			
	(Rounded to the nearest tenth of a mile)					
Orientation/first leg direction:			Degrees Magnetic			
Angle Theta:		30 / 60	Degrees			

C.5.3 HH-65 & HH-60 Helicopters Parallel (PS) and Creeping Line (CS) Search Pattern Template

Passing SAR Patterns over the Radio

HH-65 & HH-60 Helicopters

Parallel (PS) and Creeping Line (CS) Search Patterns

Directions: Fill in blanks as described; make selection where choice ("/") exist; when passing to SRU read across each line, do NOT read highlighted areas with italic typed instructions.

Search Pattern Type:	Parallel (PS) / Creeping Line (CS)				*(state which one)*	
Center Point:	Latitude		Degrees		Minutes	N / S
	Longitude		Degrees		Minutes	W / E
	(Lat/Long in degrees, minutes and tenths of minutes)					
Search Area Dimensions:	Length		NM	Width		NM
	(Search area rounded to the nearest tenth of a mile)					
Creep Direction:			Degrees True			
Track Spacing:			NM	*(Rounded to the nearest tenth of a mile)*		
First Turn Direction:	Right / Left		*(State which one)*			
Commence Search Point:	Latitude		Degrees		Minutes	N / S
	Longitude		Degrees		Minutes	W / E
	(Lat/Long in degrees, minutes and tenths of minutes)					

C.5.4 HH-65 & HH-60 Helicopters: Sector (VS) Search Pattern Template

Passing SAR Patterns over the Radio

HH-65 & HH-60 Helicopters

Sector (VS) Search Pattern

Directions: Fill in blanks as described; make selection where choice ("/") exist; when passing to SRU read across each line, do NOT read highlighted areas with italic typed instructions.

Search Pattern Type:	Sector					
Commence Search Point:	Latitude		Degrees		Minutes	N / S
	Longitude		Degrees		Minutes	W / E
	(Lat/Long in degrees, minutes and tenths of minutes)					
Radius:			NM	*(Rounded to the nearest tenth of a mile)*		
Orientation:			Degrees True or Magnetic			

C.5.5 CG Surface SRUs: Parallel (PS) and Creeping Line (CS) Search Pattern Template

Passing SAR Patterns over the Radio

CG Surface SRUs

Parallel (PS) and Creeping (CS) Line Search Patterns

Directions: Fill in blanks as described; make selection where choice ("/") exist; when passing to SRU read across each line, do NOT read highlighted areas with italic typed instructions.

Search Pattern Type:	Parallel / Creeping Line				*(state which one)*	
Commence Search Point:	Latitude		Degrees		Minutes	N / S
	Longitude		Degrees		Minutes	W / E
	(Lat/Long in degrees, minutes and tenths of minutes)					
Search Area Dimensions:	Length		NM	Width		NM
	(Search area rounded to the nearest tenth of a mile)					
Creep Direction:			Degrees True			
Track Spacing:			NM	*(Rounded to the nearest tenth of a mile)*		
First Turn Direction:	Right / Left		*(State which one)*			
If Requested:						
Center Point:	Latitude		Degrees		Minutes	N / S
	Longitude		Degrees		Minutes	W / E
	(Lat/Long in degrees, minutes and tenths of minutes)					
Corner Points	*(Lat/Long in degrees, minutes and tenths of minutes)*					
#1:	Latitude		Degrees		Minutes	N / S
	Longitude		Degrees		Minutes	W / E
#2:	Latitude		Degrees		Minutes	N / S
	Longitude		Degrees		Minutes	W / E
#3	Latitude		Degrees		Minutes	N / S
	Longitude		Degrees		Minutes	W / E
#4	Latitude		Degrees		Minutes	N / S
	Longitude		Degrees		Minutes	W / E

C.5.6 CG Surface SRUs: Sector (VS) Search Pattern Template

Passing SAR Patterns over the Radio

CG Surface SRUs

Sector and Expanding Square Search Patterns

Directions: Fill in blanks as described; make selection where choice ("/") exist; when passing to SRU read across each line, do NOT read highlighted areas with italic typed instructions.

Search Pattern Type:	Sector / Expanding Square				*(state which one)*			
Commence Search Point:	Latitude		Degrees		Minutes		Seconds	N / S
	Longitude		Degrees		Minutes		Seconds	W / E
	(Lat/Long in degrees, minutes and seconds)							
Track Spacing:			NM	*(Rounded to the nearest tenth of a mile)*				
Orientation/first leg direction:			Degrees Magnetic					

Appendix D
Medical

Section D.1
Emergency Medical Treatment Report, Form CG-5214

D.1.1 Emergency Medical Treatment Report, Form CG-5214

Emergency Medical Treatment Report, Form CG-5214 is a four-part form used to document patient injuries and general medical condition during the conduct of a MEDEVAC. Each part is identical and is distributed as follows:

Part 1 to Patient
Part 2 to Unit
Part 3 to Triage Officer
Part 4 (spare – copies are not to be sent to USCG Headquarters)

D.1.2 Forms Availability.

A sample of Part 1 of the form is provided on the following page. Emergency Medical Treatment Report, Form CG-5214 is available electronically in ADOBE PDF format in the USCG Forms Library.

EMERGENCY MEDICAL TREATMENT REPORT

VICTIM IDENTIFICATION

1. Name ______
2. Sex (check one) male ___ female ___
3. Estimated age yrs ___ mos ___

RESCUER INFORMATION

10. Name: ______ 11. Level:
12. Unit: ______
13. OPFAC #: ______
14. Rescue Vehicle: ______
15. Receiving Unit: ______
16. Time Patient Transferred: ______

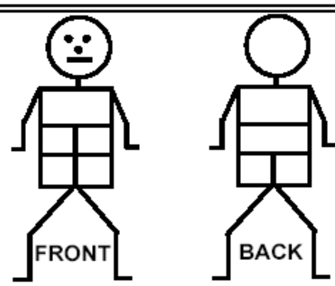
DESCRIPTION OF INCIDENT

4. Date: ______
6. Time on scene: ______
7. Time of incident: ______
8. Location: ______

5. Type of incident:
a) marine ___
b) aviation ___
c) industrial ___
d) auto ___
e) domestic ___
f) other ___

NATURE OF EMERGENCY / MECHANISM OF INJURY

OBSERVATION OF VICTIM



H - hemmorage
L - laceration
S - soft tissue injury
F - fracture
B - burns

TREATMENT (circle as needed)
1 - dressing
2 - tx splint
3 - splint
4 - c/collar
5 - back board
6 - tourniquet
7 - CPR
8 - airway
9 - oxygen
10 - MAST
11 - Miller B/B
O2 Liters ___

MEDICATIONS:

ALLERGIES:

MEDICAL HISTORY / COMMENTS / ETC.
(include additional vitals, oxygen, fluids, etc.)

SKIN (Circle appropriate number or numbers)
1 - normal
2 - pale/ashen
3 - flushed
4 - cyanotic
5 - dry
6 - moist
7 - cold
8 - warm
9 - hot

	TIME / OBSERVED				
VITAL SIGNS					
LEVEL OF CONSCIOUS	Alert				
	Responds to Verbal				
	Responds to Pain				
	Uncon / Unresponsive				
PUPILS	Perl				
	Unequal				
	Nonreactive				
	Dilated				
	Pinpoint				
PULSE	Rate (Numeric)				
	Strong				
	Weak				
BREATHING	Rate (Numeric)				
	Regular				
	Shallow				
	Labored				
BLOOD PRESSURE	Blood Pressure	/	/	/	/
TEMP	Temperature (circle) ORAL RECTAL				
MAST	**MAST BP**	/	/	/	/
	COMPARTMENT		R	L	ABD

TIME	MEDICATIONS ADMINISTERED	DOSAGE
___	___	___
___	___	___
___	___	___

TRIAGE INFORMATION (CIRCLE ONE) **PRIORITY I** **PRIORITY II** **PRIORITY III**

U.S. DEPT. OF HOMELAND SECURITY, USCG, CG-5214 (Rev. 6-04)
Previous Edition May be Used
PATIENT COPY
Reset

Figure D-1 Emergency Medical Treatment Report, Form CG-5214

Section D.2
Emergency Medical Services Agreement

D.2.1 Sample Emergency Medical Services Agreement follows:

EMERGENCY MEDICAL SERVICES AGREEMENT
between

The Governor (or County or Local Official) of the State (or County or Municipality) of **___________________** and
The Commander, **________________** Coast Guard District.

1. Purpose

This Agreement provides a means of mutual coordination between the two signatories for using available facilities to aid persons in need of emergency medical services.

2. Scope

This Agreement is the basis for mutual cooperation for using communication and transportation facilities in support of emergency medical services under the National Highway Safety Act of 1966 within the State (or County or Municipality) of **________________**.

3. General

The National Highway Safety Act of 1966 requires states to implement comprehensive safety programs for the protection and preservation of life on public roadways within their respective jurisdictions. ***The program must be developed in accordance with uniform standards promulgated by the Secretary of Transportation or by National Voluntary Standards adopted by the American Society for Testing and Materials (ASTM) F30.0 Committee on Emergency Medical Services***.

The U.S. Coast Guard provides rescue facilities for the promotion of safety on and over the high seas and waters under the jurisdiction of the United States. It is understood that the primary mission of these facilities is maritime search and rescue and that response to requests from state and local authorities shall be made on an operations-permitting basis only. It is further understood that this agreement is "interim" in nature, intended only to fill a void until adequate commercial or civil government helicopter ambulance service becomes available.

4. Organization

The Governor (or County or Local Official) of the State (or County or Municipality) of **________________** of the County (or municipality) of **________________**, through his designated Highway Safety and Emergency Medical Service Representatives, shall coordinate with the Commander, **________________** Coast Guard District, to implement the terms of this Agreement.

Within the framework of this agreement, direct liaison between local Coast Guard commanders, local law enforcement agencies, and other emergency medical services coordinators is authorized.

5. Agreement

It is agreed that:

a. Law enforcement agencies or other designated emergency medical services coordinators within the State of _______________ may request assistance from commanding officers of Coast Guard units for emergency medical transportation services within the scope of the Highway Safety Act of 1966. Such requests shall be limited to serious incidents in which Coast Guard facilities appear to be the most feasible means of providing the required assistance. Competition with private ambulance services, including air ambulance services, should be avoided.

b. Commanding officers of Coast Guard units may assist when the response will not interfere with the primary mission of maritime search and rescue. They may assume the response is required, and will not unduly compete with private services.

c. The pilot of a Coast Guard aircraft dispatched pursuant to this Agreement shall be the final judge of the feasibility of the mission, and shall discontinue the mission if, in his or her opinion, it cannot be accomplished safely.

d. Before implementing this Agreement, Coast Guard commanders shall apprise agencies and officials designated to request EMS assistance, of the capabilities and limitations of Coast Guard helicopters and other facilities likely to assist.

______________________________ Governor (County Commissioner or Mayor) State of ___________________________ (County or Municipality)	______________________________ Rear Admiral, U.S. Coast Guard Commander, ____________ Coast Guard District

Section D.3
Medical Protocols

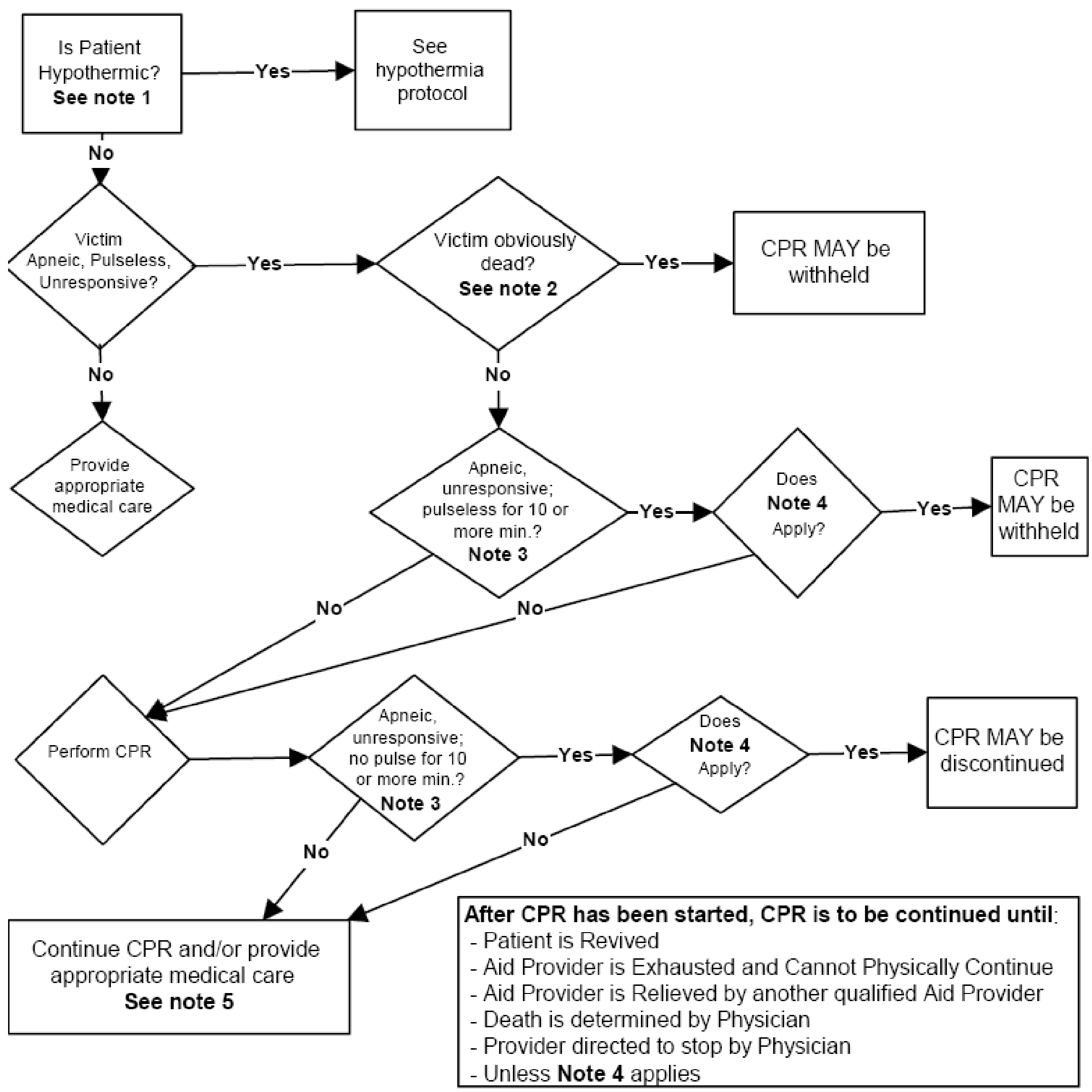
U. S. Coast Guard Medical Protocols are set and maintained by the Office of Operational and Clinical Medicine (CG-1121). These protocols are posted on their web site (Operational Medicine and Quality Improvement Division(CG-1121) (uscg.mil)) and accessed through the "Operational Medicine Resources" link. For ease of use selected protocols are provided in this appendix. SAR watch personnel should check the web site directly for additional medical information, protocols not provided here, and any updates.

D.3.1 Cardiopulmonary Resuscitation Protocol

D.3.1.1 Purpose: The purpose of this protocol is to establish service wide policy for SAR operational commanders and Coast Guard emergency medical services responders (Lifesavers and Emergency Medical Technicians) and medical officers on not starting and or not continuing cardiopulmonary resuscitation (CPR).

D.3.1.2 Background: During search and rescue missions or MEDEVACs Coast Guard SAR responders often recover victims of injury or medical emergencies who are in cardiopulmonary arrest (not breathing and do not have a pulse). The standard protocols of civilian EMS systems usually require starting CPR in the field and rapidly transporting these patients to a hospital for continued resuscitation efforts. Recent medical research on emergency cardiac resuscitation conducted by national healthcare organizations, including the American Heart Association, have made new recommendations regarding "Do Not Start CPR" and "Stop CPR" guidelines. The focus of these guidelines is to prevent nonbeneficial and ineffectual interventions, which pose risks to rescuers and unethical futile efforts, defined as less than one percent survival probability. Medical ethicists and EMS experts have agreed that physicians may withhold futile interventions deemed unlikely to benefit patients even when requested by patients or families. These policies have been clearly established and endorsed for EMS services, which have wilderness or remote locations with prolonged response and patient transport times. Coast Guard's maritime SAR operations usually involve prolonged response intervals, which exceed the accepted response intervals for successful resuscitation. ***In addition, the Coast Guard has increased operational risks for boat and aircrew SAR responders, which must also be weighed with the probability of patient benefit when making operational risk management decisions***. Risks include aircraft and vessel mishaps, personal injury, and bloodborne pathogen exposures. There are also the emotional risks to rescuers and families associated with futile resuscitation efforts. These unique risks require modification of civilian protocols and take precedence over local, regional, and state EMS protocols. Analysis of numerous operational mishaps and near misses during futile rescue attempts has shown that a service wide policy is needed to prevent recurrences.

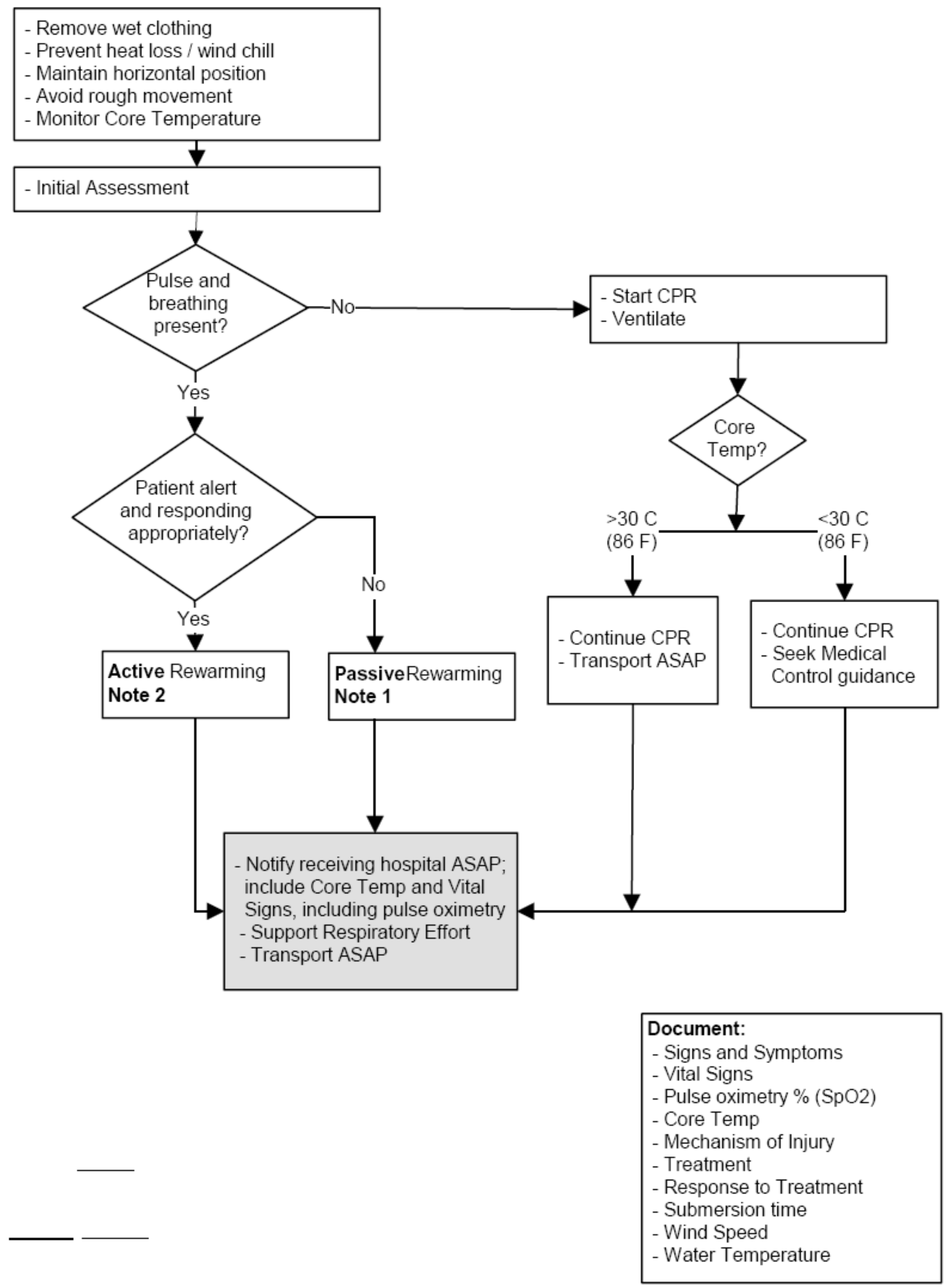
D.3.1.3 Action: A Coast Guard Emergency Medical Services protocol with criteria for not starting and or not continuing CPR has been developed and provided on the following pages (the protocols is posted on the Coast Guard's Operational Medicine web site and provided here for convenience). Operational commanders with SAR responsibilities should ensure that all potential SAR EMS responders and SAR Command Center watch standers are familiar with this protocol. MLC(k) should ensure that all medical officers are familiar with the protocol.



Notes:

1. Hypothermia is defined as a core body temperature of less than 35°C (95°F). For suspected Hypothermic patients, follow the Hypothermia protocol.
2. Obviously dead patients include those that are decapitated, incinerated, have major organs (heart, lungs, brain or liver) separated, or for whom rigor mortis or lividity is present.
3. The following must be observed and recorded by CG EMS provider: No pulse in carotid artery or cardiac apex for 60 seconds (if available, a cardiac monitor must be used); No respiratory effort for 60 seconds despite open airway (if available, a stethoscope must be used for confirmation); Unresponsive to painful stimulus such as a sternal rub and no tendon reflexes; No pupillary reflexes (i.e. pupils non-responsive to light and remain fixed and dilated) and no corneal reflexes; No evidence of drug overdose as the cause of unresponsiveness.
4. This is a SAR or MEDEVAC Mission, where higher level medical care is more than 30 minutes away, contact with a physician is impossible and the patient is 18 years of age or older.
5. When patient is not obviously dead, CG EMS providers will start and continue CPR until: Patient revives; EMS provider becomes physically exhausted and cannot continue, EMS provider is relieved by another qualified aid provider, death is determined by a physician, or aid provider directed to stop by a physician.

Figure D-2 EMT - BASIC Protocol; Decision to Withhold or Stop CPR in Adults



Notes:
1. Active methods include: electrical or charcoal warming devices, hot water baths, heating pads, radiant heat sources and warming beds.
2. Passive methods include: use of insulating blankets and Thermal Recovery Capsules (TRCs).

Figure D-3 EMT - BASIC Protocol; Hypothermia

Appendix E
Operational Risk Management

Section E.1
Operational Risk Management

E.1.1 Overview

Figure E-1 provides the Operational Risk Management decision process.

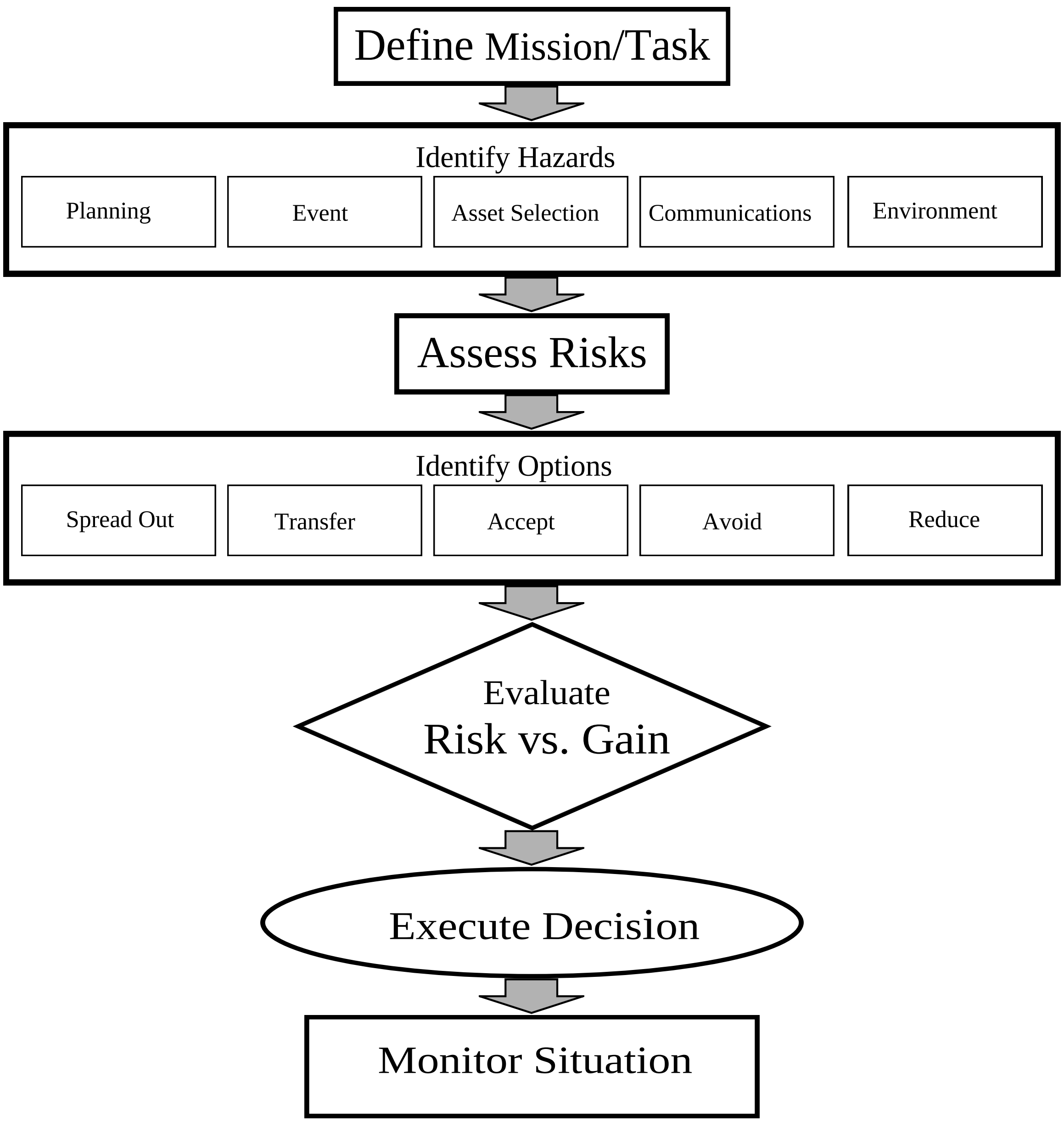


Figure E-1 Operational Risk Management Process for Tactical Decision Making

Table E-1 Relationship Between Various Decision Making Approaches

Generic Model Establish Goals	**Strategic Decision Making** Establish Goals/Objectives	**Tactical Decision Making** Define Mission/Task
Risk Assessment	Gather Stakeholders	Identify Hazards
	Establish Assumptions and Ground Rules	
	Check Baseline	
	Encode Expert Opinion	
	Develop Ranked List of Risks	Assess Risks
Risk Management	Determine Potential Countermeasures	Identify Options
	Develop Ranked List of Countermeasures	Evaluate Risk vs. Gain
	Select Countermeasures and Implement	Execute Decision
Effect Assessment	Assess Effect	Monitor Situation
	Continuous Improvement	

E.1.2 PEACE Model: Used to identify Hazards

Planning: All resources and equipment used to properly plan and execute the mission (i.e. CG and non-CG resources, SAROPS, etc.). Multiple resource operation - Air assets requiring air space deconfliction? Subsequent searches and relief assets planned ahead of time?

Event Complexity: Personnel capable and properly trained to execute the mission.

Asset Selection: Ensure the right asset is available for the mission (Boat, cutter, aircraft, and personnel).

Communications: Frequencies established and maintained with SMC, OSC and SRUs prior to arrival on scene. Comms maintained with the person(s) in need of assistance.

Environment Conditions: How will conditions affect the mission or situation? How long will conditions remain the same?

E.1.3 STAAR Model: Used to identify Options.

Spread Out: Risk can be spread out by increasing either the SRUs responding to the distress or the time between exposures of the SRUs (liner to the Fatigue Standards).

Transfer: Transferring risk does not change probability or severity but rather shifts possible losses or costs to another unit or entity (i.e. assuming SMC from a Sector or transferring OSC responsibilities).

Avoid: Canceling or delaying a mission until the risk is reduced (i.e. avoiding risks associated with a night search by planning for a first light search or waiting for poor weather to pass).

Accept: Accept the risk when the benefits clearly outweigh the costs, but only as much as necessary to complete the mission.

Reduce: To reduce risk: alleviate stress through increasing situational awareness and providing rest. Decrease the number of personnel involved; do you need to "launch the world" on this particular case?

E.1.4 GAR (General Assessment of Risk) Model: Factors to Consider When Assessing Risk

Supervision: How closely do you need to supervise the SMC/OSC/SRU? The higher the risk the more a supervisor needs to focus on observing and checking.

Planning/preparation: How much information is available, how clear is it, how much time is available to plan/execute the mission.

Crew Selection: Consider the experience of the crews performing the mission. If individuals are replaced during the mission, assess their experience level and ensure proper turnover.

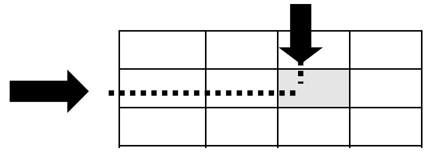
Crew Fitness: Refer to published crew Fatigue Standards.

Environment: Factors affecting personnel, unit readiness, and resource performance. Factors include the time of day, visibility, sea conditions, ceiling level, proximity to other external and geographic hazards and barriers.

Mission Complexity: Consider both the time and resources required to conduct the mission. The longer the exposure to hazards for both the SRUs and the person(s) in need of assistance, the greater the risks involved. What is the precision level needed to successfully complete the mission?

Calculating the Risk: To compute the total degree of risk for each hazard identified, assign a risk code of 0 for no risk through 10 for maximum risk to each of the six elements. Add the risk scores to come up with a total risk score.

How to use this Chart:



	High Gain	*Medium Gain*	*Low Gain*
Low Risk	**Accept the Mission. Continue to monitor Risk Factors, if conditions or mission changes.**	**Accept the Mission. Continue to monitor Risk Factors, if conditions or mission changes.**	**Accept the Mission. Re-evaluate Risk vs. Gain, should Risk Factors change.**
Medium Risk	**Accept the Mission. Continue to monitor Risk Factors and employ Control Options when available.**	**Accept the Mission. Continue to monitor Risk Factors and employ Control Options when available.**	**Accept the Mission. Continue to monitor Risk Factors and actively pursue Control Options to reduce Risk.**
High Risk	**Accept the Mission only with Command endorsement. Communicate Risk vs. Gain to Chain of Command. Actively pursue Control Options to reduce Risk.**	**Accept the Mission only with Command endorsement. Communicate Risk vs. Gain to Chain of Command. Actively pursue Control Options to reduce Risk.**	**Do not Accept the Mission. Communicate to Chain of Command. Wait until Risk Factors change or Control Options warrant.**

Figure E-2 GAR Risk Management Model

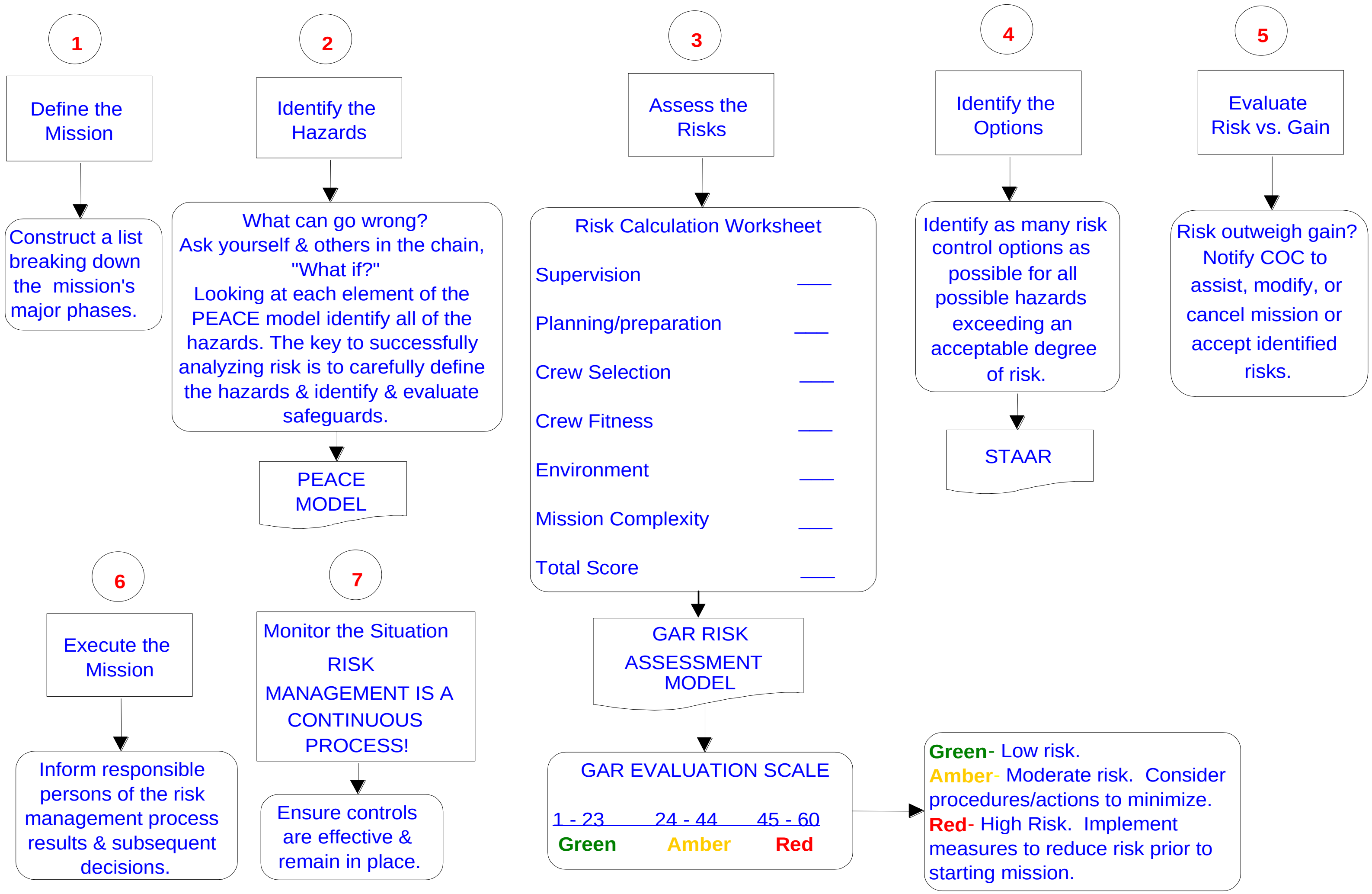


Figure E-3 Risk Assessment Decision Matrix

Appendix F
SAR Contingency Exercises

Section F.1
Introduction

This appendix provides guidance regarding maritime contingency response planning and exercises. ***District Commanders shall work with FEMA and other emergency response organizations to identify maritime contingency response communities and establish maritime SAR councils within their areas of responsibility***. These councils should ensure that appropriate contingency response plans have been developed. In situations where no other agency has taken the lead on this issue, District Commanders are authorized to do so.

Section F.2
Identifying Maritime Contingency Response Communities

While the Coast Guard traditionally has been the primary response organization for maritime incidents, the sheer numbers of people involved in potential maritime disasters involving passenger ferries, excursion vessels and passenger aircraft require significantly greater numbers of resources than the Coast Guard alone could provide. Other agencies such as the Department of Defense, the Federal Emergency Management Agency (FEMA), and State and Local Emergency Management Councils, as well as local maritime industry and other emergency support providers (hospitals, ambulance services, Red Cross, National Guard) are key players in response to potential maritime disasters. These organizations all come together to form a "maritime response community" - a group of organizations and individuals who would naturally come together to respond to a maritime incident.

F.2.1 Definition of a Response Community

A response community is:

A group of organizations and individuals who would naturally come together to respond to a maritime incident.

This definition is sufficiently broad to include any organization or group of individuals who would make a tangible contribution to the ultimate success of a maritime response.

F.2.1.1 **Possible organizations** include private companies like a vessel or facility owner or operator, or one or more companies providing specialized services, equipment or personnel related to a response operation. Other organizations include various government agencies with a mandated interest or involvement in emergency response and search and rescue.

F.2.1.2 **Possible individuals or groups** include citizens, emergency medical services providers, community groups, and groups linked by a common interest such as local fishing or towing associations. All of these groups can positively affect the outcome of maritime incident response activities through their efforts and resources.

F.2.1.3 **Maritime SAR Councils** are defined in this Addendum as committees of federal, state, local or volunteer groups with SAR capabilities localized within the maritime SAR response area. These committees serve as coordinating councils for maritime response communities.

F.2.2 Response Community Levels

Any organization that has prepared a contingency plan is actually part of several different response community levels, starting with itself at the core. This is illustrated in Figure F-1.

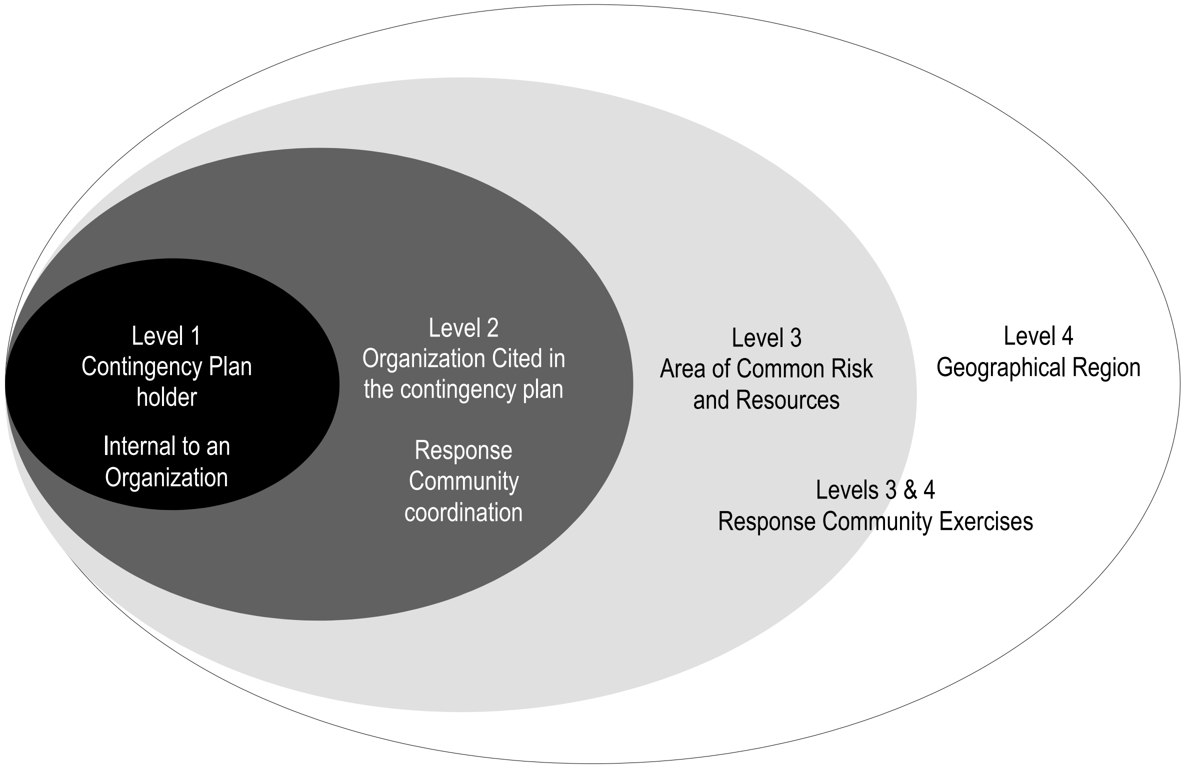


Figure F-1. A Response Community Model for Exercising

Level 1 — Contingency Plan Holder

This response community level consists of the response personnel, equipment and resources directly controlled by the contingency plan holder. For an excursion or gambling vessel owner, this includes the crew and operating staff organized into a response organization as well as response equipment maintained on board.

Level 2 — Organizations Cited in the Contingency Plan

This response community level consists of any external organizations that the plan holder would call for assistance in the event of a maritime incident. Such organizations are usually listed as key contacts in the contingency plan and might include vessel or equipment providers and contractors providing specialized services and trained personnel related to control, triage, or recovery operations, as well as government agencies.

Level 3 — Area of Common Risk and Resources

This response community level consists of the natural geographic area or zone in which a number of plan holders share a common incident risk such as navigational risk and common response resources. The best example is a port, harbor, or stretch of river where several vessel operators, facility operators, response organizations and different government jurisdictions co-exist and operate on an ongoing basis. It could also include a stretch of coastline or well-traveled navigational route.

Level 4 — Common Geographic Region

The regional response community level is simply a larger geographic region made up of a number of smaller areas of common risk (e.g., ports, harbors, or coastal traffic areas). A regional community usually has one or a few major centers of activity such as a large port. The administrative offices of larger community organizations are located there, serving as the management center for the various operations located in smaller Level 3 communities throughout the region.

Section F.3
Developing Maritime Contingency Response Plans

The Coast Guard is authorized to provide a nationwide system for maritime Search and Rescue response and to coordinate search and rescue efforts on navigable waters. Accordingly, the Coast Guard has established a network of response units throughout its jurisdiction to respond to mariners in distress. However, no single agency can provide for the level of response required in a maritime disaster situation. Similarly, the Federal Emergency Management Agency (FEMA) is authorized to coordinate emergency preparedness and response in the United States. FEMA has established a contingency organizational structure, which reaches to the local county level, but may or may not include local Coast Guard forces. To achieve efficient and effective contingency response, we need to join or establish maritime SAR councils and coordinate our efforts locally within response communities. ***We must work in concert with FEMA and with other Federal, State, and local agencies, which have similar responsibilities for contingency response***. Participation in Maritime SAR Councils will ensure individual participants and organizations know their specific roles within the response community. Only through focused, coordinated response efforts can the impact of a maritime disaster be minimized.

F.3.1 Contingency Definition

As defined in reference (nn), a contingency is a significant natural or manmade event or emergency that threatens the safety of lives, property, or the environment; threatens a national security interest; or may negatively impact the nation's well being. A contingency involves a response situation that requires a level of activity that exceeds the unit's (or local organization's) scope of normal operations. Contingencies may vary in probability of occurrence, predictability, duration, and effect on the organization and the public.

F.3.2 Contingency Response Planning

Key lessons learned from past exercises provide general guidance for plan development and form the basic elements of an efficient contingency plan:

F.3.2.1 General Guidance:

(a) Plan for the worst case scenario;

(b) Keep the plan short and use simple language - no jargon;

(c) Use existing plans where possible;

(d) Use a Joint Command Center and one Incident Commander; and

(f) Use a Joint Communications Center and employ existing communications plans.

F.3.2.2 Basic Contingency Plan Elements:

(a) Identify call out authorities: Who can stand-up the community contingency response?

(b) Lay out specific notification procedures.

(c) Who are the key points of contact and how are they notified?

(d) Specify role definitions for coordination and operations: Who will do what when?

(e) Specify the Joint Communications Plan.

(f) Address risk management within the response community organization.

Section F.4
Exercising Maritime Contingency Response Plans

As contingency plans are developed within the response community, these plans must be exercised and refined. Reference (nn) provides the framework through which exercise programs and activities of individual response community members can be organized, coordinated, and guided. Reference (nn) describes procedures, standardizes terminology, and provides general guidance for planning, executing, and evaluating contingency preparedness exercises. Using reference (nn), members of the maritime response community can achieve maximum benefit - individually and collectively - from maritime contingency response exercising. The following provides an executive summary of information on contingency exercise planning. ***Reference (nn) shall be the primary reference***.

The exercise program is intended to involve the entire maritime response community across the country and focuses on the need for a response community approach to maritime response exercising. Such an approach recognizes that the response to an actual maritime incident will be a community effort, that is, it will involve personnel, resources and plans of several organizations and agencies in addition to the Coast Guard. The number of organizations will depend on the size, location, and circumstances of the incident.

An organization participates in the Exercise Program when it recognizes the Program's guidance in planning, conducting, and evaluating its maritime response exercise activities. Participation involves upholding program principles and fulfilling the responsibility of response community members.

The Exercise Program's success will be determined by the quality, consistency, coordination and frequency of maritime response exercises. It will also be determined by the tangible contributions made to the four goals of this program: planning, training, response techniques, and exercising.

F.4.1 Guiding Principles

The following are guiding principles that provide the foundation of the Exercise Program.

F.4.1.1 Community approach to exercising. Maritime response exercising aims to incorporate the same cooperative management approach between response community members that would occur during response to a real emergency. The targeted levels of preparedness and exercising (e.g., type and frequency) are established jointly or by the community as a whole. Once determined, members work cooperatively to achieve them. Exercises are scheduled to maximize the frequency and degree of community involvement. Finally, exercise costs are shared fairly and equitably among the various community members.

F.4.1.2 Progressive development of response preparedness. The Response Community's preparedness is built progressively through simple, discrete exercises that are clearly focused on a limited number of measurable, achievable objectives. Starting with task-oriented operational exercises and then moving on to functional and combined functional management exercises, the community develops its response capability and exercise experience levels in a gradual, logical fashion.

F.4.1.3 Identifying and sharing exercise lessons learned. All maritime response exercises are thoroughly evaluated and the lessons learned from them documented and appropriately acted on by participants. The Exercise Program holds that lessons learned from individual response community exercises should be reviewed and shared with other communities to improve overall response preparedness.

F.4.2 Implications of the Levels of Response Exercising

The response community levels shown in Figure 1 correspond directly to the "tiered" approach to the response of a real incident. As the incident size, severity and likely consequences of an incident increase, the personnel, resources and capabilities required to effectively deal with it escalate to higher levels of the response community. In the event of a maritime disaster, the resources of the entire national response community might be mobilized.

The response to every marine incident will involve some segment or level of the response community of which the contingency plan holder is a member. Therefore, it follows that an organization should exercise its contingency plan through each of the response community levels with which it might have to interact, depending on the size, complexity and risk of its operations or its designated scope of responsibility and accountability.

Generally, the complexity of exercising increases with each of the response community's levels. For instance, an internal exercise involving only the plan holder's personnel will be simpler to plan, conduct, and evaluate than a community exercise involving all of the organizations operating in a particular port or coastal area.

Figure F-2 describes how the priorities of maritime incident response exercises might differ between each of the response community levels.

F.4.3 Initial Response Exercises

Level 1 exercises focus on individual facilities, vessels, and operating units. The emphasis in on developing and practicing on site personnel's initial response capabilities using regular task oriented operational exercises. Examples of such exercises include alerting key personnel, emergency termination of vessel on board activities, evacuation procedures, on site equipment deployment, and use of personal protective and lifesaving gear. Usually these exercises are limited to employees of a single organization or facility.

Management exercises at Level 1 are also internal undertakings. In other words, they are initiated, developed and led by a single organization to improve its own response preparedness level. External organizations are role-played to achieve the exercise objectives and to add an element of realism.

Level 4 – Common Geographic Area

- Several response management teams involved in all capacities (i.e., responders, SAR Planners, and evaluators).
- Possible use of full scale exercise design.
- Catastrophic incident scenario threatening national interest and requiring inter-regional cooperation's and coordination's.
- Sponsored, initiated, and led by the government.
- Combined management exercise involving several functions and locations.
- Low frequency due to long planning horizons.

Level 3 – Area of Common Risk and Resources

- Incident scenario that reflects significant risk and scope within the area.
- Larger scale or more complex operational exercises especially vessel deployment and operation.
- Combined management exercises involving multiple primary response functions.
- Involves response management teams of more than one organization acting as responders.
- Planning, control, evaluation roles may be filled by different community members.
- Frequency might be annual or even less often but predetermined and jointly agreed to by the community as a whole.
- Might replace some Level 2 exercise activities by individual organizations.

Level 2 – Organizations Cited in the Contingency Plan

- Incident scenarios that will trigger a call for outside assistance and resources.
- First practical level of response community exercise application.
- Operational exercises aimed at initial response actions and vessel deployment.
- Adds limited-scale management exercises of one or few key primary response functions.
- Involves some or all response management team members and appropriate representatives of outside organizations in person.
- Highest frequency of management exercise.

Level 1 – Contingency Plan Holder

- Incident scenarios that are focused on smaller, higher probability, operational-type incidents.
- Operational exercises oriented around emergency operating procedures, initial response actions, and on site vessel readiness and deployment.
- Involves designated initial response personnel made up of on board operating and supervisory personnel.
- Internal to a single organization.
- Management exercise involves role-playing of outside agencies.
- Frequency should be regular, predetermined and highest of all response activities.

Figure F-2. Exercise Priorities According to Response Community Level

F.4.4 Response Community Exercises

Level 2 exercises are where the concept of a response community exercise becomes operative. At this level, the plan holder exercises with some or all of the external organizations listed in its contingency plan that it will rely on for support, or that it will provide support during an incident response. At this level, management exercises involving the organization's response management team members are the focal point.

Exercises target a small number of primary response functions based on the organization's likely role and responsibilities during a real response (i.e., functional management exercises from Level 1). The functions might change from exercise to exercise as the organization works to develop its total management capability. This is the program's approach, rather than attempting to incorporate all relevant functions into a single complex exercise. At this level, large operational exercises might also take place, usually related to the deployment and operation of vessels and emergency services.

The Level 2 exercise is the most basic and traditional form of response community exercise. Although several organizations participate, the exercise is usually designed, controlled, and evaluated by the plan holder's organization. It retains a high level of management control over the exercise and pays all out of pocket costs associated with the exercise activities. External organizations cover their own direct costs.

Level 3 exercises represent a more advanced type of response community exercise. At this level, several organizations or plan holders come together as equals to cooperatively plan and execute a marine incident response exercise.

The objectives of the exercise are determined and agreed to collectively by the group instead of by a single sponsoring organization. An exercise planning committee may be set up for this purpose. Each organization contributes personnel, resources and money to the entire exercise development process from planning through to evaluation on a fair and equitable basis that has been established by the group.

Although one organization might agree to "initiate the disaster", the tasks of designing, controlling and evaluating the exercises are assigned to different personnel from the entire group. Additionally, some organizations are required to be part of the response management team in the capacities they would normally occupy following a real spill. Relatively more complex combined management exercises lend themselves well to this approach to exercising because the workload can be spread among more participants.

Figure F-3 compares the basic organization of a Level 3 response community exercise with the more traditional organization described in Level 2. In the Level 3 exercise organization, objectives are determined collectively and planning is done through a committee process and structure. In the Level 2 exercise organization, the sponsoring organization is in charge of the exercise development process and determines the exercise objectives. Other organizations follow its direction and leadership closely.

At Level 4, the common geographic region response community level, the advanced model of a community response exercise can be applied with excellent results. As presented in Figure F-3, a potential exercise design is a fairly sophisticated management exercise that triggers several response functions and focuses on inter-organizational and interagency cooperation, coordination and communication during a major incident scenario. In an exercise of this scale, the planning, control and evaluation roles are assigned to different organizations or to teams made of individuals from the various organizations.

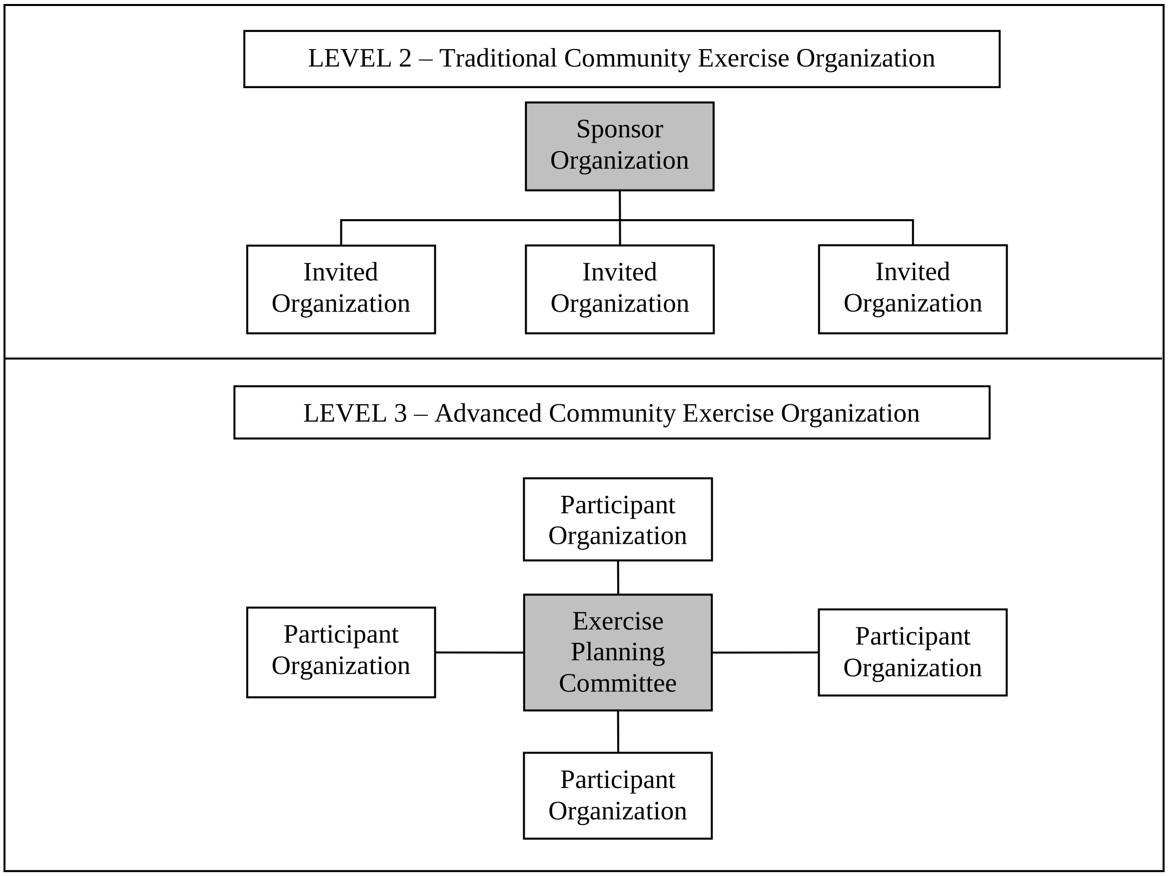


Figure F-3. Comparison of Exercise Organizations

The model also works well in an exercise involving more than one regional response community. For example, an exercise might be designed to assess several regions' ability to support the response to a catastrophic disaster scenario in another region. This type of exercise would likely be initiated and led by an organization with a clear interest or responsibility for emergency response across several regional response communities like the Coast Guard or FEMA.

F.4.5 Developing Response Capability Through a Balanced Mix of Exercise

Each member of the response community is responsible for improving its own response capabilities through exercising. Under the Exercise Program the challenge to each organization is to find the optimal balance between the different types, community levels and frequencies of exercises that best achieve the targeted improvements in preparedness within the budget allocated for this purpose.

The response community approach to exercising holds that the magnitude of the improvement can be significantly increased if the individual organizations are aware of and exercise cooperatively within the various community levels to which they belong as much as is realistically and economically practical.

F.4.5.1 As already noted, this approach requires each member to be willing to:

(a) Coordinate its exercise plans and schedules with other members;

(b) Participate in and support community exercise initiatives in various possible capacities (i.e., responder, planner, controller, evaluator);

(c) Share costs, personnel and other resources; and

(d) Share exercise lessons learned among community members and other communities.

The collective improvement achieved through selective community exercising will be reinforced by each member's program of well-planned, cost effective, regular internal response exercises.

Each organization will continue to hold internal exercises aimed at its own specific needs and priorities and involving only its own or limited external personnel. The process begins with each response community member developing its own internal exercise program.

F.4.6 Exercise Frequency

The overall level of preparedness a community strives to achieve is determined by the capabilities of its individual members. ***The response community must collectively establish a standard level of exercising for its members for both operational and management exercises***. Generally, the frequency of response exercises should be whatever is necessary to improve an organization's level of preparedness to where it can competently, effectively, and rapidly respond to a maritime incident. ***Once there, it must be able to maintain that level of capability***.

Section F.5
Requesting Support for Maritime Contingency Response Plan Exercises

F.5.1 Funding

Commands should budget for maritime contingency exercises based on the types of exercises planned and the anticipated costs. Specific guidance for determining exercise scope and estimating costs is located in reference (nn). Units that experience budgetary shortfalls should request exercise funding via their chain of command.

F.5.2 Support teams

Tiger teams are available to assist commands with contingency exercise planning. These teams are comprised of marine safety and readiness program personnel with experience in exercise planning. Upon request, the teams will deploy for up to one week to assist local commands with establishing a maritime contingency community response plan and exercise program. Interested commands should submit a letter request to Commandant (CG-5R) indicating the current status of local response community coordination and listing preferred and alternative dates for the support team visit.

Appendix G
SAR Checksheets

The following checksheets are the standard for SAR checksheets and detail the minimum amount of information to be gathered for each situation. ***Units can modify the format of these checksheets to accommodate local practices, but shall not eliminate any information***. ***The specific information to be requested/ passed to subjects in distress in regards to personal flotation devices and notifying of intended Coast Guard actions must remain in sequence as contained in the Initial SAR Checksheet.***

The information on these checksheets is captured in MISLE checksheets and the Notification and Response Activity data entry. MISLE entry is encouraged as the primary data capture means.

Privacy Concerns: When filled out, several of the checksheets within this appendix will contain Personally Identifiable Information (PII). The Coast Guard has a duty to safeguard PII in its possession to prevent any breach in order to maintain the public's trust. ***Unintended disclosure or compromise of an individual's PII constitutes a Privacy Incident and must be reported in accordance with Reference (oo).***

Radio Call	Frequency:	High Site:	DF Bearing:
Type of Comms:		Original Relay	
Time:	Date:	UCN:	Initials:

-- Initial SAR Check Sheet --

1. Position *Type of Position:* [ ] Lat/Long [ ] Geographic Reference

How determined?

2. Number of Persons On Board Adults: Children: Total:

3. Nature of Distress (if PIW complete additional PIW box below)

4. Description of Vessel Name: Length: Type: Make: Color:

5. Is there an adequate number of Personal Floatation Devices (PFDs) available for all persons onboard the vessel? Y/N

Have all persons on board the vessel put on PFDs? Y / N

***** ADVISE REPORTING SOURCE OF INTENDED ACTIONS AT THIS TIME *****

6. Determine Initial Severity / Emergency Phase

[ ] Distress	**[ ] Uncertainty** **[ ] Alert**
[ ] Dispatch Resources / Activate SAR Alarm	*Additional information is needed*
[ ] ***Advise reporting source of Coast Guard's Actions***	*Complete one or more of the following:*
[ ] Issue Urgent Marine Information Broadcast (UMIB)	[ ] Supplemental Check-sheet
[ ] Brief Sector / District	[ ] Overdue Check-sheet
[ ] Provide emergency instructions to vessel in distress	[ ] Flare Sighting Check-sheet
[ ] Complete additional check-sheets as situation dictates	[ ] MEDEVAC/MEDICO Check-sheet
	[ ] Grounding Check-sheet
	[ ] Mass Rescue Operation Supplemental Check sheet

Persons in the Water

Number:	Description:	[ ] PFD - type/color:
Time:		[ ] Exposure Suit
Confirmed? [ ]		[ ] Light

***** Complete all of the above before shifting frequency; Complete below before hanging up phone *****

Reporting Source

Name:

Vessel Name:

Call back number (with area code):

[ ] cell phone

[ ] radio / call sign: / MMSI:

Address:

On Scene Weather

Wind	Seas	Swells	Visibility
Weather Type			

SUPPLEMENTAL SAR CHECKSHEET

VESSEL	[ ] Document/Official Number [ ] State Registration		Communications Equipment [ ] VHF-FM [ ] HF [ ] DSC [ ] Other ______ [ ] Cellular: # Frequencies:
	Homeport	Flag	
	Usage	Hull Material	Navigation Equipment [ ] GPS [ ] OMEGA [ ] RADAR [ ] Fathometer [ ] Other:
	Prominent Features		Survival Equipment [ ] EPIRB Class/Type: ____________ [ ] PFDs #s/Types: ________________________
	Cause of Incident		[ ] VDS/Flares [ ] Flashlight [ ] Raft/Lifeboat [ ] Dinghy/Skiff [ ] Food/Water [ ] Foul Wx Gear

PEOPLE	[ ] Owner [ ] Operator [ ] POB Name Address Phone			[ ] Owner [ ] Operator [ ] POB Name Address Phone		
	Age:	DOB:	Male/Female	Age:	DOB:	Male/Female
	[ ] Owner [ ] Operator [ ] POB Name Address Phone			[ ] Owner [ ] Operator [ ] POB Name Address Phone		
	Age:	DOB:	Male/Female	Age:	DOB:	Male/Female

Additional Comments

ACTION	Communications Schedule	
	Start Time	Frequency
	Time Interval [ ] 15 min [ ] 30 min [ ] 60 min [ ] Other	
	Remarks	

Set and Drift [ ] Not a factor		
Set [ ] T [ ] M	Drift [ ] kts [ ] MPH	
[ ] DMB	Type	Freq
DMB	Inserted	Relocation
Time		
Position	N	N
	W	W

OVERDUE CHECKSHEET

COMPLETE BOTH SIDES OF THIS CHECKSHEET,
EVALUATE INFORMATION AND TAKE INITIAL ACTION

One of the following might be reason to immediately launch an asset:
SIGNIFICANT HOURS OVERDUE, MEDICAL CONCERNS, COMMITMENTS, WEATHER HISTORY, AGE OF POB

Vessel LPOC: ______________________________ Date/Time: ____________________
Did R/S confirm departure: **Y** **N**

Vessel NPOC: ______________________________ Date/Time: ____________________
Did R/S confirm non-arrival: **Y** **N**

Intended route: ____

POB: Adults _______ Children _______ HRS OVERDUE: _______

Have they taken this trip before:	**Y**	**N**	**UNK**
Do they usually stop over anywhere:	**Y**	**N**	**UNK**
Do they have a habit of being late:	**Y**	**N**	**UNK**

Last comms DTG: ______________________ Method: (VHF, L/L, etc.): ______________________

Intentions at last comms:

VESSEL DESCRIPTION:

Name:

Homeport:

Type VSL: PWR SPEED ROW SAIL

REG/DOC #:

Length: FT/M Type:

Make: Draft: FT/M

Hull Color: Hull Material:

S/S Color: Trim Color:

Sail Color: Fuel O/B:

Propulsion: I/B O/B I/O SINGLE TWIN

Prominent Features:

OWNER:

Name:

Address:

Phone: ( )

Is he/she on board: Y N

*** CONTACT OWNER IF NOT ON BOARD ***

ELECTRONIC EQUIPMENT:

RADAR FATH GPS SATNAV

EPIRB TYPE:

RADIOS: VHF HF SSB CB

Call Sign: FREQS:

Cellular Telephone:

Pager/Beeper:

ADDITIONAL INFORMATION:

OVERDUE CHECKSHEET PAGE 2

SURVIVAL EQUIPMENT:

PFDs	**Y**	**N**	**UNK**
Flares:	**Y**	**N**	**UNK**
Flashlight:	**Y**	**N**	**UNK**
Dye:	**Y**	**N**	**UNK**
Mirror:	**Y**	**N**	**UNK**
Smoke Marker:	**Y**	**N**	**UNK**
Smoker:	**Y**	**N**	**UNK**
Spotlight:	**Y**	**N**	**UNK**
AUX electric power:	**Y**	**N**	**UNK**
Radar reflector:	**Y**	**N**	**UNK**
Drogue:	**Y**	**N**	**UNK**
Anchor:	**Y**	**N**	**UNK**
Anchor line:	**Y**	**N**	**UNK**
Food:	**Y**	**N**	**UNK**
Water:	**Y**	**N**	**UNK**
Raft:	**Y**	**N**	**UNK**
Description:			
Dinghy:	**Y**	**N**	**UNK**
Description:			

VEHICLE:

Make: Model:
License NR: Color:
Trailer Lic: Color:

SECOND VEHICLE:
Make: Model:
License NR: Color:
Trailer Lic: Color:

ADDITIONAL NOTES:

OPERATOR:

Address:

Phone: ( )
POC/NOK:
Phone: ( )

Experience with boat:		**Y**	**N**	**UNK**
Experience in area:		**Y**	**N**	**UNK**
Swimmer:	**GOOD**	**FAIR**	**POOR**	**NON**

Clothing:
Desc: HT: WT: Eyes:
Hair: Race: Age:

HEALTH: **GOOD** **FAIR** **POOR** **UNK**

COMMITMENTS:

PASSENGER:

Address:

Phone: ( )
POC/NOK:
Phone: ( )

Experience with boat:		**Y**	**N**	**UNK**
Experience in area:		**Y**	**N**	**UNK**
Swimmer:	**GOOD**	**FAIR**	**POOR**	**NON**

Clothing:
Desc: HT: WT: Eyes:
Hair: Race: Age:

HEALTH: **GOOD** **FAIR** **POOR** **UNK**

COMMITMENTS:

PASSENGER:

Address:

Phone: ( )
POC/NOK:
Phone: ( )

Experience with boat:		**Y**	**N**	**UNK**
Experience in area:		**Y**	**N**	**UNK**
Swimmer:	**GOOD**	**FAIR**	**POOR**	**NON**

Clothing:
Desc: HT: WT: Eyes:
Hair: Race: Age:

HEALTH: **GOOD** **FAIR** **POOR** **UNK**

COMMITMENTS:

ACTION TAKEN BY COAST GUARD

Confirm departure: **Y N** Confirm non-arrival: **Y N** UMIB: **Y N**

EVALUATE WEATHER HISTORY ALONG INTENDED TRACK:
WIND: ______ / ______ SEAS: ______ / _______ VIS: ______ SEA TEMP: ______ F/C

Initial EMERGENCY PHASE: **UNCERTAINTY** **ALERT** **DISTRESS**
Initial action taken:

MEDICO / MEDEVAC CHECKSHEET

PATIENT INFORMATION

Name: Age: Sex: **M** **F** Nationality:

Type of injury (symptoms and location):

When/how injury occurred:

Medications administered (type and amount):

Previous medical history (including medications):

PATIENT VITAL SIGNS

Temp: Airway: **OBSTRUCTED** **GURGLING** **OPEN**

B/P Resp: **SHALLOW** **NORMAL** **DEEP** **NONE***

(Wrist/Neck):

Pulse: **NORMAL** **WEAK** **POUNDING** **NONE***

* IF NO PULSE/RESP, IS CPR BEING CONDUCTED? **Y** **N** How long?

Conscious: **Y** **N** Ambulatory: **Y** **N** Eyes: DILATED **Y** **N**

Convulsions: **Y** **N** Signs of Shock **Y** **N** REACTIVE **Y** **N**

Vomiting: **Y** **N** Bleeding: **Y** **N** EQUAL **Y** **N**

Tingling limbs: **Y** **N** Paralysis: **Y** **N**

Skin cond: **DRY** **NML** **CLAMMY** Skin color: **BLANCHED** **YLW** **NML** **BLUE** **RED**

First aid kit: **Y** **N** Treatment given:

Medical personnel: **DR** **RN** **EMT** **OTHER**

DIVING ACCIDENTS

2

Time of accident: _________

Total dives today: _________ Interval between dives: _________

Dive depth: ______FT/M Dive duration: _________ Decompression: _________

Dives in last 24 HRS: **Y** **N** IF YES, when? _______________

Dive depth: ______FT/M Dive duration: _________ Decompression: _________

MISC INFORMATION

Vsl LPOC/Date: Vsl NPOC/ETA:

Communications: VHF-FM MF/HF CELLULAR FREQ/Number:

O/S Weather: Wind: ______ / ______ Seas: ______ / ______ VIS: ______ Sea temp: ____ F/C

FLT Surgeon BRFD: [ ] YES [ ] NO MEDEVAC: [ ] BOAT [ ] HELO

GROUNDING CHECKSHEET

PRIMARY INFORMATION

Are you taking on water? **Y** **N**

IF YES: What part of vessel? How fast? ________ GPM

Are there any injuries or people in the water? **Y** **N**

IF YES: TREAT AS A SAR CASE

Is there any pollution as a result of the grounding? **Y** **N**

IF YES: Type of material _________________ Estimated quantity _______________

Notify the COTP and gather additional information.

What type of bottom: MUD SAND ROCK OTHER

Type of Fuel O/B: Quantity of fuel:

Type of cargo O/B: Quantity of cargo:

OTHER INFORMATION

VSL DESCRIPTION

Name:

Homeport:

Type vsl: PWR SPEED SAIL MERCHANT

REG/DOC #:

Length: FT/M Type:

Make: Draft:

Hull Clr: Hull Mat:

S/S Clr: Trim Clr:

Propulsion: I/B O/B I/O SINGLE TWIN

Additional information:

OWNER

Address:

Telephone: ( )

Has Owner been NTFD: **Y** **N**

Shipping Agent (Commercial):

Rudder movement: **Y** **N**

Wheel movement: **Y** **N**

O/S Weather: Wind: ______ / ______ Seas: ______ / ______ Vis: _____ Sea Temp: ______ F/C

Weather forecast:

Next low tide:

Next high tide:

ACTION TAKEN BY CG

Conduct a visual ATON check with CG unit (ALWAYS REQUIRED): **Y** **N**

Issue broadcast: UMIB MARB BNTM

Notify: [ ] SMC [ ] COTP

Report taken by: ____ Date: _____________

FLARE SIGHTING CHECKSHEET

REPORTING SOURCE INFORMATION

Name:____**Report DTG:** ___________________________

Contact Method: **Land Line**___________ **CELL**_______________ **Radio Freq/Ch.** _______________

1. ***What was your location when you saw the flare?*** If the R/S cannot provide position, try the following:

- *"Were you facing any structures such as a hotel, lighthouse, water tower, or sand dune?"*
- *"Were you north or south (east/west) of the___________?"*
- *"Facing the , was the_______on your right or left?"*
- *"Approximately how far from the______would you say you are/were?"*

Does R/S have a smart phone that can provide compass direction (True/Magnetic) and LAT/LON?

1a. R/S Geographic Location:	**1b. R/S Coordinates:** **Lat** ________________________ **Long** _______________________	**1c. R/S Address:**

POSITION ACCURACY (OU decision) (circle one)	0	.25 NM	1 NM	2NM

2. ***Are you still at that location?***	YES NO	**3.** If yes: ***Can you remain at that***	YES NO

FLARE INFORMATION

Before asking the following questions, state to the reporting source…

"I'm going to ask you a series of questions to help determine the probable location of the flare(s) you saw."

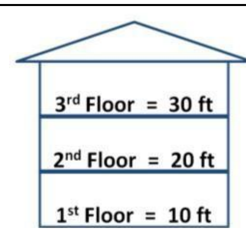
4. ***What time did you see the flare?***		
5. ***How many flares did you see?***		(If multiple flares)
6. ***How many seconds did the (each) flare last?***	Burn duration:	
7. ***What color was the flare(s)?*** (circle one)	RED AMBER WHITE GREEN OTHER:	
8. ***Did the flare appear to be…*** (circle one)	OVER LAND OVER WATER	
9. ***What was the apparent origin of the flare?*** (circle one)	SURFACE AIR OTHER:	
10. ***Did you see the flare…*** **(trajectory)** (circle one)	RISE FALL ARC STEADY OTHER:	
11. ***Were any obstructions in your line of sight?*** (circle one)	NO YES (Obstruction type)	
EVALUATED FLARE TYPE (circle one)	HANDHELD METEOR PARACHUTE OTHER:	
12. ***Did you see any vessels or aircraft in the vicinity of the flare?*** (circle one)	NO YES	
If yes, ***What type?***		

13. **R/S Height of Eye:** ___________ft.

(Determine the R/S' height of eye based on their position relative to sea level. e.g., building, beach, bluff, area of a vessel)

a. 1st floor of an average building is normally set **above** sea level. Assume 10' per floor.

b. R/S' height **+** height where standing = **Total Height of eye**.



BEARING (Clock Method)

"I'm going to talk you through an exercise to help locate the source of the flare. I'll need you to locate the horizon and think about the flare you saw in relation to the horizon."

"I'm going to ask you to imagine you are standing on the face of a clock – with 12 o'clock straight ahead, 3 o'clock to your right, 6 o'clock directly behind you, and 9 o'clock to your left. Do you understand?"

"While facing in the direction of____, what hour of the clock would you say you saw the flare(s)?"

(continued on back page)

FLARE SIGHTING CHECKSHEET

BEARING (CLOCK METHOD) (continued)

14. **Clock Hour** (Each hour = 30°)	**o'clock** = **Bearing:__________° True**
15. **Bearing Error** (circle one)	10° 20° 30°

ANGLE OF ELEVATION (CLOSED FIST METHOD)

16. **Relation to the Horizon** (circle one)	ABOVE BELOW APEX TO ORIGIN

INTERVIEW

If **ABOVE** the Horizon: ***"I'd like you to make a fist with your thumb on top as if you are holding onto a coffee mug. Fully extend your arm in the direction you saw the flare and place the bottom of your fist on the horizon - with the rest of your fist above the horizon."***

"Can you tell me if the flare rose above your fist or did it peak somewhere within the height of your fist?"?" (circle one) ABOVE THE FIST SOMEWHERE WITHIN THE FIST

(**If ABOVE THE FIST**, **STOP here**. The flare should be no more than 1.4NM away from the R/S' position.) (**If SOMEWHERE WITHIN THE FIST**, **proceed to #17**.)

If **BELOW** the Horizon: ***"I'd like you to make a fist with your thumb on top as if you are holding onto a coffee mug. Fully extend your arm in the direction you saw the flare and place the top of your fist at the horizon - with the rest of your fist below the horizon."***

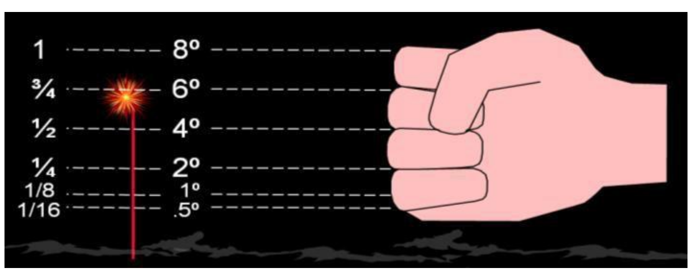
If **APEX to Origin**: If the R/S is unable to see the horizon, but was able to see where the flare came from: ***"I'd like you to make a fist with your thumb on top as if you are holding onto a coffee mug. Fully extend your arm in the direction you saw the flare and place the bottom of your fist on the (object) the flare appeared to come from - with the rest of your fist above the (object)."***

---

17. ***"Counting the number of fingers from the horizon, how high*** (or **low** if it was **below** the horizon) ***along your fist would you say you saw the flare rise?"***

(If the R/S provides a "**between_____and_____**", then it is **already "boxed in"**. Enter the heights as stated by the R/S. (If the R/S provides **only one height**, you may **"box it in"**. Take the next higher and next lower heights. Avoid using On Horizon as the minimum angle for Above Horizon observations.

Example: *If the R/S states "**approximately between my index and middle finger**"*
This indicates 6°. Box this in by entering minimum of 4° and maximum of 8°.



R/S Response: __________° __________° (or) __________°

No less than — No more than — About

CLOSED FIST RESULTS: __________° __________°

No less than — No more than

Consider possible correlation with other ongoing SAR cases.

AIRCRAFT EMERGENCIES

NATURE OF DISTRESS: INFLIGHT EMERGENCY / DITCHED / OVERDUE

AIRCRAFT DATA
(AFRCC/FAA can provide cross-reference via tail number or name.)

Tail Number:_______________ Nationality:_______________ MILITARY / CIVILIAN

Type:__________________ Description:______________________________________
(Wing configuration, # engines, etc.)

Color:____________________________ No. of POB:___________________________

Flight Plan Filed: Y / N Type: VFR / IFR None Required: Y / N

Last Known Comms Frequencies:____

Fuel Remaining:________________________ Altitude___________________________

Survival Equipment: RAFT / LIFEJACKET(S) / EPIRB/ELT (Type:_______) / FLARES/ MIRROR / DYE /

SPOTLIGHT / FLASHLIGHT / OTHER:________________

Parachutes: Y / N

POSITION

Latitude/Longitude: _______________________N _______________________W

Bearing/Range: _________/________T / M From:_____________________ (nav. aid)

Geographic Position: ____

Speed:__________ Course:__________T / M Altitude: _________________ FT / M

O/S Weather: Winds:_______/_______ Seas:______/______ Vis:________

ROUTE INFORMATION

Departure from:________________________________ ETD:____________________

Via:____ ETA:_____________________

Via:____ ETA:_____________________

Via:____ ETA:_____________________

Destination:___________________________________ ETA:_____________________

Alternate Destination:____

PILOT/OWNER/PASSENGER INFORMATION

Pilot Name:____
Address:____
Phone:____

Owner's Name:____
Address:____
Phone:____

Passenger Name:____
Address:____
Phone:____

Passenger Name:____
Address:____
Phone:____

ADDITIONAL INFORMATION SHEETS

ABANDONED OR ADRIFT

Did anyone see the vessel operating in the area? Y / N

Was it occupied? Y / N ____

How much and what type marine growth is on the hull? ______________

____

Is there a motor or means of propulsion? _________________________

Were the keys in the ignition? Y / N _____________________________

Is there fishing or camping gear onboard which could have been carried or used on a recent trip? Y / N

____

____

Is there emergency equipment (PFDs, flares, radio, EPIRB) on board? Y / N

____

Does the vessel have parted or cut lines attached? Y / N

____

Are fenders rigged? Y / N _____________________________________

Is the anchor set or is there evidence that the anchor line was cut or parted? Y / N

____

Is there debris in the area? Y / N _______________________________

How far offshore is the boat? ___________________________________

Other damage? ____

Reports of overdue or unreported vessels in the same area? Y / N

BESET BY WEATHER

How long has the vessel been in the storm system?_________________

What storm tactics are being used by the vessel, and what storm tactics are available?____

____

Is the vessel experiencing icing conditions?________________________

CAPSIZED

Are there any People In the Water?______________________________

Any possibility that there are survivors trapped in the hull?____________

COLLISION

Are there any people missing (PIW case)?_________________________

Injuries?____

Condition of the vessel involved:________________________________

____

ADDITIONAL INFORMATION SHEETS

DISABLED

Are there any other vessels in the area?______________________________________

Is the vessel experiencing any icing conditions?____________________

DISORIENTED

Are there any other vessels in the area?___________________________________

Is the vessel experiencing any Icing Conditions?____________________________

Landmarks and ATON the vessel can see:________________________________

____

Depth of water at the vessel:_____________ Trackline of the vessel since time of departure:____

UNCORRELATED MAYDAY, MAYDAY, PROBABLE HOAX CALLS, AUTOMATED S.O.S.

PRIMARY INFORMATION

Exact wording of radio call:____

____

____

Possible correlating incidents:

DFs OBTAINED

SITE/LOCATION	BEARING (T / M)
__________________________	______________
__________________________	______________

RFFs, HI SITES, LOCAL ANTENNA, AND OTHER UNITS RECEIVING THE TRANSMISSION

SITE/LOCATION	STRENGTH (strong, medium, weak)
______________________________	____________________
______________________________	____________________
______________________________	____________________

PIW

What were the circumstances?___________________________________

Is there any question that it was a person in the water? Describe what was sighted._____________________________

____

PIW name:__________________ Age:_____Sex: M / F Weight:______

PIW health:_____________________Nationality:____________________

What was the PIW wearing (clothes)?____

PIW swimming capabilities: excellent / medium / poor

Was the PIW seen going under? Yes / No

Did PIW resurface? Yes / No

Determine water temperature:__________

ADDITIONAL INFORMATION SHEETS

SARSAT DATA	
Site ID:	406 Hexidecimal Code:

Hi-Flyer Reports:

Posn:__________________ Flight Level:________ Positive / Negative

Posn:__________________ Flight Level:________ Positive / Negative

Posn:__________________ Flight Level:________ Positive / Negative

Posn:__________________ Flight Level:________ Positive / Negative

Posn:__________________ Flight Level:________ Positive / Negative

Posn:__________________ Flight Level:________ Positive / Negative

RESPONSE POLICY

Beacon Alert	**Emergency Phase**
• 406 MHz GEO registered alert • 406 MHz GEO unregistered, unlocated alert with digital encoded GPS position (“E” Solution) • 406 MHz LEO “A” solution alert • 406 MHz LEO registered, unlocated alert • 121.5/243 MHz multiple reports of audible alert	Initially evaluate as **DISTRESS**
• 406 MHz LEO “B” solution alert with probabilities > 20% • 121.5/243 MHz First report of audible alert	Initially evaluate as **ALERT**. Investigate, reevaluate and respond as facts and circumstances warrant.
• 406 MHz LEO “B” solution alert with probabilities < 20%	Initially evaluate as **UNCERTAINTY**. Investigate, reevaluate and respond as facts and circumstances warrant.

TAKING ON WATER (TOW) OR FIRE

Are there any other vessels in the area?________________________________

Rate of flooding:________ Are there any pumps onboard?____________

Can they keep up with the flooding?_______________________________

Where/Why is the vessel flooding:____

If a commercial vsl, type/amount of cargo:____

Is the vessel experiencing any Icing Conditions?_____________________

BRIEFING CHECKSHEET

Reason for Brief: ☐ Information ☐ ACTSUS ☐ Other ____________________

INITIAL REPORT: At ________ (time) ____________________ (unit) received a report of ____________________ (incident) via ____________________ (method of report).

SITUATION:

Circumstances/type of distress: ____________________

Number of POB: ________ Survival equipment: ____________________

PFD's: ☐ Confirmed ☐ Not Confirmed

Name of Vessel involved: ____________________

Description of *primary* search object: ____________________

secondary search object: ____________________

Possible visual / electronic *distress signals*: ____________________

Last known position: ____________________ (GPS / Geographic / UNK)

Area characteristics: ____________________ (Shallow, Marshy, Confined, etc.)

MISCELLANEOUS INFORMATION:

Previous history: ____________________

Medical concerns: ____________________

Media Interest: ☐ Low ☐ Medium ☐ High

PAO or District (dpa): ☐ Required ☐ Not Required

Press Release: ☐ Required ☐ Not Required

NOK: ____________________ (Briefed / Not Located, etc.)

SMC: ____________________ SMC briefing: ☐ Completed ☐ Not Completed

GAR Model ☐ Completed ☐ Not Completed Score: ______ ☐ Green ☐ Amber ☐ Red

WEATHER:

Prior to incident / ops:		*Current:*		*Forecast:*	
Wind	________	Wind	________	Wind	________
Seas	________	Seas	________	Seas	________
Visibility	________	Visibility	________	Visibility	________
Water temp	________	Water temp	________	Water temp	________
Air Temp	________	Air Temp	________	Air Temp	________

Tides / currents: High: ________ Low: ________ Location: ____________________

Page 1

ACTION TAKEN:

DMB / SLDMB ☐ Inserted ☐ Not Inserted Time inserted: ________ by ____________

UMIB: ☐ Issued ☐ Not Issued Time issued: ________

Responses to UMIB ☐ Yes ☐ No

Search Effort

Total number of CG sorties: ________ Total number of sorties all agencies: ________

Other agencies involved: ______________________________

Number of surface assets used: ________ Number of air assets used: ________

SAROPS drifts completed: A B C D E F G H I J K … (Circle all applicable drifts completed)

Searches completed

Search #	% Complete	Type of SRU	Time On Scene	Time Departed

Square NM searched: __________ Total hours assets searched: ________

Effort summary

Primary search object: ___________ Track Space: _____ Sweep Width: ______ POS: ______

Secondary search object: ___________ Track Space: _____ Sweep Width: ______ POS: ______

Equipment Used: FLIR: ☐ Yes ☐ No NVG: ☐ Yes ☐ No Other: __________

First Light Search: ☐ Completed ☐ Not Required ☐ Not Completed & Reason: __________

CASE SUSPENSION:

PSDA Predicted Functional Time: __________ Predicted Survival Time: __________

Articulate reason for suspension recommendation: ______________________________

____

Page 2

SAR CASE SUSPENSION CHECKLIST

Safety

- If we decide to continue what is the risk to our SRUs?

Search Planning Tools

- Was SAROPS used to determine search area and track spacing? If not, why not?
- If SAROPS was used, what was the POS for the planned/completed searches?
- If SAROPS was NOT used, what was the level of confidence we were searching the correct area?
- Will continuing to search significantly improve the POS?

Case Review

- Are we aggressively using UMIBs?
- Proper Assumptions?
- Did we look in the correct places for the correct object?
- How certain were you of the initial position?
- How good was the search effort?
- Was a first light search conducted?
- Do/did we have enough assets on scene to adequately cover the area?
- What assets were used?
- Did we re-evaluate leads & clues?
- Did we review datum calculations?
- Were all the search areas searched?
- Were the search variables high enough? (track spacing, sweep width, navigation errors, environmentals, etc.)
- Did we have reasonable planning scenarios?
- What other agencies were involved?

Did you consider?

- Did they survive the incident?
- Could they survive after the incident?
- How much time has elapsed?
- On scene conditions?
- What will the weather be over the next 12 hours?
- The condition of potential survivors? (Pre-existing medical conditions or injuries)
- Their will to live?
- Survival equipment available?
- What do the survivability tables/program say? (PSDA model)

Next of Kin Notification

- Has the NOK been kept informed?
- Has the Sector Commander (or other appropriate level) been involved?
- Has the family been given advanced warning?

Media Interest

- Is there high or potentially adverse media interest?
- Is PAO/District (dpa) help needed?
- Press release/photos?

Mass Rescue Operation Supplemental Checksheet

MISLE CASE #	**Watchstander:**	**Date/Time:**
Nature of Distress ***(Refer to Initial SAR Check Sheet)***		**Description of Craft** ***(Refer to Initial SAR Check Sheet)***

1. Initial Actions

[ ] Determine total passengers/ crew on board ____________________________

- If a large passenger vessel is involved, refer to the SAR Plans for Cooperation index located at https://www.gov.uk/government/publications/international-sar-co-operation-plans-index.; or look up vessel specifics in MISLE.

- If a commercial passenger airline is involved, contact the Transportation Security Operations Center (TSOC) to obtain passenger count information; (703) 563-3400 or email CDO.TSA@tsa.dhs.gov .

- If a passenger train is involved, contact Department of Transportation Emergency Operations Center at (202) 366-1863 to obtain additional information.

[ ] Designate SMC

[ ] Launch appropriate resources

[ ] Assign an On Scene Coordinator (OSC) or Aircraft Coordinator (ACO).

[ ] Contact local aviation authority to impose flight restrictions; if necessary.

[ ] Determine appropriate Landing Site /Triage area; per unit's MRO Plan and Annex (1).

[ ] Establish safety/security zone (if necessary).

2. Safety & Survival Equipment

Communications Equipment

[ ] VHF-FM [ ] HF [ ] DSC [ ] Other ____________________

____

[ ] Cellular: #

____

Survival Equipment

[ ] Life boats: #__________________Capacity of Life boats __________________

[ ] Life rafts: #__________________Capacity of Life rafts __________________

[ ] Other ____________________

3. Incident Management Team and/ or Unified Command Actions

[ ] Initiate the process for standing up an Incident Management Team / Incident Command Post /Unified Command.

- Implement ICS in accordance w/CG Incident Management Handbook, COMDTPUB P3120.17 (see Chapter 13, SAR) or unit specific policy/procedures.

[ ] Follow all other guidance set forth in unit's MRO plan.

Mass Rescue Operation Supplemental Checksheet

HELO RESOURCES (Within range, as needed, up to 500 miles)

To augment high readiness and traditionally used resources

Static Data for planning (update/keep current)

FOR THE PORT/ AOR OF:								
OWNER & POC (24 hour Contact #)	**NUMBER OF AVAILABLE HELO(s) BY TYPE**	**RESPONSE TIME**	**ENDURANCE (hrs)**	**HOISTING CAPABILITY (Y/N)**	**OFF-SHORE CAPABILITY (RANGE)**	**PASSENGER CAPACITY**	**DATE LAST UPDATED**	**COMMS FREQs/COMMENTS**

ANNEX (1)
Helicopter Resources

Mass Rescue Operation Supplemental Checksheet

FIXED WING RESOURCES (Within range, as needed, up to 500 miles)

To augment high readiness and traditionally used resources

Static Data for planning (update/keep current)

FOR THE PORT/ AOR OF:								
OWNER & POC (24 hour Contact #)	NUMBER OF AVAILABLE AIRCRAFT(s) BY TYPE	RESPONSE TIME	ENDURANCE (hrs)	CARGO CAPABILITY	OFF-SHORE CAPABILITY (RANGE)	PASSENGER CAPACITY	DATE LAST UPDATED	COMMS FREQs/COMMENTS

ANNEX (2)
Fixed Wing Resources

Mass Rescue Operation Supplemental Checksheet

LOCAL RESOURCES
(i.e. HARBOR PILOT, TUGS, TOUR BOATS, FERRY, STATE, LOCAL, INDUSTRY, COMMERCIAL PROVIDERS)
To augment high readiness and traditionally used resources

Static Data for planning (update/keep current)

FOR THE PORT/ AOR OF:				
WHO & POC (24 hour Contact #)	**NUMBER OF RESOURCE(s) BY TYPE**	**RESPONSE TIME**	**DATE LAST UPDATED**	**COMMENTS/ SPECIAL CAPABILITIES**

ANNEX (3)
Local Resources

Mass Rescue Operation Supplemental Checksheet

OFF SHORE RESOURCES
(i.e. OFFSHORE PLATFORMS, FERRY, NAVY, NOAA, TUGS, COMMERCIAL PROVIDERS)

To augment high readiness and traditionally used resources

Static Data for planning (update/keep current)

FOR THE PORT/ AOR OF:				
WHO & POC (24 hour Contact #)	**NUMBER OF RESOURCE(s) BY TYPE**	**RESPONSE TIME**	**DATE LAST UPDATED**	**COMMENTS/ SPECIAL CAPABILITIES**

ANNEX (4)
Offshore Resources

Mass Rescue Operation Supplemental Checksheet

UNIT/FACILITIES AT POTENTIAL RISK IN YOUR AREA OF RESPONSIBILITY (i.e. CRUISE LINE, FERRY, CASINO BOAT, DINNER CRUISE, AIRLINE, CHEMICAL/ NUCLEAR FACILITIES)

Static Data for planning (update/keep current)

FOR THE PORT/ AOR OF:					
COMPANY NAME/ ADDRESS/ CONTACT INFORMATION	**CRAFT NAME/ MEDICAL & EMERGENCY PERSONNEL CAPABILITY**	**EMERGENCY MANAGEMENT CENTER POC & CONTACT INFORMATION**	**HOURS OF OPERATION**	**DATE LAST UPDATED**	**COMMENTS**

ANNEX (5)
Potential Risks in Your AOR

Mass Rescue Operation Supplemental Checksheet

POTENTIAL LANDING/TRIAGE SITES
(Consider SRU turnaround time back to scene)

Static Data for planning (update/keep current)

FOR THE PORT/ AOR OF:				
DISEMBARK FROM	**LOCATION / POC (for further transfer)**	**LAT/LONG**	**DATE LAST UPDATED**	**COMMENTS**
Aircraft				
Small Vessel				
Large Deep Draft Vessel				

ANNEX (6)
Potential Landing/Triage Sites

U.S. Coast Guard Search and Rescue
Survivor Immersion Data Checksheet

Use this checksheet for survivors who have been immersed for a duration of an hour or more. Data collected allows the Coast Guard to improve the accuracy of estimated survival times for persons in the water and the Probability of Survival Decision Aid (PSDA). Upload the completed checksheet to the corresponding MISLE case folder and e-mail a copy to: HQS-SMB-CG-SAR@uscg.mil. Use "IMMERSION CHECKSHEET" in the subject line of the e-mail.

MISLE Case #: ___________________

PIW Information

Date of Rescue: __________________

Approximate duration of time in water (hours and minutes): ______________________

Survivor Gender: ________________

Age (approximate if unknown): ______________

Height (approximate if unknown): ______________

Weight (approximate if unknown): ______________

Build of Survivor (circle): Lean / Average / Heavy / Very Heavy

Flotation Devices (circle): PFD / Survival Suit / Other (debris, buoys, floats, etc.)

Swim Ability (circle): Yes / No

Alcohol Involved (circle): Yes / No

Immersion: Up to neck / Partial (for example: hanging onto vessel)

Describe clothing worn: ____

Medical concerns (including symptoms indicative of dehydration, hypothermia, fatigue, exhaustion, etc.): ____

____

Weather Observations (water and air temperature, wave heights, etc.):

____

____

Other Observations:

____

Appendix H
Search Planning Guide

Section H.1
Search Planning

This Appendix provides U. S. Coast Guard policy and guidance for planning searches. Both the manual method and the computer-based method using the Search and Rescue Optimal Planning System (SAROPS) are discussed. However, this Appendix does not constitute a complete user's manual for either method. Discussion of the manual method is restricted to Coast Guard modifications and enhancements to the method described in the *IAMSAR Manual*. The discussion on SAROPS is restricted to policies regarding it use, the philosophy of its design and use, a high-level overview of how it works, some examples of its inputs and outputs, and some comparisons with the manual method to illustrate similarities and differences.

Search planning is necessary when the location of distress incident survivors is not known, or significant time has passed since the survivor's position was last known. This means that the survivor's location can be represented only as an estimated *probability density distribution* showing the more probable and less probable locations according to the available information. The SMC is responsible for developing and updating an effective, efficient search plan. The plan may involve a single SRU sortie or many SRUs searching for several days. A variety of sensors may be used, but most SAR searching is still done visually—with the unaided eye and binoculars during daylight and with night vision goggles (NVGs) at night. The search object(s) may be the survivors themselves floating or swimming in the water, a craft containing the survivors such as a drifting life raft or disabled boat or vessel, or debris from the distress incident that may provide some clue about where and when the distress occurred. The environment plays a substantial role in search planning in several ways. Hazardous weather and sea conditions may cause or contribute to the distress incident and may, thereby, provide an indication of where and when the distress may have occurred. Wind and current acting upon search objects in the marine environment cause them to move or drift over time unless they are moored, anchored or aground. The environment affects the abilities of most sensors to detect the search object(s). For example, visual search is affected by meteorological visibility and sea state, (two of many environmental factors affecting detection).

H.1.1 Overview

Search planning consists of determining where to deploy the available search facilities, developing an attainable search plan, selecting search patterns, planning on scene coordination, developing a Search Action Plan (SAP) containing specific SRU assignments and all necessary coordination details, transmitting the complete SAP to the OSC and all participating search facilities, and reviewing the search results. Many factors influence the movements of the search object and the range of its possible/probable locations as of the time when search facilities can be on scene. The SMC judges the impact of these factors to determine the region to search and methods to use, evaluates the number and capabilities of available search facilities, and tries to increase the cumulative probability of success (POS) as quickly as practicable with those search facilities. The methods described in this Appendix are based on a well-studied branch of applied science called *search theory*, which is part of a larger branch of applied science called *operations research*. There are basically two methods for planning searches. In the manual method, the application of search theory is extensively simplified so that searches may be planned using only traditional paper and pencil methods with a minimal amount of computation. The other method involves computer simulation that requires extensive amounts of computation. Although both methods are effective tools, success can never be guaranteed. Knowledge of the exact circumstances of the distress incident, knowledge of environment and how search objects respond to it, knowledge of the capabilities and actual performance of the available sensors and search platforms, etc. will always be imperfect. No matter how sophisticated computer-based search planning aids like SAROPS become, search planner training, experience, proficiency, and judgment will always play a critical role in improving the chances for success.

H.1.1.1 Search planning involves the following steps:

(a) Evaluate the situation, including any previous search results;

(b) Estimate the possible distress incident positions and how the associated probability densities are distributed;

(c) Estimate the survivors' post-distress movements (drift in the marine environment) to produce an estimate of their possible locations and associated probability densities at the time when search facilities can be on scene;

(d) Determine the best way to deploy the available search facilities so the chances of finding the survivors are maximized (optimal search effort allocation);

(e) Define search sub-areas and search patterns for assignment to specific search facilities; and

(f) Provide a comprehensive search action plan to the OSC, all search facilities, and other appropriate parties that includes a current summary of the situation, detailed search object description(s), specific search assignments for the search facilities, on scene coordination instructions, and search facility reporting requirements.

H.1.1.2 These steps are repeated until either all survivors are found and rescued, or evaluation of the situation shows that continued searching is very unlikely to succeed in saving a life.

H.1.1.3 For land cases, the search area is normally dependent on the environment. Natural boundaries and barriers, injuries, lost person behaviors, and other hard-to-quantify factors affecting the lost/missing person's movements are important in search area decisions. The experience and judgment of the SMC is a key factor. A more detailed discussion and planning guidance for land cases is provided in references (a) and (b).

H.1.2 Search Planning Methods Background

There are basically only two methods for planning searches—manual and computer simulation. The manual search planning method is found in the *International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual*, *Volume II*. Although there are several computerized versions of the manual method (sometimes with slight variations from *IAMSAR*) in use in various parts of the world, they are not fundamentally different from the manual method itself and suffer from its inherent limitations. The Joint Automated Work Sheets (JAWS) software was one of these used by the Coast Guard prior to 2007. In some cases these computer programs have access to more detailed environmental data than one normally associates with paper-and-pencil methods, but otherwise the computer is simply being used as a tool to perform the same computations and display the same results the paper-and-pencil manual method would produce. Consequently, the quality of the results often is not substantially better than could be obtained with pencil and paper. Another tool in use prior to 2007 was the Computer Assisted Search Planning (CASP) system. CASP used a simulation approach but it was outdated and had some serious limitations that could not be overcome without a complete re-design. Consequently, the Search and Rescue Optimal Planning System (SAROPS) was developed to replace both JAWS and CASP. SAROPS was fielded for operational use in 2007 and it is currently the only search planning software for maritime SAR that uses the simulation approach. The main advantage of simulation is that it allows a more realistic representation of real-world complexity than the grossly over-simplified manual method. SAROPS is more comprehensive and sophisticated than any of its predecessors, addresses many of their limitations and shortcomings, and is easier to use.

H.1.3 Search Planning Variables

Search planning is based on myriad variables including environmental factors, the nature, time and location of the distress incident, the type(s) of search object(s) resulting from the distress, and the available search platforms and their capabilities, including the time at which they can be on scene. The variables whose values ultimately determine where to place the search area over a given time period, as well as its size and orientation, are those variables needed to estimate a probability density distribution describing where search objects are more likely and less likely to be during the time when search facilities can be on scene, plus the variables needed to estimate the available ***search effort (Z)*** during that time. In the manual method, the probability density distribution was estimated by computing one or two drift trajectories to obtain datum positions and then assuming the probability density was distributed around those datums according to a specific distribution function from statistics. This function was a circular bivariate normal distribution whose size was characterized by the total probable error of position (***E***). By definition, there was a 50% *probability of containment (POC)* within a radius of ***E*** from a datum position, or more generally, if ***n*** datums were computed, the POC within the probable error of each datum was 50%/***n***. A tacit and unrealistic assumption of the manual method was that search objects do not move while SRUs are on scene searching.

H.1.3.1 Whether using the manual method or a computer simulation like SAROPS, estimating a probability density distribution for planning a search requires the following information:

(a) The list of search objects that may have been set adrift by the distress incident and the leeway coefficients for those objects along with the uncertainties about the objects' leeway, which affects their ranges of possible drift trajectories.

(b) An estimate of the distress incident's date and time, and the distressed craft's position and positional uncertainty at that time.

(c) The commence search date and time and the estimated duration of the search epoch being planned.

(d) Wind and current data for the vicinity of the distress incident sufficient to cover any place the object(s) may have drifted since the distress incident, along with uncertainties about the wind and current values.

H.1.3.2 Estimating the available search effort (Z) requires the following information:

(a) The list of search objects that may have been set adrift by the distress incident and their types, sizes, and other parameters affecting their potential for detection by the sensor(s) in use.

(b) The numbers and types of search facilities available.

(c) The detection method(s)/sensor(s) to be used (e.g., daylight visual search or NVG search).

(d) The on scene endurance for each facility (depends on its overall endurance and the location of the search area in relation to the facility's departure and recovery locations).

(e) The search speed for each search facility.

(f) The on scene environmental conditions affecting detection as of the time of the search.

H.1.4 Uncertainty, Probability, and Probability Density Distributions

Searching necessarily involves uncertainty. If the search object's location were known or could be accurately predicted, no searching would be necessary. ***Therefore, the search planner must deal with the uncertainty in the object's location at the time SRUs can be on scene***. This often involves uncertainties about the pre-distress movements of the distressed craft with consequent uncertainty about the time and location of the distress incident, uncertainty about the types of objects (disabled craft, PIW, raft, etc.) that may be adrift, etc. Even when these are known within close limits, if a significant amount of time will pass between the time of a distress and the arrival of resources on scene, uncertainty about the object's location will grow due to uncertainties in the available data about the environmental forces that cause drift, and uncertainties in knowledge about the exact nature of the search object and how it will respond to those forces. In addition, detection of the object once resources arrive on scene and begin searching is by no means certain. These uncertainties require the search planner to think in terms of probabilities and relative likelihoods (also known as probability ***weights***) such as ***A*** is "very likely" while ***B*** is "unlikely." ***Weights*** are scored on a scale of 0 to 10 where 0 is "Ignore" (almost never happens) and 10 is "Almost certain." In this example, ***A*** would be scored as "9" and ***B*** would be scored as "3," making ***A*** three times as likely as ***B***. ***Weights*** are generally used when describing the relative likelihoods of competing scenarios or the relative likelihoods of different search object types within scenarios.

H.1.4.1 After scenarios, subsequent drift, and any previous searching have been evaluated and the time has come to plan the next search, the three probabilities of primary concern are:

(a) The probability that the search object will be in some bounded area (probability of containment or POC) when search facilities can be on scene searching.

(b) The probability that the search object will be detected; assuming it will be in an area during the time the area is searched (probability of detection or POD).

(c) The probability of finding the search object (probability of success or POS) based on both the POCs for the areas searched and the PODs from searching those areas.

H.1.4.2 This is a simplistic view since the true situation is very dynamic. Search objects in the marine environment are almost always in motion due to environmental forces that cause drift. This means that for any fixed area, such as an assigned search area, the POC value changes continuously. The act of searching itself causes changes in POC values since, according to the *Rule of Bayes* from statistics, searching a region without finding the search object reduces the POC estimate for that region and increases the POC estimates for other, unsearched, regions. However, this simple model is still useful for illustrating some basic concepts.

The first concept is that for any given search area,

$$POS = POC \times POD\,.$$

H.1.4.3 For non-overlapping search areas that are covered more or less simultaneously, the total POS is roughly the total sum of all the POS values for the individual search areas. The cumulative POS (POS_{CUM}) is the probability that all searching done to date would have located the search object.

H.1.4.4 The second concept is that there is always a tradeoff between POC and POD. For a given level of search effort, increasing the size of the search area to include more of the possible search object locations will increase POC, but the POD will be decreased because the effort will be more thinly spread giving a lower *coverage factor*. Decreasing the size of the search area will reduce the POC but will increase the coverage factor and POD. Finding the search area(s) to cover with the available effort so that POS is maximized is called optimal effort allocation.

H.1.5 The Goal of Search Planning

The ultimate goal of search planning is to find the survivors of a distress incident as quickly as possible. The way to achieve this goal is to increase the cumulative probability of success (POS_{CUM}) as quickly as possible using the available resources. “Optimal effort allocation” is the process of finding the combination of search sub-areas, coverages, and resource assignments that produces the most efficient search plan. This is a mathematically complex process that requires a sophisticated computer program. The *IAMSAR Manual* method produces “near-optimal” search plans based on a number of simplifying assumptions and corresponding “optimal search factors”. Often times, the extreme degree of simplification required produces results that are not a very good match for the real-world situation. SAROPS does a much better job of modeling real-world complexity and generally produces more nearly optimal operationally feasible search plans than any other method. However, SAROPS is not perfect and its results and recommendations should always be carefully reviewed for practicality and sensibility.

H.1.6 Search Planning Methods and Tools

When developing a search plan, especially when developing scenarios to describe where and when the distress may have occurred, search planners must be detectives and information distillers. They must aggressively pursue leads and obtain all information available. Scenario development and analysis is particularly important since scenarios form the foundation on which search plans are built. ***Search planners must continually think "outside the box."***

Coast Guard Search planners shall plan searches in one of two ways, subject to the guidance provided in this Appendix: Manually in accordance with the IAMSAR Manual

and this Appendix, or with SAROPS. SAROPS shall be used whenever practicable.

H.1.6.1 Manual Method: The *IAMSAR Manual* describes the basic manual method for Coast Guard use in oceanic and most coastal situations, with a few modifications that are described in Section H.2. This method is may be adequate for situations where no more than 24 hours have elapsed between the distress incident and the planned search. In addition, some aspects of manual search planning are usually adequate and even preferred for restricted waters such as small bays, estuaries, sounds, etc., with limited outlets to the sea, rivers, and lakes smaller than the Great Lakes. In restricted waters, usually the best method is to "bound the problem" using the shorelines and minimum and maximum drift rates. This method will then define an "Area" scenario suitable for use in SAROPS. ***SAROPS shall be used to plan oceanic, coastal, and Great Lakes searches whenever practicable***.

H.1.6.2 Search and Rescue Optimal Planning System (SAROPS): SAROPS employs a Monte Carlo (a.k.a. "particle filter" in the scientific literature) simulation technique where thousands of independent drift trajectories are computed from a like number of independently selected samples of starting positions and times, wind and current values, and leeway parameters.

(a) These are sampled from the ranges of possible values implied by their respective uncertainties. The results are displayed as a cellular probability map/grid showing the more probable and less probable places the search object could be during the planned search. SAROPS can handle multiple complex scenarios, including operating areas and voyages/flights on which craft are unreported or overdue. SAROPS has a number of important advantages over previous methods. Some of these are:

(1) Simulation of pre-distress motion and encounters with hazards to generate sample distress times and corresponding positions consistent with the available information,

(2) Access to superior environmental data products and the ability to take full advantage of them when simulating post-distress (drift) motion,

(3) Development of hundreds of "trial" search plans and return of the one that produces the highest POS, i.e., the most nearly optimal search plan,

(4) The ability to properly account for previous search results when developing the next search plan,

(5) Computation and display of cumulative POS values for all searching done to date.

(b) Regarding last two items, each simulated search object in SAROPS has an associated "Pfail" value that represents the probability that all searching done to date would have failed to detect that object. In the SAROPS simulation, whenever a search facility passes within the maximum detection range of a particle, the Pfail of the particle is adjusted at the closest point of approach (CPA) for that search leg using an appropriate algorithm that computes the "single pass" POD as a function of distance at CPA. Cumulative POS values and subsequent probability maps are constructed from these Pfail values to properly account for the effects of previous searching.

(c) SAROPS is the preferred method for planning coastal and oceanic searches and searches on the Great Lakes. However, SAROPS is not well suited for planning searches for smaller lakes, nearly enclosed bays, harbors, and estuaries, or rivers. Specialized methods are needed for these situations, as described in Section H.3.6.

(d) The *IAMSAR Manual* method provides good results only in simple situations. These include situations where there is a single known distress position and time and the winds and currents are approximately uniform over the entire area and duration of interest. Other situations may be accommodated by computing several drift solutions starting from different locations/times and combining the results, but this should be done only with extreme care and caution. Normally, SAROPS is the method of choice. Each of these methods is discussed in more detail below, along with their capabilities and limitations. Further guidance on usage is also provided in this Appendix.

Section H.2
Manual Solution Model

All Coast Guard personnel who may become responsible for carrying out SMC duties or planning searches shall be familiar with the basic manual search planning methods and terminology contained in the IAMSAR Manual, Volume II, as amended below. Familiarity with Chapters 4 and 5 of the *IAMSAR Manual, Volume II* is a prerequisite for understanding the material provided in this section.

H.2.1 Overview

The Manual Solution works on the principle of estimating an average (mean, expected) search object position and uncertainty about that position. The expected, or most likely, position is called ***datum*** and it is used as the reference position for planning a search. The level of uncertainty about the datum position is represented by the ***probable error*** of position. Probable error of position is defined as the radius of the circle centered on datum that contains 50% of the possible positions. For manual search planning, a particular type of probability density distribution is assumed. That type is called a circular bivariate normal distribution. This means that if datum were plotted on an ordinary piece of graph paper, then the distribution of x-coordinates for possible positions around datum would follow the familiar "bell curve," and likewise for the distribution of y-coordinates. The probability that any particular "square" or cell on the graph contains the actual position is the ***joint probability*** that the x-coordinate falls within the necessary range of values ***and*** that the y-coordinate falls within the necessary range of values for the point to fall within the cell in question. A joint probability is the product of two independent individual (e.g., x and y) probabilities. The *IAMSAR Manual, Volume II, Appendix M* contains probability maps showing probability of containment (POC) values around a datum position for cells of various sizes in relation to the probable error. In theory, there is no maximum radius around datum that is guaranteed to contain all possible positions. However, a radius of three times the probable error has a POC value of over 99%.

H.2.1.1 Since objects in the marine environment tend to drift under the influence of wind and current, it is necessary to estimate the search object's location when planning a search, which is done by updating the datum position(s) to account for drift. Since uncertainty about the search object's position increases with the passage of time, it is also necessary to update this value. The size of the search area depends on the size of the ***total probable error of position (E)*** and on the amount of searching effort that is available. The size of the total probable error of position depends on the probable error of the initial distress position (X), the probable error due to uncertainty in the drift estimate (D_e), and the probable error of the search craft's position while searching (Y). The uncertainty of the drift estimate depends, in turn, on the uncertainties associated with the environmental factors affecting drift (wind and current) and the limitations in our knowledge of how drifting objects respond to these environmental factors.

H.2.1.2 Once a datum position and its total probable error have been established for a specific point in time, a search plan that maximizes the chances for finding the survivors can be developed based on the amount of searching effort available around that time. This is called "optimal effort allocation." It is the reason for having an estimate of how the search object's positional uncertainty is distributed. If the nature of the distribution is known then it is possible to estimate the POC of a square centered on datum as a function of the square's inscribed radius. If POD as a function of coverage is also known, then it is possible to find the combination of search area size and coverage for a given level of effort that maximizes the probability of success (POS). Methods for doing this are described in the *IAMSAR Manual, Volume II*. These methods, with the modifications described in this Appendix, comprise the manual method approved for USCG use.

H.2.2 Modifications to the IAMSAR Manual Method

H.2.2.1 The modifications to the *IAMSAR Manual* methods described in this Appendix are:

(a) The *IAMSAR Manual* wind current graph and computations are replaced by the wind current computations given in Paragraph H.3.1 and the wind current worksheet at the end of this Appendix. Note: Wind current computations were originally intended for use in the deep ocean in combination with seasonal average sea surface current values from atlases, pilot charts, etc. Surface current values derived from DMB and SLDMB drift trajectories or other direct observations, and those provided by most modern near-real-time coastal and oceanic circulation models which are coupled with atmospheric circulation models, already contain the wind effects on surface current. Wind current should ***not*** be added to surface currents obtained from these sources. Values from tidal current tables and tidal models do not generally contain a wind driven component, but the effects of wind in tidal areas are extremely difficult to predict due to the proximity of land and the limited depth of the water. Therefore, wind current from the deep ocean model is not used inside the 17 fathom (about 100 foot) curve. ***Past experience, local knowledge and sound judgment must be used to determine when and how the wind may be affecting currents in tidal areas.***

(b) Additional worksheets are provided for computing reversing tidal and other currents.

(c) The table of probable errors of initial position associated with different means of navigation contains more means of navigation than the corresponding table in the *IAMSAR Manual*. However, the two tables agree when the method of navigation is the same. The same is true for other tables of probable position error associated with types of craft***. Important note:*** The probable error associated with ***any*** position is ***not*** actually a function of the means of navigation. The table of probable errors represents the ***minimum probable error*** that should be associated with each listed means of navigation. For search planning purposes, these values should be increased to reflect the search planner's confidence in the position and other factors that affect the probable error estimate. Additional information is provided in Section H.3.3 below.

(d) The leeway divergence angles given in this Appendix are rounded up to the next highest whole degree and are therefore more accurate than those in the *IAMSAR Manual*, which are rounded up to the next highest multiple of five degrees. However, all leeway data for both this Appendix and the *IAMSAR Manual* are based on the same research and are therefore otherwise consistent.

(e) The sweep width tables given in this Appendix include more altitudes and therefore have more entries than those in the *IAMSAR Manual*. However, both sets of tables are based on the same research and are therefore consistent. The sweep width tables in the *IAMSAR*

Manual are a proper subset of the tables contained in this Appendix.

H.2.2.2 Some additional information and graphs are also provided in this Appendix, but these are consistent with the material contained in the *IAMSAR Manual*.

H.2.2.3 In order to make manual search planning possible and avoid requiring an extensive background in search theory, mathematics and statistics, not to mention the need to avoid an impractical amount of computation, it was necessary to grossly oversimplify the approach to the search-planning problem and to make sweeping assumptions and generalizations. For these reasons, the manual method is truly adequate only for simple situations of relatively short duration (on the order of 24 hours adrift).

Section H.3
Search Planning Basics

The expected location of the search object at any given time is known as the ***datum*** for that time. Datum is a position, line or area that is used as a reference for describing the distribution of possible search object locations and for planning searches. Generally the region near the datum contains the most probable search object locations. As a practical matter, all datums are either single points or are formed by points that are then connected by line segments. Only points are updated for drift. For line and area datums, the points used to form them, plus the possible addition of other carefully chosen points are updated for drift and then a new datum line or area is inferred from the results. Determining datum begins with the reported position of the incident. Unless a distressed craft or individual is immobilized, as in a boat grounding or a forced aircraft landing or debilitating physical injury on land, the actual position of the search object during the search may be substantially different from the initial position. Therefore, possible movement of the search object should be accounted for when calculating datum. Datum should be recomputed periodically as movement due to drift or other factors continues to affect the position of the search object. Recomputed datums are usually labeled sequentially (e.g., Datum1, Datum2, Datum3). The time for which the datum was computed should be noted.

The original manual method, developed during the Second World War, was designed to handle a single simple scenario with simple paper-and-pencil computations and plots. The simple scenario consisted of a single distress incident time with no appreciable uncertainty, and a single initial position that could have a significant amount of uncertainty due to the limitations of navigation at that time. Only a single type of search object was considered: a survivor adrift in a life raft like those carried by aviators. Drift updates assumed that the winds and currents over the entire area and period of concern could be adequately represented by their average values with no significant systematic variations present with respect to either time or space. This tended to rule out use in tidal areas or in areas with strong, persistent currents, such as the Gulf Stream with its high current gradients. In other words, the drift update method was generally adequate for open ocean use away from the influences of tides and strong currents.

It is possible, but not always practical, to extend the original method to include more variations and types of uncertainty than the original. It has been found, for example, that objects tend to have leeway off the down wind direction to the left or right and it is assumed that these port and starboard tacks are equally likely. This requires computing two datums instead of the original one. ***Other extensions are also possible, but as the number of distinct possibilities increases, so does the number of datums that must be computed***. In fact, the number of computations tends to increase exponentially. In the discussion that follows, a simple scenario is assumed where the distress position is approximately known within uncertainty characterized by an estimate of the probable error (X), the time of the distress is known, the type of search object is known and it is a type with a significant leeway divergence off the downwind direction, and about 12 hours will elapse between the incident time and the commence search time (CST).

H.3.1 Currents

H.3.1.1 **Wind Current (WC)** or wind-driven current, is generated by the wind acting on the water surface over a period of time. As a wind blows over water, it causes horizontal water movement that grows with wind speed and duration. ***Whenever computation of wind current***

is necessary, the computational method given below shall be used by USCG search planners. It replaces the method given in the *IAMSAR Manual, Volume II*.

(a) For areas that are more than 20 nautical miles from shore and have water depths greater than 100 feet, wind current is computed using Table H-4 using recent wind history and forecasts. Wind currents also exist nearer shore along coasts and in lakes, rivers, harbors estuaries, etc. However, estimating wind current in these areas requires complex computer models tailored to the specific area. Therefore, wind current is not computed for manual search planning under these circumstances. Search planners should be alert for unusually strong winds that could affect the normal current flow in coastal or restricted waters and should seek assistance from the appropriate NOAA or USN METOC offices in these instances.

(b) In offshore areas, wind observations/estimates should be obtained for the 48-hour period prior to the assumed time the distressed craft began drifting. Accuracy of calculation is less with shorter wind histories. Forecasts should be used through the time period containing datum. On scene wind data should agree with the general circulation shown on area surface weather charts; if it does not, it should be either confirmed or disregarded. Generally, surface winds are directed 20° toward the low-pressure side of isobars on surface weather charts.

(1) Wind history is wind speed and direction near datum for the previous 48 hours, divided into 6-hour periods. Period 1 is the most recent 6 hours, period 2 the next most recent, and so on. Because wind observations are often available only at normal synoptic hours (0000Z, 0600Z, 1200Z, and 1800Z), it is best to select the wind interval that begins and ends midway between the synoptic hours bracketing the reported wind time. All other wind intervals also begin and end midway between normal synoptic hours.

(2) For each period, wind velocity (speed and direction) is determined by using observed wind for the midpoint of the time period. When hourly winds are available, average wind velocity over the time period is used. ***Wind velocities must be averaged as vectors***.

(c) Wind current computation involves the following considerations:

(1) Wind current should be calculated in 48-hour periods made up of sub-periods of 6 hours. The first period should begin at the time of datum and move backward for eight 6-hour periods.

(2) The contribution that winds from each sub-period make should be determined and then added. The column in Table H-1a or H-1b with the latitude closest to the position where local wind current is calculated (do not interpolate) is selected.

(3) For each time period in Table H-1a, the lower number shows the relationship between wind speed and current speed, and the upper number shows the relationship between wind direction and current direction. The current speed of each period is found by *multiplying* wind speed by the lower number. The current direction for each period is determined by *adding* the upper number to the direction from which the wind blew. These contributions from each time period are added as vectors to obtain local wind current at the desired place and time.

Table H-1a Wind Current - North Latitudes

	NORTH LATITUDES													
Period	0°N	5°N	10°N	15°N	20°N	25°N	30°N	35°N	40°N	45°N	50°N	55°N	60°N	65°N
1	With sustained winds of 6 hours or more wind current speed will be 5% of wind speed with direction	185° 0.029	190° 0.028	196° 0.028	200° 0.027	205° 0.027	210° 0.026	214° 0.025	217° 0.024	221° 0.023	224° 0.022	226° 0.021	228° 0.020	230° 0.020
2		203° 0.012	226° 0.012	249° 0.012	271° 0.011	292° 0.011	312° 0.011	332° 0.011	350° 0.010	007° 0.010	022° 0.009	036° 0.009	049° 0.009	059° 0.008
3		219° 0.009	258° 0.009	296° 0.009	333° 0.009	009° 0.008	043° 0.008	076° 0.008	107° 0.008	136° 0.007	162° 0.007	186° 0.007	207° 0.007	224° 0.006
4		235° 0.008	289° 0.008	342° 0.008	035° 0.007	085° 0.007	134° 0.007	180° 0.007	223° 0.006	264° 0.006	301° 0.006	334° 0.006	003° 0.006	028° 0.005
5		250° 0.007	320° 0.007	029° 0.007	096° 0.006	162° 0.006	224° 0.006	283° 0.006	339° 0.006	031° 0.005	079° 0.005	121° 0.005	159° 0.005	192° 0.004
6		266° 0.006	352° 0.006	076° 0.006	158° 0.006	238° 0.006	314° 0.005	027° 0.005	095° 0.005	159° 0.004	217° 0.004	269° 0.004	315° 0.004	355° 0.004
7		282° 0.006	023° 0.006	123° 0.006	220° 0.005	314° 0.005	044° 0.005	130° 0.005	211° 0.004	286° 0.004	355° 0.004	056° 0.004	111° 0.003	158° 0.003
8		298° 0.005	054° 0.005	169° 0.005	281° 0.005	030° 0.005	134° 0.004	233° 0.004	327° 0.004	053° 0.004	132° 0.003	204° 0.003	267° 0.003	321° 0.003

Note: In each time period, the number shows the relationship between wind direction and current direction, and the lower number shows the relationship between wind speed and current speed.

Table H-1b Wind Current - South Latitudes

	SOUTH LATITUDES													
Period	0°S	5°S	10°S	15°S	20°S	25°S	30°S	35°S	40°S	45°S	50°S	55°S	60°S	65°S
1	With sustained winds of 6 hours or more wind current speed will be 5% of wind speed with direction	175° 0.029	170° 0.028	164° 0.028	160° 0.027	155° 0.027	150° 0.026	146° 0.025	143° 0.024	139° 0.023	136° 0.022	134° 0.021	132° 0.020	130° 0.020
2		157° 0.012	134° 0.012	111° 0.012	089° 0.011	068° 0.011	048° 0.011	028° 0.011	010° 0.010	353° 0.010	338° 0.009	324° 0.009	311° 0.009	301° 0.008
3		141° 0.009	102° 0.009	064° 0.009	027° 0.009	351° 0.008	317° 0.008	284° 0.008	253° 0.008	224° 0.007	198° 0.007	174° 0.007	153° 0.007	136° 0.006
4		125° 0.008	071° 0.008	018° 0.008	325° 0.007	275° 0.007	226° 0.007	180° 0.007	137° 0.006	396° 0.006	059° 0.006	026° 0.006	357° 0.006	332° 0.005
5		110° 0.007	040° 0.007	331° 0.007	264° 0.006	198° 0.006	136° 0.006	077° 0.006	021° 0.006	329° 0.005	281° 0.005	239° 0.005	201° 0.005	168° 0.004
6		094° 0.006	008° 0.006	284° 0.006	202° 0.006	122° 0.006	046° 0.005	333° 0.005	265° 0.005	201° 0.004	143° 0.004	091° 0.004	045° 0.004	005° 0.004
7		078° 0.006	337° 0.006	237° 0.006	140° 0.005	046° 0.005	316° 0.005	230° 0.005	149° 0.004	074° 0.004	005° 0.004	304° 0.004	249° 0.003	202° 0.003
8		062° 0.005	306° 0.005	191° 0.005	079° 0.005	330° 0.005	226° 0.004	127° 0.004	033° 0.004	307° 0.004	228° 0.003	156° 0.003	093° 0.003	039° 0.003

H.3.1.2 Tidal Current (TC) is found in coastal waters, and changes direction and velocity as the tide changes. The effect of the tide on currents in any area may be found by consulting tide current tables and charts, or by seeking local knowledge. Calculating wind and sea currents close to landmasses is normally not possible. Therefore, drift computations depend on tidal current and leeway. Procedures for determining tidal current vectors are provided with the worksheets in this Appendix, and the appropriate tidal current manual.

(a) With reversing currents that abruptly change direction approximately 180 degrees, the effect in one direction is normally greater than in the other, causing a net drift in one direction.

(b) With rotary tidal currents, an object will generally follow an elliptical path.

(c) The cumulative effect of tidal current and leeway may move the object into the influence of different tidal conditions or to where sea current takes effect. Consideration may shift from tidal to sea current in the later stages of a SAR case. Intermediate datums should be computed for small periods of time to account for different influences.

(d) Nearby landmasses may also affect tidal current. Inlets will channel and release a current, often in a different direction at the inlet mouth. When an object drifts near the mouth of a bay or inlet, manuals can be used to see whether tidal current data has changed.

H.3.1.3 Other Water Currents affecting search objects are usually difficult to calculate.

(a) *Lake Current (LC)* information usually comes from local knowledge, charts, tables, or computer models. A current in a large lake can vary with season, weather, or time of day.

(b) *River Current (RC)* information can usually be obtained from published data, local knowledge, or direct observation. Current data is published for most large rivers. The National Ocean Survey and the Army Corps of Engineers are the primary sources of information on river currents. In areas where a river discharges into the ocean, tidal current can affect river current upstream, and river current can affect tidal and sea currents. If offshore current is present, the SMC should not expect the river discharge to fan out symmetrically, but should expect displacement in the direction of the offshore current. Local colleges or universities may be a source of specific knowledge regarding this interface.

(c) *Bottom Current (BC)* should be considered in underwater incidents. Bottom current is usually not strong enough to move a sunken object, including a body. However, if current exceeds 4 to 5 knots, as in a rain-swollen river, the sunken search object may tumble along the bottom. For bottom currents in harbor areas the Army Corps of Engineers should be consulted.

(d) *Swell/Wave Currents (SWC)* may, in the absence of winds, affect rafts and other small marine craft. Because SWC speed is slight, this drift force is usually disregarded. However, it may be useful for determining probable direction of search object movement.

(e) *Surf Current (SUC)* is considered only for coastal surf areas and is more of a factor in rescue or salvage than in search planning. Surf current will move the object perpendicular to the line of breakers toward the shore. The object will also be displaced in the direction of any along-shore current.

H.3.2 Total Water Current (TWC)

Total Water Current (TWC) is the vector sum of currents affecting the search object. The best information on total water current in a localized area is usually obtained from one or more Datum Marker Buoys (DMBs), which may be of several types. However, the data from one or even several DMBs may not provide the best estimate of currents over a wider area.

H.3.2.1 SLDMBs (Self-Locating Datum Marker Buoys), standard DMBs and sonobuoys are droppable floating beacons transmitting a signal on UHF frequencies or to a satellite tracking system (SLDMBs). The buoy drifts with surface currents, but shows no leeway. Of the three, SLDMBs provide the most accurate and largest volume of data on the water movement due to their specific design. Each standard DMB used on scene should operate on a different frequency to preclude confusion over DMB origin. ***SLDMB serial number must be noted to track that particular buoy's data.***

H.3.2.2 With minimal current, first-day standard DMB observations may be questionable because of SRU navigational error. Standard DMB motion is more affected by wind and wave motion than SLDMBs. The average over 2 to 3 days can reduce the effect of such errors. Standard DMBs should be inserted or relocated as accurately as navigational systems permit. SLDMB data can be used throughout a search.

H.3.2.3 Information on currents obtained by a DMB should be used with caution. It provides information only while in the water and represents total water current valid only during the time of deployment and for the water area through which it traveled. Even so, it is probably a more accurate representation of local current than that previously calculated from historical and statistical data. If there is a wide disparity between DMB and planning information, the SMC should consider adjusting search areas and/or datum.

H.3.2.4 To preclude diversion from planned search patterns, SRUs should relocate radio beacon DMBs only at the beginning or end of search. SLDMBs do not require relocation by search units. SLDMBs are preferred for that reason and because each SLDMB has a GPS receiver that provides more much more frequent and more accurate positioning than relocation by SRU could ever provide.

H.3.2.5 Other on scene observations can improve the accuracy of drift estimates where information from normal sources (NOAA, U.S. Navy, SLDMB/DMB, SRUs on scene) is not available. Ships and stations near the incident can be asked for recent wind and local current observations, but these should also be used with caution. The quality of the observations is often unknown and affected by method and instrumentation used (calibration and location of instruments, etc.). These sources also do not provide predictions needed for planning purposes.

H.3.3 Initial Position Error (*X*)

The initial positions error (X) is the estimated probable error of the initial position based on the information available to the search planner. This may be the same as the probable navigational error of the distressed craft or the position fixing accuracy of the radio DF net, radar net, SOFAR net, etc., reporting the initial position. However, it may be a much larger value depending on how the position was reported. ***The search planner must always bear in mind that the uncertainty associated with any piece of data is a reflection of how much confidence may be placed in it***. For example, if the *Mary Jane* reports itself in distress and taking on water "50 miles southeast of Cape Fear" based on a GPS fix, that does not mean the quality of the information as received is as good as the average quality of GPS positions. It would be more prudent to assume the range and bearing given were only approximate, possibly an estimate made by eye from a nautical chart while the reporting source was under stress. The resulting uncertainty about the distress position would then be much larger than the uncertainty associated with GPS navigation in general.

H.3.3.1 If information on the means of navigation used by the distressed craft is available, the navigational fix errors (Fix_e) listed in Table H-2 are the minimum values that may be assumed for positions reported as navigation fixes ($X=Fix_e$). As discussed above, larger values may be appropriate depending on how the position information is represented and on the circumstances surrounding the report. If the means of navigation on the distressed craft is unknown, the SMC should assign error on the following basis:

(a) 5 NM for ships, military submarines, and aircraft with more two engines.

(b) 10 NM for twin-engine aircraft.

(c) 15 NM for boats, submersibles, and single-engine aircraft.

Table H-2 Navigational Fix Errors

Means Of Navigation	*Fix Errors (NM)*
NAVSAT	0.5 NM
Radar	1 NM
Visual Fix (3 lines)*	1 NM
Celestial Fix (3 lines)*	2 NM
Marine Radio Beacon	4 NM (3 beacon fix)
SARSAT (Doppler)	3 NM
SARSAT (E Solution/GPS)	.1NM
INS	0.5 NM per flight hour without position update
VOR	$\pm$ 3 degree arc and 3% of distance or 0.5 NM radius, whichever is greater
TACAN	$\pm$ 3 degree arc and 3% of distance or 0.5 NM radius, whichever is greater
GPS	0.1 NM**
DGPS	0.1 NM**

*Should be evaluated upward according to circumstances.
**Published accuracy of the system is much greater.

H.3.3.2 If the position is determined from an FCC direction-finding network, the fix error corresponds to the assigned classification of the fix as shown in Table H-3.

Table H-3 FCC DF Network Fix Errors

Class of Fix	*Fix Error*
A	20 NM
B	40 NM
C	60 NM

H.3.3.3 When the initially reported position is based on dead reckoning (DR), an additional error is assumed for the distance traveled since the last fix. The initial position error is the sum of the fix error and DR error (DRe). Table H-4 gives DRe, which may be assumed for various types of craft.

Table H-4 Dead Reckoning Errors

Type of Craft	*DR**e** (% of the DR distance)*
Ship	5
Submarine (military)	5
Aircraft (more than 2 engines)	5
Aircraft (twin-engine)	10
Aircraft (single-engine)	15
Submersible	15
Boat	15

H.3.4 Leeway (LW)

Leeway is the movement through water caused by winds blowing against the exposed surfaces of the search object. The pushing force of the wind is countered by water drag on the under-water surface of the object. Most marine craft have a portion of the hull and superstructure (sail area) exposed above the water. The more sail area the search object has, the greater the wind force on the object. Completely submerged objects and objects that are awash with no appreciable sail area are assumed to have no leeway. The SMC should get information on the physical characteristics of the search object to determine the amount of leeway.

H.3.4.1 **Leeway Calculations**. Leeway is movement through the water caused by wind and waves acting on the search object. These forces are countered by water drag on the underwater portion of the drift object. This balance of forces results in a linear relationship between leeway speed and wind speed. Leeway speed is simply the magnitude of the velocity of the object relative to the water and can be estimated using the following equations.

Equation 1: Leeway speed (knots) = [Slope * Wind Speed (knots)] + Y-intercept (knots), for wind speeds greater than or equal to six knots.

Equation 2: Leeway speed (knots) = [Slope + Y-intercept/6] * Wind Speed (knots), for wind speeds less than six knots.

The second equation ensures that zero wind speed produces zero leeway and that the computed leeway for a six-knot wind is the same for both equations.

H.3.4.2 **Leeway Taxonomy.** Allen and Plourde (1999) conducted a review of twenty-six leeway field studies. Presented in their report is a systematic approach (taxonomy) to classify leeway objects by primary and secondary characteristics that affect their leeway drift. This taxonomy's purpose is to provide a classification system that allows the search planner to identify an appropriate class for the drifting object of interest.

H.3.4.3 Given the enormous diversity of objects for which a search planner could be expected to predict drift, the taxonomy was developed with seven object classification levels progressing from general to more specific leeway-determining characteristics (Table H-5). These levels result in a "branching effect" for object classification that can be clearly seen in Figure H-1 where only the first three levels of the taxonomy are depicted.

Table H-5 Names and descriptions of Leeway Taxonomy Levels

Taxonomy Level Number	Level Name	Level Descriptions
Level 1	Governmental Response Mechanism / Organizations	• Reflects governmental response mechanisms that are triggered • Reflects behavioral differences in response units • Identifies expected behavioral characteristics of the search object • Reflects an expectation of the amount and types of datum information that may be available
Level 2	Primary Source of the Leeway Object	• Identifies the primary source of the drifting object • SAR targets originate from marine or aviation sources • Non-SAR targets originate from non-SAR sources
Level 3	Major Object Categories	• First level using specific drift object characteristics • Identifies broad categories of intended object use • Highest level that could possibly have leeway information
Level 4	Object Sub-Categories	• Identifies major divisions within drift object categories • First level for which the size or shape of the drift object determines its placement in the taxonomy • First level that considers the ratio of drift object surface area above and below the waterline • The majority of current target leeway drift information will be found at this level
Level 5	Primary Object Leeway Descriptor	• Identifies the drift object feature that exerts the greatest influence on the drift object leeway ratio (typically above or below the waterline) • Swamping or capsizing are dominant leeway characteristics
Level 6	Secondary Object Leeway Descriptor	• Identifies the drift object feature that exerts the second strongest influence on the drift object leeway ratio (typically the above or below the waterline features opposite the primary feature)
Level 7	External Modifiers	• Identifies those items that can affect an object's leeway drift that have not been addressed in earlier levels • These items are usually controlled by the occupants onboard leeway targets • These items effectively modify the primary and secondary influences identified in Levels 5 and 6.

	Level 1	Level 2	Level 3
Leeway Taxonomy	Search and Rescue (SAR)	Maritime Sources of SAR Objects	Boating PIW
			Maritime Survival Craft
			Personal Powered Craft
			Sailing Vessels
			Power Vessels
			Boating Debris
		Aviation Sources of SAR Objects	Aviation PIW
			Aviation Survival Craft
			Aircraft Debris
	Combat Search and Rescue (Combat SAR)	Aviation Sources of Combat SAR Objects	Combat SAR Aviation PIW
			Combat SAR Aviation Survival Craft
			Combat SAR Aviation Debris
		Maritime Sources of Combat SAR Objects	Combat SAR Maritime PIW
			Combat SAR Maritime Survival Craft
			Combat SAR Maritime Power Vessels
			Combat SAR Maritime Debris
	Non-SAR Drift Objects	Law Enforcement Drift Objects	Drug Flotsam
			Drug Vessels (Evasive Target)
			Immigration Target (Evasive Target)
		Marine Safety Drift Objects	Surface Slick
			Hazards to Navigation
		Military Drift Objects	Ordinance
			Non-Ordinance

Figure H-1 Outline of the first three Leeway Drift Taxonomy levels.

H.3.4.4 Leeway Definitions and Calculations. In conjunction with the development of the vessel taxonomy, the report by Allen and Plourde (1999) compiled the results from twenty-six leeway field tests, performed further analysis of other leeway studies, and presented results for general leeway categories. Their results provide valuable information to assist in correct application of the most accurate leeway values.

(a) The first four columns of Table H-7 are the systematic organization of SAR objects by their leeway drift characteristics (a portion of the vessel taxonomy). The columns are organized from general to increasingly more specific following the taxonomy guidelines discussed above; however, the table actually begins with level three of the overall taxonomy. This is because our primary SAR interests lie within the taxonomy level two classification: "Maritime Sources of SAR Targets" (Figure H-1). The fifth and sixth columns of Table H-7 are coefficients to the leeway speed versus wind speed equation (Eq. 1). The Slope coefficient is dimensionless and the Y-intercept has units of nautical miles per hour [kts].

(b) Leeway divergence angle is the divergence of the drift object from the downwind direction due to the lack of symmetry of a drift object. The seventh column in Table H-7 is the divergence leeway angle in degrees representing the average angle off the downwind direction. This value can be used to determine search area size based on uncertainty in the direction of leeway drift. Two examples to illustrate the use of Table H-7 are presented below:

Example 1: The search planner is looking for Persons-in-the-Water (PIWs) in winds of 15 KTS. Information is lacking on their condition (conscious or unconscious) and whether they are wearing lifejackets or survival suits. Thus the general category PIW is chosen. Equation (1) for general category of PIW for winds of 15 KTS is shown below.

Leeway Target Class				Leeway Speed		Divergence
Category	Sub Categories	Primary Leeway Descriptors	Secondary Leeway Descriptors	Slope	Y-intercept (KTS)	Angle (deg)
PIW				0.011	0.0680	30
	Vertical			0.005	0.0739	18
	Sitting			0.012	0.0004	18
	Horizontal	Survival Suit		0.014	0.1011	30
		Scuba Suit		0.007	0.0836	30
		Deceased		0.015	0.0778	30

Leeway speed (knots) = [0.011* 15 knots] + 0.0680 knots = 0.233 knots

Leeway Divergence Angle (degrees) = plus or minus 30 degrees.

Example 2: A fishing vessel has sunk, and four men were last seen entering their life raft in winds of 20 knots. After talking with the fishing vessel's home office, the manufacture and type of life raft on board is determined. An illustration from the manufacturer catalogue of the life raft is available at the manufacturer's web site. The search planner then enters the Table H-7 (extract below) at Survival Craft, moves through to the sub-category – Maritime Life Rafts, and then looking at the illustration from the manufacturer's web site determines that the 4-6 person life raft has deep ballast bags and a canopy. The search planner then goes to Table H-7A (extract below) and finds the Capacity Modifier – 4-6 Person Capacity life rafts. The search planner does not know if the fishermen deployed their drogue (Drogue Modifier). Therefore, the search planner determines a search area, based upon a 4-6 person life raft. This scenario is shown below.

Leeway Target Class				Leeway Speed (kts)		Divergence Angle (deg)
Category	Sub Categories	Primary Leeway Descriptors	Secondary Leeway Descriptors	Slope	Y-intercept (kts)	
Survival Craft	Maritime Life Rafts	No Ballast Systems		0.042	0.0311	28
			no canopy, no drogue	0.057	0.2119	24
			no canopy, w/ drogue	0.044	-0.2002	28
			canopy, no drogue	0.037	0.1108	24
			canopy, w/ drogue	0.030	0.0	28
		Shallow Ballast Systems and Canopy		0.029	-0.0039	22
			no drogue	0.032	-0.0194	22
			with drogue	0.025	0.0136	22
			Capsized	0.017	-0.1011	8
		Deep Ballast Systems & Canopies	(See Table H-7A for Levels 4-6)	0.030	0.0156	13
	Other Maritime Survival Craft	life capsule		0.038	-0.0797	22
		USCG Sea RescueKit		0.025	-0.0408	7
	Aviation Life Rafts	no ballast, w/canopy	4-6 person, w/o drogue	0.037	0.1108	24
		Evac/ Slide	46-person	0.028	-0.0117	15

Leeway Target Class				Leeway Speed (kts)		Divergence
Secondary Leeway Descriptors	Capacity Modifier	Drogue Modifier	Loading Modifier	Slope	Y-intercept (kts)	Angle (deg)
Maritime Life Rafts with Deep Ballast Systems and Canopies	4-6 person capacity			0.029	0.0389	20
		without drogue		0.038	-0.0408	20
			light loading	0.038	-0.0408	20
			heavy loading	0.036	-0.0292	20
		with drogue		0.018	0.0272	16
			light loading	0.016	0.0525	32
			heavy loading	0.021	0.0	27
	15-25 person capacity			0.036	-0.0855	14
		w/o drogue	light loading	0.039	-0.0603	12
		with drogue	heavy loading	0.031	-0.0700	12
	Capsized			0.009	0.0	16
	Swamped			0.010	-0.0428	11

Leeway speed (knots)=[0.029* 20 knots] + 0.0389 knots = 0.619 knots

Leeway Divergence Angle (degrees) = plus or minus 20 degrees

H.3.4.5 When utilizing these leeway values it should always be remembered that personnel onboard SAR targets are often able to change the target's leeway drift in ways that are not possible to predict or account for in the taxonomy. For instance a PIW may attempt to swim towards the nearest shore.

H.3.4.6 If wind speed is measured in knots Table H-7 should be used and if wind speed is available in cm/s use Table H-6 to perform conversions as needed. ***The equation for Leeway Speed remains the same regardless of which values are used, but units must remain consistent***.

Table H-6 Conversion Factors

To Covert From	*To*	*Multiply by:*
m/s	knots	1.94
cm/s	knots	0.02
knots	m/s	0.51
knots	cm/s	51.44

H.3.4.7 Table H-7 was modified from the original report for operational use.

(a) Y-intercept (in knots) was rounded to nearest 0.01 knots (0.5 cm/s).

(b) Several vertical lines between leeway target modifiers where removed, where they were did not add further sub-division for that class.

(c) Several horizontal lines were thickened to separate leeway categories.

(d) Two classes were added back in: Sewage Floatables and Medical Waste.

(e) Under the Sub-Class: Commercial Fishing Vessels, Primary Leeway Descriptors – Junk was changed to Asian Coastal F/V.

(f) The Divergence Angles reported in Allen and Plourde (1999) "Review of Leeway: Field Experiments and Implementation" have been adjusted for Manual SAR planning tools. As recommended by the "Leeway Divergence" report, the original maximum values were divided by 1.35 and rounded up to the nearest degree to provide the average values appearing in this appendix.

(g) One additional column was added; the Standard Error of the Leeway data. These values are from Allen and Plourde (1999).

Standard Error (knots) = Syx (cm/s) x 0.019438462 knots/cm/s x 1.1774 St.Error / St.Dev

The original Standard Error data was rounded to the nearest 0.01 knot. The presented Standard Error column presents the Standard Error rounded up to the nearest 0.05 knots.

Rounding up the Standard Error is more inclusive of the error and presents the values to a reasonable degree of separation and simplicity.

Table H-7 Leeway Speed and Direction Values for Drift Objects

Leeway Target Class				Leeway Speed (kts)		Divergence Angle (deg)	St Err (kts)
Category	Sub Categories	Primary Leeway Descriptors	Secondary Leeway Descriptors	Slope	Y-intercept (kts)		
PIW				0.011	0.07	30	0.35
PIW	Vertical			0.005	0.07	18	0.25
PIW	Sitting			0.012	0.00	18	0.05
PIW	Horizontal	Survival Suit		0.014	0.10	30	0.05
PIW	Horizontal	Scuba Suit		0.007	0.08	30	0.15
PIW	Horizontal	Deceased		0.015	0.08	30	0.25
Survival Craft	Maritime Life Rafts			0.042	0.03	28	0.35
Survival Craft	Maritime Life Rafts	No Ballast Systems	no canopy, no drogue	0.057	0.21	24	0.25
Survival Craft	Maritime Life Rafts	No Ballast Systems	no canopy, w/ drogue	0.044	-0.20	28	0.10
Survival Craft	Maritime Life Rafts	No Ballast Systems	canopy, no drogue	0.037	0.11	24	0.05
Survival Craft	Maritime Life Rafts	No Ballast Systems	canopy, w/ drogue	0.030	0.00	28	0.35
Survival Craft	Maritime Life Rafts	Shallow Ballast Systems and Canopy		0.029	0.00	22	0.35
Survival Craft	Maritime Life Rafts	Shallow Ballast Systems and Canopy	no drogue	0.032	-0.02	22	0.05
Survival Craft	Maritime Life Rafts	Shallow Ballast Systems and Canopy	with drogue	0.025	0.01	22	0.10
Survival Craft	Maritime Life Rafts	Shallow Ballast Systems and Canopy	Capsized	0.017	-0.10	8	0.05
Survival Craft	Maritime Life Rafts	Deep Ballast Systems & Canopies	(See Table H-7A for Levels 4-6)	0.030	0.02	13	0.20
Survival Craft	Other Maritime Survival Craft	Life capsule		0.038	-0.08	22	0.05
Survival Craft	Other Maritime Survival Craft	USCG Sea Rescue Kit		0.025	-0.04	7	0.10
Survival Craft	Aviation Life Rafts	No ballast, w/canopy	4-6 person, w/o drogue	0.037	0.11	24	0.05
Survival Craft	Aviation Life Rafts	Evac/Slide	4-6 person	0.028	-0.01	15	0.10
Person-Powered Craft	Sea Kayak	w/ Person on aft deck		0.011	0.24	15	0.10
Person-Powered Craft	Surf board	w/ person		0.020	0.00	15	0.25
Person-Powered Craft	Windsurfer	w/ person and mast	& sail in water	0.023	0.10	12	0.10

Table H-7 (Continued) Leeway Speed and Direction Values for Drift Objects

Leeway Target Class				Leeway Speed (kts)		Divergence Angle (deg)	St Err (kts)
Category	Sub Categories	Primary Leeway Descriptors	Secondary Leeway Descriptors	Slope	Y-intercept (kts)		
Sailing Vessels	Mono-hull	Full Keel	Deep Draft	0.030	0.00	48	0.25
		Fin Keel	Shoal Draft	0.040	0.00	48	0.25
Power Vessels	Skiffs	Flat Bottom	Boston whaler	0.034	0.04	22	0.05
		V-hull	Std. Config.	0.030	0.08	15	0.10
			Swamped	0.017	0.00	15	0.10
	Sport Boats	Cuddy Cabin	Modified V-hull	0.069	-0.08	19	0.10
	Sport Fisher	Center Console	Open cockpit	0.060	-0.09	22	0.10
Power Vessels	Commercial Fishing Vessels			0.037	0.02	48	0.35
		Sampans	Hawaiian	0.040	0.00	48	0.25
		Side-stern Trawler	Japanese	0.042	0.00	48	0.25
		Longliners	Japanese	0.037	0.00	48	0.25
		Asian Coastal F/V	Korean	0.027	0.10	48	0.10
		Gill-netter	w/rear reel	0.040	0.01	33	0.10
	Coastal Freighter			0.028	0.00	48	0.25
Boating Debris	F/V debris			0.020	0.00	10	0.25
	Bait/wharf box holds a cubic meter of ice			0.013	0.27	31	0.15
		lightly loaded		0.026	0.18	15	0.10
		fully loaded		0.016	0.16	33	0.10
Misc. SAR Objects	Immigration Vessel	Cuban refugee raft	w/o sail	0.015	0.17	17	0.05
			w/ sail	0.079	-0.17	33	0.15
	Sewage Floatables	Tampon Applicators		0.018	0.00	5	0.35
	Medical Waste	Vials & Syringes		0.028	0.00	10	0.35

Table H-7A Sub-Table for Maritime Life Rafts with Deep Ballast Systems and Canopies

Leeway Target Class				Leeway Speed (kts)		Divergence Angle (deg)	St. Error (kts)
Secondary Leeway Descriptors	Capacity Modifier	Drogue Modifier	Loading Modifier	Slope	Y-intercept (kts)		
Maritime Life Rafts with Deep Ballast Systems and Canopies	4-6 person capacity			0.029	0.04	15	0.20
		w/o drogue		0.038	-0.04	15	0.15
		w/o drogue	light loading	0.038	-0.04	15	0.15
		w/o drogue	heavy loading	0.036	-0.03	15	0.10
		with drogue		0.018	0.03	12	0.10
		with drogue	light loading	0.016	0.05	24	0.10
		with drogue	heavy loading	0.021	0.00	20	0.10
	15-25 person capacity			0.036	-0.09	10	0.15
		w/o drogue	light loading	0.039	-0.06	9	0.10
		with drogue	heavy loading	0.031	-0.07	9	0.10
	Capsized			0.009	0.00	12	0.10
	Swamped			0.010	-0.04	8	0.05

H.3.4.8 Taxonomy class Definitions/Descriptions. The following section provides information about each of the leeway drift objects in Table H-7. For each description, the target characteristics are summarized and pictures are provided where available. These target descriptions are in no way meant to be all-inclusive. They are intended to assist a search planner in target identification. Proper identification will make the application of more specific leeway values possible. Some categories in Table H-7 do not require further explanation and therefore descriptions/pictures are not included. The SAR planner should also be reminded that any classification system would have overlap between some categories. ***In these cases, a decision must be made about the most probable situation.***

(a) **PIW.** Persons in the water include persons without any flotation, and those with a throwable cushion, with a PFD, in an anti-exposure suit and in survival/immersion suits.

(1) **Vertical.** Generally requires a conscious and active PIW to maintain this position. ***PIWs wearing a sport/work vest, anti-exposure suit, or float coat or having no flotation must actively maintain a vertical position in the water or become victims in the horizontal position.***

(2) **Sitting.** The classic fetal position with legs drawn up and arms huddled across the PFD. This is the preferred position a conscious or unconscious person assumes, especially in cold water, when wearing offshore lifejackets, horse-collar lifejackets, or inflatable vests. A conscious PIW hanging onto a throwable device will also assume the sitting position until he become unconscious at which time he become a victim.

(3) **Horizontal.** Three separate configurations place the PIW in a horizontal position. A conscious or unconscious PIW wearing a survival suit will float flat on his back. A PIW in scuba gear, with an inflated buoyancy vest, will float in a semi-reclined position. The classic floating position of a victim is floating face down in the water.

(b) **Maritime Survival Craft**. Includes life rafts, lifeboats, and life capsules. It does not include dinghies or inflatable boats that may be carried for the same purpose. (Figure H-2)

(1) **Maritime Life Rafts.** If there is any question about what type of life raft a vessel may carry, a phone call to life raft repair and repackaging facilities close to the homeport of the distressed vessel may provide ballast, canopy, size, and drogue information.

a. **Shallow Ballast.** Consists of a series of fabric pockets, generally 4 inches in diameter and less than six inches in depth.

b. **Deep Ballast.** Consist of large fabric bags, from 3-7 on the raft, that are at least 1'x 2' x 2'.

(2) **Other Maritime Survival Craft.**

a. **Life Capsule.** Fully enclosed crafts commonly used on large merchant and military vessels.

(3) **Aviation Life Rafts.** Fall basically into two groups, life rafts and slide rafts. Aviation life rafts are similar to marine life rafts, but are usually made from lighter materials.

a. **Evacuation/Slide.** Slide rafts are specifically designed devices intended to ease evacuation from an aircraft. They mount to doorframes or near wing emergency exits and are cut loose from the airframe once fully loaded.

(c) **Person-Powered Craft.** Includes all forms of rowed or paddled boats including rowboats, inflatable boats without motors, canoes, kayaks, surfboards, and windsurfers. (Figure H-3).

(d) **Mono-hull Sailing Vessel.** It is assumed that all targets in this category are adrift; therefore sails are down or missing and the crew is unable to maneuver the vessel at all. For small centerboard sailing vessels typically used for racing and day sailing, assume the centerboard functions as a shoal-draft fin keel.

(1) **Full Keel.** Small to medium sized sailboats whose keel runs the full length or nearly the full length of the hull. While the forward portion of the keel is modified or eliminated on some full keel sailboats, the keel on all full keel sailboats extends aft to the rudder. This is an old hull design and is not commonly used in new hull construction due to the relatively slow sailing speeds of this hull design. (Figure H-4)

(2) **Fin Keel.** Small to medium sized sailboats with permanent keel skegs, that do not extend aft to the rudder. (Figure H-5)

(e) **Skiffs.** Open boats less than 20 ft long that use an outboard motor as the primary source of propulsion. Some have characteristics identical to rowed boats with the exception that an outboard motor has been attached to the stern. This group includes, but is not limited to, tenders for larger vessels, bass boats, hunting boats, Jon boats, and a large category of utility boats. Skiffs are usually found on lakes and rivers, but are also common in the calm waters of many bays and rivers that provide access to the open ocean. Flat bottom skiffs include both those with truly flat bottoms and those like Boston whalers that have multiple shallow Vs to improve stability. (Figure H-6) Caution: Very light-weight skiffs, like those made of aluminum, may have higher leeway rates more like those of life rafts with no ballast pockets, no canopy, no drogue.

(f) **Personal Water Craft.** Include a number of different designs for one or more persons. Generally there are stand up models and ride on models. Some craft marketed as PWC closely resemble small sport boats. Most PWCs have water jet propulsion. No leeway drift experiments have yet been performed on PWCs and they do not appear within Table H-7. Leeway category choice should be based on number of passengers/loading, size of PWC (draft, length, freeboard) of PWC. These factors may be comparable (not exact) to several other leeway targets. (Figure H-7)

(g) **Sport Boats**. Includes pleasure craft from 15 to 28 feet long with beam widths from roughly 6 to 9 feet. They include metal, fiberglass, and wood vessels with a V, modified-V, or deep-V hull form. Sport boats can be outfitted with inboard, outboard, or I/O propulsion. This category includes side console (closed bow and bow riders) and cuddy cabin boats. (Figure H-8)

(h) **Sport Fisher.** Include pleasure and commercial craft form 17 to approximately 100 feet long with beam widths up to 24 feet. The majority are between 30 and 50 feet long, with beam widths between 10 and 15 feet. This class includes both semi-displacement and planning hull forms that can be outfitted with inboard, outboard, or I/O propulsion. This category includes boats with simple center console or walk-round cabin. Convertibles are sport fishers with a walk around cabin and flying bridge. Convertibles designed for offshore fishing may also have a spotting tower. Many convertibles provide extended cruising capabilities similar to sport cruisers, but their after deck design provides a larger open area to work fishing gear. Some of these vessels can also be found in the cruiser or motor yacht categories. (Figure H-9)

(i) **Commercial Fishing Vessels.** Include vessels from 45 to 100 feet long designed for fishing or shell fishing in coastal and ocean waters. They include side and stern trawling rigs, long liners, bottom dragging rigs, and purse seiners. Pole fishers are simply modified use of a sport fisher or sport cruiser and should be treated as such. Commercial fishers can be working alone, as paired vessels, or can be the mother ship to a group of smaller fishing skiffs. These vessels have different design features based on their purpose, but all have some form of deckhouse and an open area from which nets can lines are worked. A deck winch and boom system is commonly used to handle nets or lines. (Figure H-10)

(j) **Coastal Freighter.** Include a wide range of commercial shipping platforms up to 100 feet in length. These vessels transfer cargo from one port to another, and shipping agents can provide estimated voyage schedules. Coastal freighters include vessels with a deckhouse on the forecastle, amidships deckhouse (common to cargo vessels), and an aft deckhouse (common to tankers and container ships). Leeway of these vessels will of course not only vary with respect to deckhouse location; it will also be greatly affected by loading, amount, and type of cargo. (Figure H-11)

(k) **Boating Debris.** Includes any debris that can be expected from a boat that is sinking and/or breaking up. It may include paper or plastic containers, bedding or clothing, and a variety of fragmented boat sections.

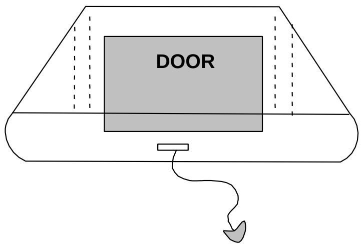
(1) **Fishing debris.** Debris typical to a fishing vessel such as lifejacket, life ring, fishing float balls, fishing box lid, or wooden boards.

(2) **Bait/wharf box.** Commercially available 1.1 X1.5 meter plastic box used by commercial fisherman for holding ice and/or fish. Although not it's intended use, it could also serve as a floatation/life raft by persons in distress.

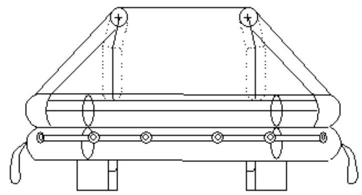
a. Lightly loaded. Approximately 200 lbs (simulation of one person)

b. Full loaded. Approximately 800 lbs (simulation of four persons)

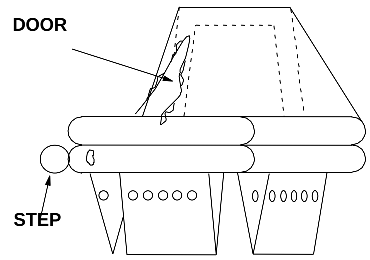
(l) **Immigration Vessel.** Refer to types of vessels typically employed in illegally transporting alien persons to U.S. ports. This ranges from small coastal and sailing vessels to homemade rafts and inner tubes.



No Ballast Life Raft



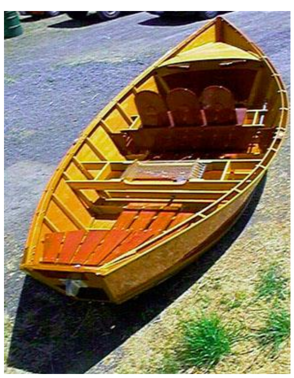
Shallow Pocket Ballast



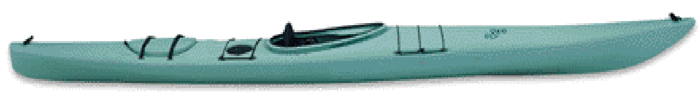
Deep Pocket Ballast

Life Capsule

Figure H-2 Maritime Survival Craft



Row Boat

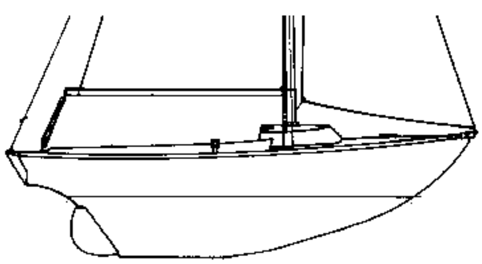


Sea Kayak

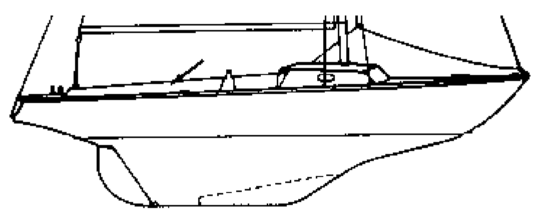
Canoe

Surf Board

Figure H-3 Person-Powered Craft

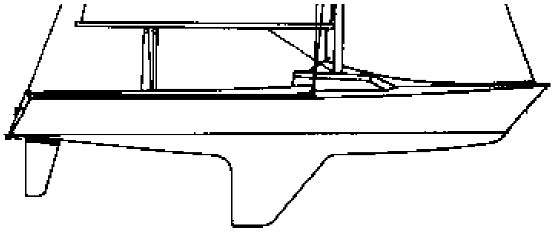


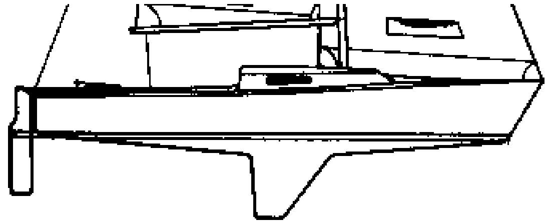
Open Cockpit



Cabin

Figure H-4 Full Keel One-design Sailboat





Open Cockpit **Cabin**

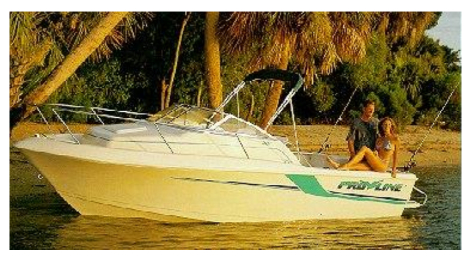
Figure H-5 Fin Keel One-design Sailboat

Flat Bottom Skiff **V-Hull Skiff**

Figure H-6 Skiffs

Figure H-7 Personal Water Craft

Bow Rider



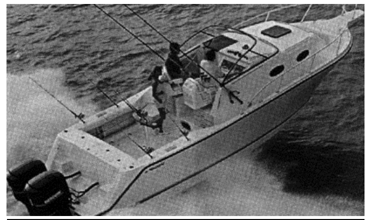
Closed Bow

Cuddy Cabin

High Performance

Figure H-8 Sport Boats

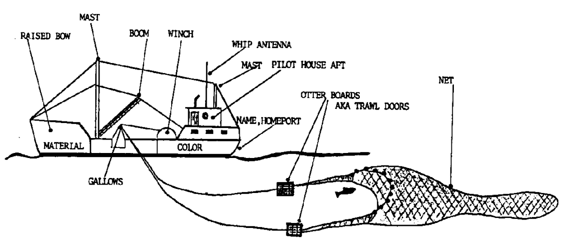
Center Console



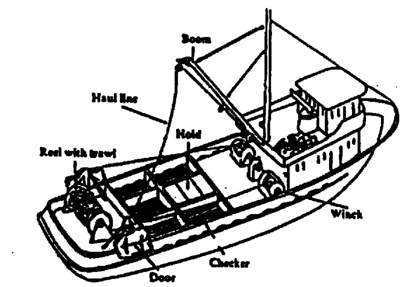
Walk Around Cuddy

Convertible

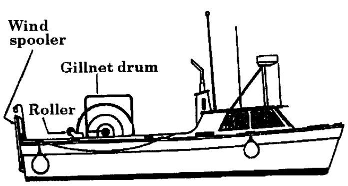
Figure H-9 Sport Fishers



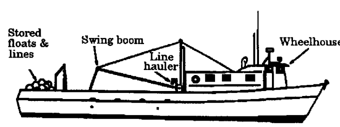
Side Trawler



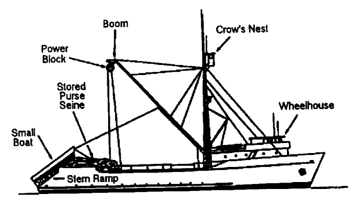
Stern Trawler



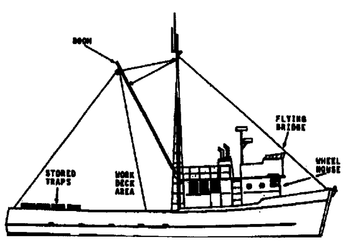
Gillnetter



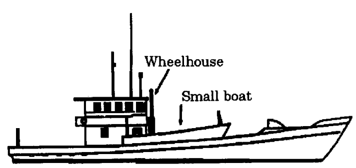
Longliner



Purse Seiner



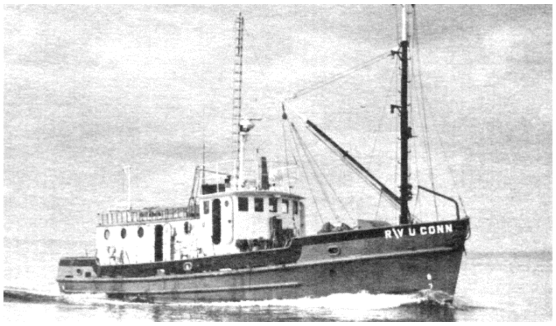
Trap Boat



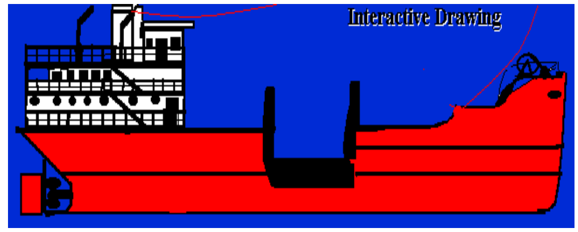
Sampan

Lobster Boat

Figure H-10 Commercial Fishers



Coastal Freighter with Mid Deckhouse



Coastal Freighter with Aft Deckhouse

Figure H-11 Coastal Freighters

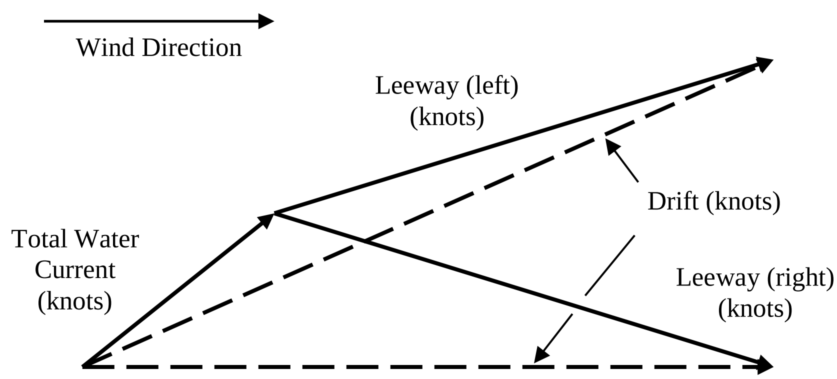
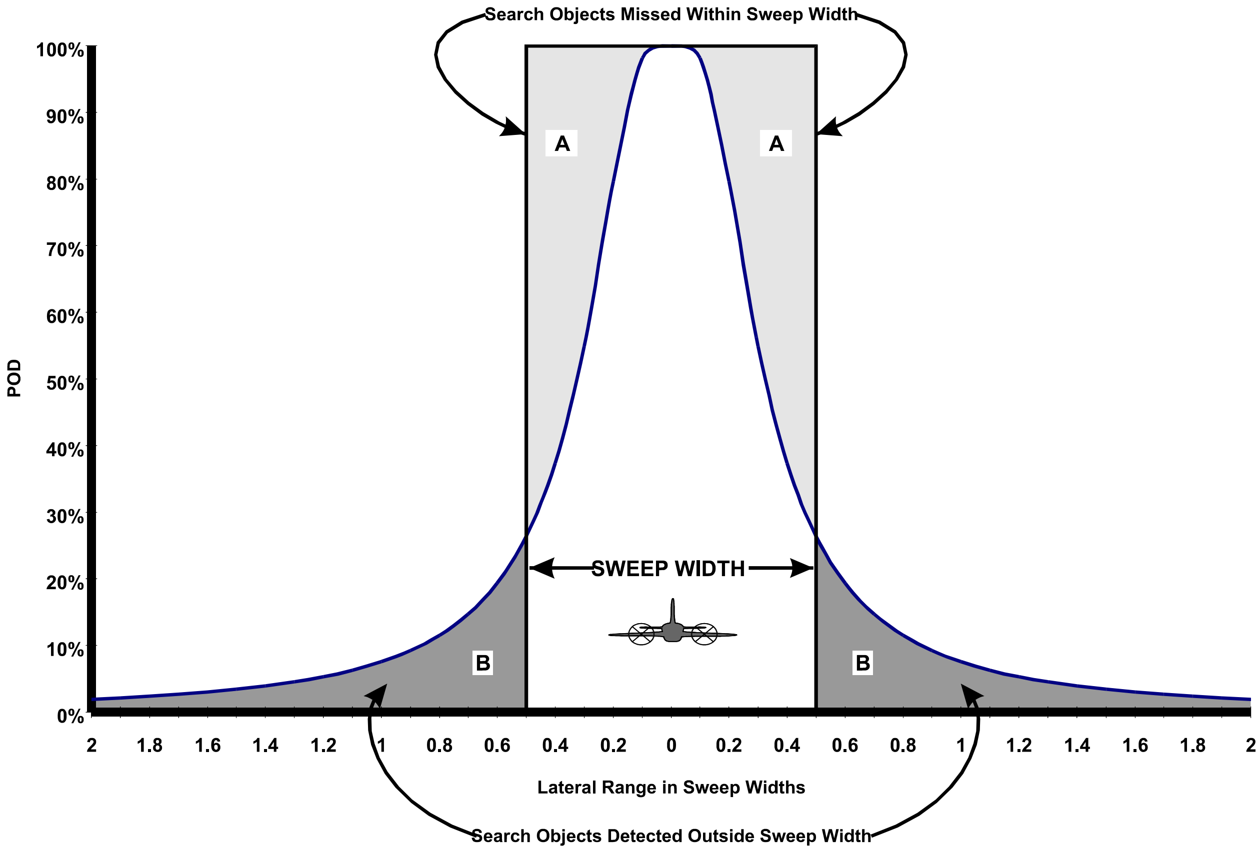


Figure H-12 Vector Plot of Basic Surface Drift Velocities

H.3.5 Sweep Width

Sweep width (*W*) is the width of a swath centered on the SRU's track where the probability of detecting the search object if it is outside of that swath is equal to the probability of missing the search object if it is inside that swath, assuming the distribution of search objects is uniform. It is a measure of detection capability based on search object and sensor characteristics, weather, and other factors. Sweep width is less, often much less, than twice the maximum detection range, which is the farthest range at which the object can be detected. See Figure H-13. It is usually expressed in yards or meters for underwater and ground searches, and in nautical miles for other types of searches. Use of the sweep width concept in any search allows solution of otherwise unworkable search planning and optimal effort allocation problems.



Note:	Area "A" represents the number of objects missed inside a swath of width ***W*** and equals area "B" that represents the number of objects detected outside that swath.

Figure H-13 Sweep Width

H.3.5.1 Sweep width varies with the type of sensor employed. Visual searching is used most often. However, other sensor searches can be far more efficient than visual and should be considered when it is known, or even suspected, that the distressed craft or persons may be more readily detected by electronic or other non-visual means.

(a) Sensors include radio, radar, magnetic, voltage, radioactive, infrared, ultraviolet, electro-optical, and other electromagnetic signal sensing equipment. Most common in SAR applications are radio and radar, with infrared becoming increasingly available. Detection range information may be available from parent agencies, operating commands, manufacturers, or operators.

(b) Each SAR agency should test its specific equipment to develop accurate estimates of sensor sweep width. Output power, reflective capabilities, antennae heights, environmental ambient noise and clutter levels, and other factors that affect the quality of sensor receiving and transmitting may affect sweep width.

(c) Although some sensors may be more efficient at detecting objects than visual search, rarely are they able to recognize whether a detected object is the search object. Generally visual confirmation is required.

H.3.5.2 **Visual sweep widths** are determined by choosing an uncorrected sweep width based on type of search object and SRU altitude and correcting it for environmental conditions, speed, and fatigue. For maritime SAR, sweep width corrected (W_c) = sweep width uncorrected (W_u) x weather correction (f_w) x fatigue correction (f_f) x speed correction (f_v-aircraft only). For land searches, see the *IAMSAR Manual*. Maritime sweep width tables are provided below. Factors affecting sweep width are:

(a) *Search Object characteristics. **The object's size, shape, color contrast and brightness contrast, and movement must be considered.***

(b) *Meteorological Visibility.* The maximum range at which large unlighted objects such as landmasses can be seen constitutes meteorological visibility. Reduced visibility results in reduced detectability and sweep width.

(c) *Terrain/Sea Conditions*. Normally, the more level the terrain, the more effective a land search can be. Trees, rock outcroppings, and other surface irregularities decrease search effectiveness. Similarly, characteristics of the water surface such as sea state, whitecaps, wind streaks, foam streaks, breaking seas, swell systems, salt spray, and sun reflections decrease search effectiveness over water. Over water sweep width decreases as wind speed and significant wave height increase.

(d) *Cloud Cover.* Visual sweep widths may be reduced 10 to 20 percent by cloud cover above the SRU due to reduced surface illumination.

(e) *Search Altitudes for Aircraft.* For many objects, the available sweep width tables indicate that sweep width increases slightly with increasing altitude up to 3,000 feet under ideal conditions. However, these figures should not be given undue regard as the smaller increases indicated are generally within the estimation error of the methods used to create the tables. For example, at 500 and 1,000 feet, the uncorrected sweep width for a four-person raft is given as 1.8 NM while at 1,500 and 2,000 feet the uncorrected sweep width is given as 1.9 NM. The decision on what altitude to assign should not be based on the difference in the uncorrected sweep widths. As a general rule, differences in sweep widths of less than 10% should be ignored when making altitude assignment decisions. Another general rule is that the search altitude should not be so high that it is an appreciable fraction of the corrected sweep width. As altitude decreases, the search object passes more rapidly through the scanner's field of vision. This effect is most pronounced at altitudes below 500 feet. Nevertheless, if a large number of objects are in the area, a low altitude is preferable to reduce diversions for identifying sightings. Also, low altitude favors object identification because scanners are more familiar with objects viewed from low angles. For maritime searches, the daylight lower limit is 200 feet for all search conditions, and altitude usually does not exceed 3000 feet even under ideal search conditions. For land searches, scanner efficiency decreases rapidly as altitude increases from 200 feet up to 2000 feet, and more slowly as it increases above 2000 feet. See Table H-8 for recommended search altitudes.

(f) *Search Speed.* At low altitudes, higher speed causes blurring of search objects at close ranges and decreases exposure time to the scanner, which can significantly reduce sweep width. At altitudes above 500 feet, search speed of traditional SRUs has less influence on over water sweep widths.

Table H-8 Recommended Visual Search Altitudes

Search Object	*Terrain*	*Recommended Altitudes (ft AGL)*
Person, cars, light aircraft crashes	Moderate	200 to 500
Trucks, large aircraft	Moderate	400 to 1000
Persons, 1-6 person rafts, boats<15 ft, light aircraft crashes	Water or flat	200 to 500
Small to medium boats, >6 person rafts, trucks, aircraft	Water or flat	1000 to 3000
Distress signals	Night-all	1500 to 2000

(g) *Maximizing Available Effort.* The available search effort on scene is the product of corrected sweep width (*W*), search speed (*V*) and *search* endurance (*T*) ($Z = W \times V \times T$). The combination of these that produces the largest value, subject to common sense and flight safety constraints, is generally the best combination because it maximizes the amount of searching the available SRUs can do. However, search planners are cautioned against spending excessive amounts of their valuable time trying to find the combination that provides the absolute maximum effort since gains are likely to be small. Search speeds should be within the range of values for which correction factors are given in Table H-9. For small objects, especially PIWs, search altitudes and speeds should be kept in the lower part of the range for which uncorrected sweep widths are given in Tables H-11 to H-19. ***Vertical separation must be maintained for aircraft in adjacent search areas, and speeds and altitudes are always subject to on scene conditions for reasons of flight safety***.

H.3.5.3 Visual Sweep Width Corrections

(a) **Correcting for Search Aircraft Speed**. Enter the speed correction table (Table H-9) with aircraft type (fixed-wing or helicopter) and the speed flown. Read down the column to the search object. This value is the speed correction. Interpolate as required. There is no speed correction for surface SRUs.

Table H-9 Search Aircraft Speed Correction

Search Object	*Fixed Wing Speed (Knots)*			*Helicopter Speed (Knots)*			
	150 or less	*180*	*210*	*60 or less*	*90*	*120*	*140*
Person in Water	1.2	1.0	0.9	1.5	1.0	0.8	0.7
Raft - 1-4 Man	1.1	1.0	0.9	1.3	1.0	0.9	0.8
Raft - 6-25 Man	1.1	1.0	0.9	1.2	1.0	0.9	0.8
Power Boat - to 25 ft	1.1	1.0	0.9	1.2	1.0	0.9	0.8
Power Boat - 26-40 ft	1.1	1.0	0.9	1.1	1.0	0.9	0.9
Power Boat - 41-65 ft	1.1	1.0	1.0	1.1	1.0	0.9	0.9
Power Boat - 66-90 ft	1.1	1.0	1.0	1.1	1.0	1.0	0.9
Sail Boat - to 26 ft	1.1	1.0	0.9	1.2	1.0	0.9	0.9
Sail Boat - 30-52 ft	1.1	1.0	1.0	1.1	1.0	0.9	0.9
Sail Boat - 65-90 ft	1.1	1.0	1.0	1.1	1.0	1.0	0.9
Ship - over 90 ft	1.0	1.0	1.0	1.1	1.0	1.0	0.9

(b) **Position of the Sun.** The sun's position relative to SRU and target can significantly influence target appearance. Detectability, however, is not necessarily better or worse in any particular direction relative to the sun except for low sun angles close to dawn and dusk.

(c) **Correcting for Fatigue.** Degradation of detection performance during a search can be significant due to fatigue. The sweep widths given in the uncorrected visual sweep width tables that follow are adjusted for a normal amount of crew fatigue. If feedback from on scene SRUs indicates search crews were excessively fatigued, reduce sweep width values by 10 percent (multiply by 0.9).

(d) **Correcting for Weather.** Table H-10 should be used to determine the weather correction factor. *IAMSAR Manual Volume 2, Table N-7* provides corresponding information. If weather conditions in more than one row apply, i.e. winds 10 knots and seas 4 feet, use the lower row for more correction.

Table H-10 Weather Correction Factor

Weather: Winds (kts) or seas (ft)	**Search Object**	
	Person in water, raft or boat < 30 ft	Other search objects
Winds 0 to15 kts or seas 0 to 3 ft	1.0	1.0
Winds >15 to 25 kts or seas >3 to 5 ft	0.5	0.9
Winds > 25 kts or seas >5 ft	0.25	0.9

H.3.5.4 Uncorrected Visual Sweep Width Tables

(a) Interpolation is to be used within these tables as needed.

(b) When vessel length is larger than the largest "power boat" or "sail boat", interpolate between the largest "power boat" or "sail boat" line and the smallest "ship" line.

(c) When searching for small objects, high search altitudes for aircraft SRUs yield little to no improvement in sweep width while actually making it more difficult for aircraft scanners to visually identify the search object. For normal search operations, giving consideration to on scene weather and aircraft separation needs, search altitudes should be restricted to no higher than 1000 feet for small objects. For the purposes of using the following tables, entries for small objects are shaded in the tables for higher search altitudes for combinations of search object and altitude that should be avoided. Small objects include:

(1) PIWs

(2) Rafts ≤ 6 person

(3) Powerboats < 15 feet

(4) Sailboats < 15 feet

(d) For search altitudes up to 500 feet only, the values given for sweep width for a person in water may be increased by a factor of 4 if it is known that the person is wearing a personal flotation device.

(e) Visual searches are seldom conducted from altitudes above 3000 feet; however, for altitudes up to 5000 feet where visibility exceeds 3 NM and search object size exceeds 25 feet, the sweep widths given for 3000 feet remain applicable.

Table H-11 Uncorrected Visual Sweep Width – Fixed-wing Aircraft for Altitudes 300-500 Feet

Search Object	*Altitude 300 Feet Visibility (NM)*							*Altitude 500 Feet Visibility (NM)*						
	1	*3*	*5*	*10*	*15*	*20*	*30*	*1*	*3*	*5*	*10*	*15*	*20*	*30*
Person in Water*	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Raft 1 person	0.3	0.7	0.9	1.2	1.3	1.3	1.3	0.3	0.7	0.9	1.2	1.4	1.4	1.4
Raft 4 person	0.4	0.9	1.3	1.7	2.0	2.2	2.2	0.4	1.0	1.3	1.8	2.0	2.2	2.2
Raft 6 person	0.4	1.1	1.5	2.1	2.5	2.7	2.7	0.4	1.1	1.5	2.2	2.5	2.8	2.8
Raft 8 person	0.4	1.2	1.6	2.3	2.6	2.9	2.9	0.4	1.2	1.6	2.3	2.7	2.9	2.9
Raft 10 person	0.4	1.2	1.7	2.4	2.9	3.2	3.2	0.4	1.2	1.7	2.5	2.9	3.2	3.2
Raft 15 person	0.5	1.3	1.9	2.7	3.2	3.5	4.0	0.5	1.3	1.9	2.7	3.3	3.6	4.0
Raft 20 person	0.5	1.4	2.1	3.1	3.7	4.2	4.8	0.5	1.5	2.1	3.2	3.8	4.2	4.8
Raft 25 person	0.5	1.5	2.2	3.4	4.1	4.6	5.2	0.5	1.6	2.3	3.4	4.1	4.6	5.3
Power Boat ≤ 15 ft	0.4	0.8	1.1	1.4	1.6	1.7	1.7	0.4	0.9	1.2	1.5	1.7	1.8	1.8
Power Boat 20 ft	0.5	1.6	2.4	3.5	4.3	4.8	4.8	0.5	1.7	2.4	3.6	4.3	4.8	4.8
Power Boat 33 ft	0.6	2.1	3.3	5.3	6.6	7.6	9.1	0.6	2.1	3.3	5.3	6.7	7.7	9.1
Power Boat 53 ft	0.6	2.6	4.5	8.1	10.9	13.1	16.4	0.6	2.7	4.5	8.1	10.9	13.1	16.5
Power Boat 78 ft	0.6	2.8	5.0	9.7	13.5	16.6	21.6	0.6	2.8	5.0	9.8	13.5	16.7	21.7
Sail Boat 15 ft	0.5	1.5	2.2	3.2	3.8	4.3	4.3	0.5	1.6	2.2	3.2	3.9	4.3	4.3
Sail Boat 20 ft	0.6	1.8	2.6	4.0	4.9	5.6	5.6	0.6	1.8	2.7	4.0	5.0	5.6	5.6
Sail Boat 25 ft	0.6	2.0	3.1	4.8	6.0	6.9	6.9	0.6	2.0	3.1	4.9	6.1	7.0	7.0
Sail Boat 30 ft	0.6	2.3	3.6	5.9	7.5	8.8	10.6	0.6	2.3	3.6	5.9	7.6	8.8	10.6
Sail Boat 40 ft	0.6	2.6	4.3	7.5	10.0	11.9	14.8	0.6	2.6	4.3	7.6	10.0	11.9	14.8
Sail Boat 50 ft	0.6	2.7	4.6	8.4	11.3	13.6	17.3	0.6	2.7	4.6	8.4	11.3	13.7	17.3
Sail Boat 70 ft	0.6	2.8	4.9	9.3	12.7	15.5	20.0	0.6	2.8	4.9	9.3	12.7	15.5	20.0
Sail Boat 83 ft	0.6	2.8	5.1	9.9	13.7	16.9	22.1	0.6	2.8	5.1	9.9	13.7	17.0	22.1
Ship 120 ft	0.6	2.9	5.4	11.1	15.9	20.0	26.9	0.6	2.9	5.4	11.1	15.9	20.1	26.9
Ship 225 ft	0.6	3.0	5.7	12.5	18.8	24.7	34.8	0.6	3.0	5.7	12.5	18.9	24.7	34.8
Ship ≥ 300 ft	0.7	3.0	5.8	13.2	20.6	27.9	41.4	0.7	3.0	5.8	13.2	20.6	27.9	41.4

* For search altitudes up to 500 feet only, the values given for sweep width for a person in water may be increased by a factor of 4 if it is known that the person is wearing a personal flotation device.

Table H-12 Uncorrected Visual Sweep Width – Fixed-wing Aircraft for Altitudes 750-1000 Feet

Search Object	*Altitude 750 Feet Visibility (NM)*							*Altitude 1000 Feet Visibility (NM)*						
	1	*3*	*5*	*10*	*15*	*20*	*30*	*1*	*3*	*5*	*10*	*15*	*20*	*30*
Person in Water	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Raft 1 person	0.3	0.7	0.9	1.2	1.4	1.4	1.4	0.3	0.7	0.9	1.2	1.4	1.4	1.4
Raft 4 person	0.4	1.0	1.3	1.8	2.1	2.2	2.2	0.3	1.0	1.3	1.8	2.1	2.3	2.3
Raft 6 person	0.4	1.1	1.6	2.2	2.6	2.8	2.8	0.4	1.1	1.6	2.2	2.6	2.8	2.8
Raft 8 person	0.4	1.2	1.7	2.3	2.7	3.0	3.0	0.4	1.2	1.7	2.4	2.8	3.0	3.0
Raft 10 person	0.4	1.3	1.8	2.5	3.0	3.3	3.3	0.4	1.3	1.8	2.6	3.0	3.3	3.3
Raft 15 person	0.4	1.4	1.9	2.8	3.3	3.7	4.1	0.4	1.4	2.0	2.8	3.4	3.7	4.2
Raft 20 person	0.5	1.5	2.2	3.2	3.8	4.3	4.9	0.4	1.5	2.2	3.2	3.9	4.3	4.9
Raft 25 person	0.5	1.6	2.3	3.5	4.2	4.7	5.4	0.4	1.6	2.3	3.5	4.2	4.7	5.4
Power Boat ≤ 15 ft	0.4	0.9	1.2	1.6	1.8	1.9	1.9	0.4	1.0	1.3	1.7	1.8	2.0	2.0
Power Boat 20 ft	0.5	1.7	2.4	3.6	4.4	4.9	4.9	0.5	1.7	2.5	3.7	4.4	5.0	5.0
Power Boat 33 ft	0.6	2.1	3.3	5.3	6.7	7.7	9.2	0.5	2.2	3.4	5.4	6.8	7.8	9.3
Power Boat 53 ft	0.6	2.7	4.5	8.2	10.9	13.1	16.5	0.6	2.7	4.5	8.2	10.9	13.1	16.6
Power Boat 78 ft	0.6	2.8	5.0	9.8	13.5	16.7	21.7	0.6	2.8	5.1	9.8	13.6	16.7	21.7
Sail Boat 15 ft	0.5	1.6	2.3	3.3	3.9	4.4	4.4	0.5	1.6	2.3	3.3	4.0	4.4	4.4
Sail Boat 20 ft	0.5	1.8	2.7	4.1	5.0	5.7	5.7	0.5	1.8	2.7	4.2	5.1	5.7	5.7
Sail Boat 25 ft	0.6	2.1	3.1	5.0	6.2	7.0	7.0	0.5	2.1	3.2	5.0	6.2	7.1	7.1
Sail Boat 30 ft	0.6	2.3	3.6	6.0	7.5	8.9	10.7	0.6	2.3	3.6	6.0	7.6	8.9	10.7
Sail Boat 40 ft	0.6	2.6	4.3	7.6	10.0	11.9	14.9	0.6	2.6	4.3	7.6	10.9	12.0	14.9
Sail Boat 50 ft	0.6	2.7	4.6	8.5	11.4	13.7	17.4	0.6	2.7	4.6	8.5	11.4	13.7	17.4
Sail Boat 70 ft	0.6	2.8	4.9	9.3	12.7	15.6	20.0	0.6	2.8	4.9	9.3	12.8	15.6	20.1
Sail Boat 83 ft	0.6	2.8	5.1	9.9	13.8	17.0	22.2	0.6	2.8	5.1	9.9	13.8	17.0	22.2
Ship 120 ft	0.6	2.9	5.4	11.1	15.9	20.1	27.0	0.6	2.9	5.4	11.1	15.9	20.1	27.0
Ship 225 ft	0.6	3.0	5.7	12.5	18.9	24.7	34.9	0.6	3.0	5.7	12.5	18.9	24.7	34.9
Ship ≥ 300 ft	0.7	3.0	5.8	13.2	20.6	27.9	41.4	0.6	3.0	5.8	13.2	20.6	27.9	41.4

Table H-13 Uncorrected Visual Sweep Width – Fixed-wing Aircraft for Altitudes 1500-2000 Feet

Search Object	*Altitude 1500 Feet Visibility (NM)*							*Altitude 2000 Feet Visibility (NM)*						
	1	*3*	*5*	*10*	*15*	*20*	*30*	*1*	*3*	*5*	*10*	*15*	*20*	*30*
Person in Water	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Raft 1 person	0.2	0.7	0.9	1.3	1.4	1.4	1.4	0.1	0.6	0.9	1.2	1.4	1.4	1.4
Raft 4 person	0.3	1.0	1.3	1.9	2.1	2.3	2.3	0.2	0.9	1.3	1.9	2.2	2.3	2.3
Raft 6 person	0.3	1.1	1.6	2.3	2.6	2.9	2.9	0.2	1.1	1.6	2.3	2.7	2.9	2.9
Raft 8 person	0.3	1.2	1.7	2.4	2.8	3.1	3.1	0.2	1.2	1.7	2.5	2.9	3.2	3.2
Raft 10 person	0.3	1.3	1.8	2.6	3.1	3.4	3.4	0.2	1.2	1.8	2.7	3.1	3.5	3.5
Raft 15 person	0.3	1.4	2.0	2.9	3.4	3.8	4.3	0.2	1.4	2.0	3.0	3.5	3.9	4.4
Raft 20 person	0.4	1.5	2.2	3.3	4.0	4.4	5.1	0.4	1.5	2.2	3.4	4.0	4.5	5.1
Raft 25 person	0.4	1.6	2.4	3.6	4.3	4.8	5.6	0.3	1.6	2.4	3.6	4.4	4.9	5.7
Power Boat ≤ 15 ft	0.3	1.0	1.3	1.7	2.0	2.1	2.1	0.2	1.0	1.3	1.8	2.0	2.2	2.2
Power Boat 20 ft	0.4	1.7	2.5	3.7	4.5	5.1	5.1	0.3	1.7	2.5	3.8	4.6	5.1	5.1
Power Boat 33 ft	0.5	2.2	3.4	5.5	6.8	7.9	9.4	0.3	2.2	3.4	5.5	6.9	8.0	9.5
Power Boat 53 ft	0.5	2.6	4.5	8.2	11.0	13.2	16.6	0.4	2.6	4.5	8.3	11.0	13.3	16.7
Power Boat 78 ft	0.5	2.8	5.1	9.8	13.6	16.7	21.8	0.4	2.8	5.0	9.8	13.6	16.8	21.8
Sail Boat 15 ft	0.4	1.6	2.3	3.4	4.1	4.5	4.5	0.3	1.6	2.3	3.5	4.1	4.5	4.5
Sail Boat 20 ft	0.4	1.8	2.8	4.2	5.2	5.8	5.8	0.3	1.8	2.8	4.3	5.2	5.9	5.9
Sail Boat 25 ft	0.5	2.1	3.2	5.1	6.3	7.2	7.2	0.3	2.1	3.3	5.2	6.4	7.3	7.3
Sail Boat 30 ft	0.5	2.3	3.7	6.1	7.7	9.0	10.8	0.3	2.3	3.7	6.1	7.8	9.1	10.9
Sail Boat 40 ft	0.5	2.6	4.3	7.6	10.1	12.0	14.9	0.4	2.5	4.3	7.7	10.1	12.1	15.0
Sail Boat 50 ft	0.5	2.7	4.6	8.5	11.4	13.8	17.5	0.4	2.7	4.6	8.6	11.5	13.9	17.5
Sail Boat 70 ft	0.5	2.8	4.9	9.4	12.8	15.7	20.2	0.4	2.7	4.9	9.4	12.9	15.7	20.2
Sail Boat 83 ft	0.5	2.8	5.1	10.0	13.8	17.1	22.3	0.4	2.8	5.1	10.0	13.9	17.1	22.3
Ship 120 ft	0.5	2.9	5.4	11.1	16.0	20.1	27.0	0.4	2.9	5.4	11.1	16.0	20.1	27.1
Ship 225 ft	0.5	3.0	5.7	12.5	18.9	24.7	34.9	0.4	3.0	5.7	12.5	18.9	24.7	34.9
Ship ≥ 300 ft	0.6	3.0	5.8	13.2	20.7	27.9	41.4	0.5	3.0	5.8	13.2	20.7	27.9	41.5

Table H-14 Uncorrected Visual Sweep Width - Fixed Wing Aircraft for Altitudes 2500-3000 Feet

Search Object	*Altitude 2500 Feet Visibility (NM)*							*Altitude 3000 Feet* Visibility (NM)*						
	1	*3*	*5*	*10*	*15*	*20*	*30*	*1*	*3*	*5*	*10*	*15*	*20*	*30*
Person in Water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Raft 1 person	0.1	0.5	0.8	1.2	1.4	1.4	1.4	0.1	0.5	0.8	1.1	1.3	1.3	1.3
Raft 4 person	0.1	0.8	1.3	1.8	2.2	2.4	2.4	0.1	0.7	1.2	1.8	2.1	2.3	2.3
Raft 6 person	0.1	1.0	1.5	2.3	2.7	2.9	2.9	0.1	0.9	1.5	2.2	2.7	2.9	2.9
Raft 8 person	0.1	1.1	1.7	2.5	2.9	3.2	3.2	0.1	1.0	1.6	2.5	2.9	3.2	3.2
Raft 10 person	0.2	1.2	1.8	2.7	3.2	3.5	3.5	0.1	1.1	1.8	2.7	3.2	3.5	3.5
Raft 15 person	0.2	1.3	2.0	3.0	3.6	4.0	4.5	0.1	1.2	2.0	3.0	3.6	4.0	4.5
Raft 20 person	0.2	1.4	2.2	3.4	4.1	4.6	5.2	0.1	1.4	2.2	3.4	4.1	4.6	5.3
Raft 25 person	0.2	1.5	2.4	3.7	4.5	5.0	5.7	0.1	1.5	2.4	3.7	4.5	5.1	5.8
Power Boat ≤ 15 ft	0.1	0.9	1.3	1.8	2.1	2.2	2.2	0.1	0.8	1.3	1.8	2.1	2.3	2.3
Power Boat 20 ft	0.2	1.6	2.5	3.8	4.6	5.2	5.2	0.1	1.6	2.5	3.9	4.7	5.3	5.3
Power Boat 33 ft	0.2	2.1	3.4	5.6	7.0	8.1	9.6	0.2	2.1	3.4	5.6	7.1	8.1	9.7
Power Boat 53 ft	0.3	2.6	4.5	8.3	11.3	13.3	16.7	0.2	2.5	4.5	8.3	11.1	13.4	16.8
Power Boat 78 ft	0.3	2.7	5.0	9.8	13.6	16.8	21.9	0.2	2.7	5.0	9.9	13.7	16.8	21.9
Sail Boat 15 ft	0.2	1.5	2.3	3.5	4.2	4.7	4.7	0.1	1.5	2.3	3.5	4.3	4.7	4.7
Sail Boat 20 ft	0.2	1.8	2.8	4.3	5.3	6.0	6.0	0.1	1.7	2.8	4.4	5.3	6.0	6.0
Sail Boat 25 ft	0.2	2.1	3.3	5.2	6.5	7.5	7.5	0.2	2.0	3.3	5.3	6.6	7.5	7.5
Sail Boat 30 ft	0.2	2.2	3.7	6.1	7.8	9.1	11.0	0.2	2.2	3.7	6.2	7.9	9.2	11.1
Sail Boat 40 ft	0.3	2.5	4.3	7.7	10.2	12.1	15.1	0.2	2.4	4.3	7.7	10.2	12.1	15.1
Sail Boat 50 ft	0.3	2.6	4.6	8.6	11.5	13.9	17.6	0.2	2.6	4.6	8.6	11.6	14.0	17.7
Sail Boat 70 ft	0.3	2.7	4.9	9.4	12.9	15.8	20.3	0.2	2.6	4.9	9.4	13.0	15.8	20.3
Sail Boat 83 ft	0.3	2.8	5.1	10.0	13.9	17.2	22.4	0.2	2.7	5.1	10.0	14.0	17.2	22.5
Ship 120 ft	0.3	2.8	5.4	11.1	16.0	20.2	27.1	0.2	2.8	5.3	11.1	16.0	20.2	27.1
Ship 225 ft	0.3	2.9	5.6	12.5	18.9	24.8	35.0	0.2	2.8	5.6	12.5	18.9	24.8	35.0
Ship ≥ 300 ft	0.3	2.9	5.7	13.2	20.7	27.9	41.5	0.2	2.9	5.7	13.2	20.7	27.9	41.5

* Visual searches are seldom conducted from altitudes above 3000 feet; however, for altitudes up to 5000 feet where visibility exceeds 3 NM and target size exceeds 25 feet, the sweep widths given for 3000 feet remain applicable.

Table H-15 Uncorrected Visual Sweep Width – Helicopters for Altitudes 300-500 Feet

Search Object	*Altitude 300 Feet Visibility (NM)*							*Altitude 500 Feet Visibility (NM)*						
	1	*3*	*5*	*10*	*15*	*20*	*30*	*1*	*3*	*5*	*10*	*15*	*20*	*30*
Person in Water*	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Raft 1 person	0.4	0.9	1.2	1.5	1.7	1.7	1.7	0.4	0.9	1.2	1.6	1.8	1.8	1.8
Raft 4 person	0.5	1.2	1.6	2.2	2.5	2.7	2.7	0.5	1.2	1.6	2.2	2.6	2.8	2.8
Raft 6 person	0.5	1.4	1.9	2.7	3.1	3.4	3.4	0.5	1.4	1.9	2.7	3.2	3.5	3.5
Raft 8 person	0.6	1.4	2.0	2.8	3.3	3.6	3.6	0.6	1.5	2.0	2.8	3.3	3.7	3.7
Raft 10 person	0.6	1.5	2.1	3.0	3.6	3.9	3.9	0.6	1.6	2.2	3.1	3.6	4.0	4.0
Raft 15 person	0.6	1.6	2.3	3.3	3.9	4.3	4.9	0.6	1.7	2.3	3.3	4.0	4.4	5.0
Raft 20 person	0.6	1.8	2.6	3.8	4.5	5.1	5.8	0.6	1.8	2.6	3.8	4.6	5.1	5.9
Raft 25 person	0.6	1.9	2.7	4.1	4.9	5.5	6.3	0.6	1.9	2.7	4.1	5.0	5.6	6.4
Power Boat ≤ 15 ft	0.5	1.1	1.4	1.9	2.1	2.2	2.2	0.5	1.2	1.5	1.9	2.2	2.3	2.3
Power Boat 20 ft	0.7	2.0	2.9	4.3	5.2	5.8	5.8	0.7	2.0	2.9	4.3	5.2	5.8	5.8
Power Boat 33 ft	0.8	2.5	3.8	6.1	7.7	8.9	10.6	0.8	2.5	3.9	6.2	7.8	9.0	10.7
Power Boat 53 ft	0.8	3.1	5.1	9.2	12.2	14.7	18.5	0.8	3.1	5.1	9.2	12.3	14.7	18.5
Power Boat 78 ft	0.8	3.3	5.7	10.8	15.0	18.4	23.9	0.8	3.3	5.7	10.8	15.0	18.4	23.9
Sail Boat 15 ft	0.7	1.9	2.7	3.9	4.6	5.2	5.2	0.7	1.9	2.7	3.9	4.7	5.2	5.2
Sail Boat 20 ft	0.7	2.2	3.2	4.8	5.9	6.6	6.6	0.7	2.2	3.2	4.8	5.9	6.7	6.7
Sail Boat 25 ft	0.8	2.4	3.6	5.7	7.1	8.1	8.1	0.8	2.4	3.7	5.7	7.1	8.2	8.2
Sail Boat 30 ft	0.8	2.7	4.2	6.8	8.7	10.1	12.2	0.8	2.7	4.2	6.9	8.7	10.2	12.3
Sail Boat 40 ft	0.8	3.0	4.9	8.6	11.3	13.4	16.7	0.8	3.0	4.9	8.3	11.3	13.5	16.8
Sail Boat 50 ft	0.8	3.1	5.2	9.5	12.7	15.3	19.3	0.8	3.1	5.2	9.5	12.7	15.3	19.4
Sail Boat 70 ft	0.8	3.2	5.5	10.3	14.1	17.2	22.1	0.8	3.2	5.5	10.4	14.1	17.3	22.2
Sail Boat 83 ft	0.8	3.3	5.7	11.0	15.2	18.7	24.3	0.8	3.3	5.7	11.0	15.2	18.7	24.4
Ship 120 ft	0.8	3.4	6.0	12.2	17.4	21.9	29.3	0.8	3.4	6.0	12.2	17.4	21.9	29.3
Ship 225 ft	0.8	3.4	6.3	13.6	20.4	26.6	37.7	0.8	3.4	6.3	13.6	20.4	26.6	37.3
Ship ≥ 300 ft	0.8	3.5	6.4	14.3	22.1	29.8	43.8	0.8	3.5	6.4	14.3	22.1	29.8	43.8

* For search altitudes up to 500 feet only, the values given for sweep width for a person in water may be increased by a factor of 4 if it is known that the person is wearing a personal flotation device.

Table H-16 Uncorrected Visual Sweep Width – Helicopters for Altitudes 750-1000 Feet

Search Object	*Altitude 750 Feet Visibility (NM)*							*Altitude 1000 Feet Visibility (NM)*						
	1	*3*	*5*	*10*	*15*	*20*	*30*	*1*	*3*	*5*	*10*	*15*	*20*	*30*
Person in Water*	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Raft 1 person	0.4	0.9	1.2	1.6	1.7	1.8	1.8	0.4	0.9	1.2	1.6	1.8	1.8	1.8
Raft 4 person	0.5	1.2	1.7	2.3	2.6	2.8	2.8	0.5	1.2	1.7	2.3	2.6	2.9	2.9
Raft 6 person	0.5	1.4	2.0	2.7	3.2	3.5	3.5	0.5	1.4	2.0	2.8	3.2	3.5	3.5
Raft 8 person	0.5	1.5	2.1	2.9	3.4	3.7	3.7	0.5	1.5	2.1	2.9	3.4	3.8	3.8
Raft 10 person	0.6	1.6	2.2	3.1	3.7	4.0	4.0	0.5	1.6	2.2	3.2	3.7	4.1	4.1
Raft 15 person	0.6	1.7	2.4	3.4	4.0	4.5	5.0	0.6	1.7	2.4	3.5	4.1	4.5	5.1
Raft 20 person	0.6	1.8	2.6	3.9	4.6	5.2	5.9	0.6	1.8	2.7	3.9	4.7	5.2	6.0
Raft 25 person	0.6	1.9	2.8	4.2	5.0	5.6	6.5	0.6	1.9	2.8	4.2	5.1	5.7	6.5
Power Boat ≤ 15 ft	0.5	1.2	1.6	2.0	2.3	2.4	2.4	0.5	1.2	1.6	2.1	2.3	2.5	2.5
Power Boat 20 ft	0.7	2.0	2.9	4.4	5.3	5.9	5.9	0.7	2.1	3.0	4.4	5.3	5.9	5.9
Power Boat 33 ft	0.7	2.5	3.9	6.2	7.8	9.0	10.7	0.7	2.6	3.9	6.3	7.9	9.1	10.8
Power Boat 53 ft	0.8	3.1	5.1	9.2	12.3	14.7	18.5	0.7	3.1	5.2	9.2	12.3	14.8	18.6
Power Boat 78 ft	0.8	3.3	5.7	10.9	15.0	18.4	23.9	0.8	3.3	5.7	10.9	15.0	18.5	23.9
Sail Boat 15 ft	0.7	1.9	2.7	4.0	4.8	5.3	5.3	0.6	1.9	2.8	4.0	4.8	5.4	5.4
Sail Boat 20 ft	0.7	2.2	3.2	4.9	6.0	6.7	6.7	0.7	2.2	3.2	4.9	6.0	6.8	6.8
Sail Boat 25 ft	0.7	2.5	3.7	5.8	7.2	8.3	8.3	0.7	2.5	3.7	5.8	7.3	8.3	8.3
Sail Boat 30 ft	0.8	2.7	4.2	6.9	8.8	10.2	12.3	0.7	2.7	4.2	6.9	8.8	10.3	12.4
Sail Boat 40 ft	0.8	3.0	4.9	8.6	11.3	13.5	16.8	0.7	3.0	4.9	8.6	11.4	13.5	16.8
Sail Boat 50 ft	0.8	3.1	5.3	9.5	12.7	15.4	19.4	0.7	3.1	5.3	9.5	12.8	15.4	19.5
Sail Boat 70 ft	0.8	3.2	5.5	10.4	14.2	17.3	22.2	0.8	3.2	5.6	10.4	14.2	17.3	22.2
Sail Boat 83 ft	0.8	3.3	5.7	11.0	15.2	18.8	24.4	0.8	3.3	5.7	11.0	15.3	18.8	24.4
Ship 120 ft	0.8	3.4	6.0	12.2	17.4	21.9	29.3	0.8	3.4	6.0	12.2	17.4	21.9	29.3
Ship 225 ft	0.8	3.4	6.3	13.6	20.4	26.6	37.3	0.8	3.4	6.3	13.6	20.4	26.6	37.3
Ship ≥ 300 ft	0.8	3.5	6.4	14.3	22.2	29.8	43.8	0.8	3.5	6.4	14.3	22.2	29.8	43.9

Table H-17 Uncorrected Visual Sweep Width – Helicopters for Altitudes 1500-2000 Feet

Search Object	*Altitude 1500 Feet Visibility (NM)*							*Altitude 2000 Feet Visibility (NM)*						
	1	*3*	*5*	*10*	*15*	*20*	*30*	*1*	*3*	*5*	*10*	*15*	*20*	*30*
Person in Water*	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Raft 1 person	0.3	0.9	1.2	1.6	1.8	1.8	1.8	0.2	0.8	1.2	1.6	1.8	1.8	1.8
Raft 4 person	0.4	1.2	1.7	2.3	2.7	2.9	2.9	0.3	1.2	1.7	2.3	2.7	3.0	3.0
Raft 6 person	0.4	1.4	2.0	2.8	3.3	3.6	3.6	0.3	1.4	2.0	2.8	3.3	3.6	3.6
Raft 8 person	0.4	1.5	2.1	3.0	3.5	3.9	3.9	0.3	1.5	2.1	3.0	3.6	3.9	3.9
Raft 10 person	0.4	1.6	2.2	3.2	3.8	4.2	4.2	0.3	1.6	2.3	3.3	3.9	4.2	4.2
Raft 15 person	0.5	1.7	2.4	3.5	4.2	4.6	5.2	0.3	1.7	2.5	3.6	4.3	4.7	5.3
Raft 20 person	0.5	1.9	2.7	4.0	4.8	5.3	6.1	0.4	1.8	2.7	4.0	4.9	5.4	6.2
Raft 25 person	0.5	2.0	2.9	4.3	5.2	5.8	6.7	0.4	1.9	2.9	4.3	5.3	5.9	6.8
Power Boat ≤ 15 ft	0.4	1.3	1.7	2.2	2.5	2.6	2.6	0.3	1.3	1.7	2.3	2.6	2.7	2.7
Power Boat 20 ft	0.6	2.1	3.0	4.5	5.4	6.1	6.1	0.4	2.1	3.0	4.5	5.5	6.1	6.1
Power Boat 33 ft	0.6	2.6	4.0	6.3	7.9	9.2	10.9	0.5	2.6	4.0	6.4	8.0	9.3	11.0
Power Boat 53 ft	0.7	3.1	5.2	9.3	12.4	14.8	18.6	0.5	3.0	5.2	9.3	12.4	14.9	18.7
Power Boat 78 ft	0.7	3.2	5.7	10.9	15.1	18.5	24.0	0.5	3.2	5.7	10.9	15.1	18.5	24.0
Sail Boat 15 ft	0.6	2.0	2.8	4.1	4.9	5.5	5.5	0.4	1.9	2.8	4.2	5.0	5.6	5.6
Sail Boat 20 ft	0.6	2.2	3.3	5.0	6.1	6.9	6.9	0.5	2.2	3.3	5.1	6.2	7.0	7.0
Sail Boat 25 ft	0.6	2.5	3.8	5.9	7.4	8.4	8.4	0.5	2.5	3.8	6.0	7.5	8.6	8.6
Sail Boat 30 ft	0.6	2.7	4.2	7.0	8.9	10.3	12.5	0.5	2.7	4.3	7.0	9.0	10.4	12.6
Sail Boat 40 ft	0.6	3.0	4.9	8.7	11.4	13.6	16.9	0.5	3.0	4.9	8.7	11.4	13.6	17.0
Sail Boat 50 ft	0.7	3.1	5.3	9.6	12.8	15.5	19.5	0.5	3.1	5.3	9.6	12.9	15.5	19.6
Sail Boat 70 ft	0.7	3.2	5.6	10.4	14.3	17.4	22.3	0.5	3.2	5.6	10.5	14.3	17.4	22.4
Sail Boat 83 ft	0.7	3.3	5.7	11.1	15.3	18.8	24.5	0.5	3.2	5.7	11.1	15.4	18.9	24.6
Ship 120 ft	0.7	3.3	6.0	12.2	17.5	22.0	29.4	0.5	3.3	6.0	12.2	17.5	22.0	29.4
Ship 225 ft	0.7	3.4	6.3	13.6	20.4	26.6	37.3	0.5	3.4	6.3	13.6	20.4	26.6	37.4
Ship ≥ 300 ft	0.7	3.4	6.4	14.3	22.2	29.8	43.9	0.6	3.4	6.4	14.3	22.2	29.8	43.9

Table H-18 Uncorrected Visual Sweep Width - Helicopters for Altitudes 2500-3000 Feet

Search Object	*Altitude 2500 Feet Visibility (NM)*							*Altitude 3000 Feet Visibility (NM)*						
	1	*3*	*5*	*10*	*15*	*20*	*30*	*1*	*3*	*5*	*10*	*15*	*20*	*30*
Person in Water*	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Raft 1 person	0.1	0.8	1.1	1.6	1.8	1.8	1.8	0.1	0.7	1.0	1.5	1.8	1.8	1.8
Raft 4 person	0.2	1.1	1.6	2.3	2.7	3.0	3.0	0.1	1.0	1.6	2.3	2.7	3.0	3.0
Raft 6 person	0.2	1.3	1.9	2.8	3.3	3.7	3.7	0.1	1.2	1.9	2.8	3.3	3.7	3.7
Raft 8 person	0.2	1.4	2.1	3.1	3.6	4.0	4.0	0.1	1.3	2.1	3.1	3.6	4.0	4.0
Raft 10 person	0.2	1.5	2.2	3.3	3.9	4.3	4.3	0.1	1.4	2.2	3.3	3.9	4.3	4.3
Raft 15 person	0.2	1.7	2.5	3.6	4.3	4.8	5.4	0.2	1.6	2.4	3.7	4.4	4.9	5.5
Raft 20 person	0.3	1.8	2.7	4.1	4.9	5.5	6.3	0.2	1.7	2.7	4.1	5.0	5.6	6.3
Raft 25 person	0.3	1.9	2.9	4.4	5.3	6.0	6.9	0.2	1.9	2.9	4.4	5.4	6.0	6.9
Power Boat ≤ 15 ft	0.2	1.2	1.7	2.3	2.6	2.8	2.8	0.1	1.1	1.7	2.3	2.7	2.9	2.9
Power Boat 20 ft	0.3	2.0	3.0	4.6	5.5	6.2	6.2	0.2	2.0	3.0	4.6	5.6	6.3	6.3
Power Boat 33 ft	0.4	2.5	4.0	6.5	8.1	9.3	11.1	0.2	2.5	4.0	6.5	8.2	9.4	11.2
Power Boat 53 ft	0.4	3.0	5.2	9.3	12.4	14.9	18.8	0.3	3.0	5.2	9.3	12.5	15.0	18.8
Power Boat 78 ft	0.4	3.2	5.7	10.9	15.1	18.6	24.1	0.3	3.1	5.7	10.9	15.1	18.6	24.1
Sail Boat 15 ft	0.3	1.9	2.8	4.2	5.1	5.6	5.6	0.2	1.9	2.8	4.3	5.1	5.7	5.7
Sail Boat 20 ft	0.3	2.2	3.3	5.1	6.3	7.1	7.1	0.2	2.1	3.3	5.2	6.3	7.1	7.1
Sail Boat 25 ft	0.4	2.5	3.8	6.1	7.6	8.7	8.7	0.2	2.4	3.9	6.1	7.7	8.8	8.8
Sail Boat 30 ft	0.4	2.7	4.3	7.1	9.0	10.5	12.6	0.2	2.6	4.3	7.1	9.1	10.6	12.7
Sail Boat 40 ft	0.4	2.9	4.9	8.7	11.5	13.7	17.0	0.3	2.9	4.9	8.7	11.5	13.7	17.1
Sail Boat 50 ft	0.4	3.1	5.3	9.6	12.9	15.6	19.7	0.3	3.0	5.3	9.7	13.0	15.6	19.7
Sail Boat 70 ft	0.4	3.1	5.6	10.5	14.3	17.5	22.4	0.3	3.1	5.6	10.5	14.4	17.5	22.5
Sail Boat 83 ft	0.4	3.2	5.7	11.1	15.4	18.9	24.6	0.3	3.1	5.7	11.1	15.4	19.0	24.7
Ship 120 ft	0.4	3.3	6.0	12.2	17.5	22.0	29.4	0.3	3.2	6.0	12.2	17.5	22.0	29.5
Ship 225 ft	0.4	3.3	6.3	13.6	20.4	26.6	37.4	0.3	3.3	6.3	13.6	20.4	26.6	37.4
Ship ≥ 300 ft	0.5	3.4	6.4	14.3	22.2	29.8	43.9	0.3	3.3	6.4	14.3	22.2	29.8	43.9

* Visual searches are seldom conducted from altitudes above 3000 feet; however, for altitudes up to 5000 feet where visibility exceeds 3 NM and target size exceeds 25 feet, the sweep widths given for 3000 feet remain applicable.

Table H-19 Uncorrected Visual Sweep Width – Vessels and Boats

Search Object	*Vessel SRU Visibility (NM)*						*Small Boat SRU Visibility (NM)*					
	1	*3*	*5*	*10*	*15*	*20*	*1*	*3*	*5*	*10*	*15*	*20*
Person in Water*	0.3	0.4	0.5	0.5	0.5	0.5	0.2	0.2	0.3	0.3	0.3	0.3
Raft 1 person	0.9	1.8	2.3	3.1	3.4	3.7	0.7	1.3	1.7	2.3	2.6	2.7
Raft 4 person	1.0	2.2	3.0	4.0	4.6	5.0	0.7	1.7	2.2	3.1	3.5	3.9
Raft 6 person	1.1	2.5	3.4	4.7	5.5	6.0	0.8	1.9	2.6	3.6	4.3	4.7
Raft 8 person	1.1	2.5	3.5	4.8	5.7	6.2	0.8	2.0	2.7	3.8	4.4	4.9
Raft 10 person	1.1	2.6	3.6	5.1	6.1	6.7	0.8	2.0	2.8	4.0	4.8	5.3
Raft 15 person	1.1	2.8	3.8	5.5	6.5	7.2	0.9	2.2	3.0	4.3	5.1	5.7
Raft 20 person	1.2	3.0	4.1	6.1	7.3	8.1	0.9	2.3	3.3	4.9	5.8	6.5
Raft 25 person	1.2	3.1	4.3	6.4	7.8	8.7	0.9	2.4	3.5	5.2	6.3	7.0
Power Boat ≤ 15 ft	0.5	1.1	1.4	1.9	2.1	2.3	0.4	0.8	1.1	1.5	1.6	1.8
Power Boat 20 ft	1.0	2.0	2.9	4.3	5.2	5.8	0.8	1.5	2.2	3.3	4.0	4.5
Power Boat 33 ft	1.1	2.5	3.8	6.1	7.7	8.8	0.8	1.9	2.9	4.7	5.9	6.8
Power Boat 53 ft	1.2	3.1	5.1	9.1	12.1	14.4	0.9	2.4	3.9	7.0	9.3	11.1
Power Boat 78 ft	1.2	3.2	5.6	10.7	14.7	18.1	0.9	2.5	4.3	8.3	11.4	14.0
Sail Boat 15 ft	1.0	1.9	2.7	3.9	4.7	5.2	0.8	1.5	2.1	3.0	3.6	4.0
Sail Boat 20 ft	1.0	2.2	3.2	4.8	5.9	6.6	0.8	1.7	2.5	3.7	4.6	5.1
Sail Boat 25 ft	1.1	2.4	3.6	5.7	7.0	8.1	0.9	1.9	2.8	4.4	5.4	6.3
Sail Boat 30 ft	1.1	2.7	4.1	6.8	8.6	10.0	0.9	2.1	3.2	5.3	6.6	7.7
Sail Boat 40 ft	1.2	3.0	4.9	8.5	11.2	13.3	0.9	2.3	3.8	6.6	8.6	10.3
Sail Boat 50 ft	1.2	3.1	5.2	9.4	12.5	15.0	0.9	2.4	4.0	7.3	9.7	11.6
Sail Boat 70 ft	1.2	3.2	5.5	10.2	13.9	16.9	0.9	2.5	4.2	7.9	10.7	13.1
Sail Boat 83 ft	1.2	3.3	5.7	10.8	15.0	18.4	0.9	2.5	4.4	8.3	11.6	14.2
Ship 120 ft	1.8	3.3	6.0	12.0	17.1	21.5	1.4	2.5	4.6	9.3	13.2	16.6
Ship 225 ft	1.8	3.4	6.3	13.4	20.1	26.0	1.4	2.6	4.9	10.3	15.5	20.2
Ship ≥ 300 ft	1.8	3.4	6.4	14.1	21.8	29.2	1.4	2.6	4.9	10.9	16.8	22.5

H.3.5.5 Visual Distress Signaling Devices (VDSDs). When estimating sweep widths for VDSDs, such as pyrotechnics, dye markers, tracer bullets, or signal mirrors, use either twice the range at which survivors can be expected to detect the SRU, or the value given in Tables H-20, H-21, H-22, H-23 or H-24, whichever is smaller.

(a) *Daylight Detection Aids.* Effectiveness of daylight aids is marginal due to the difficulty in achieving sufficient contrast in a sunlit environment. Estimated sweep widths for various daylight detection aids are given in Tables H-20 and H-21. Hand held orange smoke detectability varies by type of SRU, and also by time on task for surface SRUs. Estimated sweep widths for hand held orange smoke are given in Table H-21 for winds 10 knots or less. For winds over 10 knots the smoke tends to dissipate and sweep width degrades to less than 2 nautical miles.

Table H-20 Visual Sweep Width Estimate for Daylight Detection Aids

Device	*Estimated Sweep Width (NM)*	*SRU Type*
Red/orange balloon	0.5	Air or surface
Orange flight suit	0.5	Air
Red hand flare (500 candlepower)	0.5	Air or surface
Day/night flare	0.5	Air or surface
Red pen gun flare	0.75	Air or surface
Red reflective paulin	2.0	Air or surface
Tracer bullets	2.0	Air or surface
Green dye marker*	2.0	Air
Red/orange flag (waving) (3 ft x 3 ft)	2.5	Air or surface
Sun signal mirror	5.0	Air or surface
White parachute	5.0	Air or surface
Red meteor (star) or parachute flare (10,000 candlepower)*	6.0	Air or surface

*Greatly reduced in heavy seas

Table H-21 Visual Sweep Width Estimates for Hand Held Orange Smoke[1]

SRU Type	*Time on Task (hr)*	
	< 3	*≥ 3*
Small boat (CG 47' MLB or less)	4.6	2.8
Vessel (CG greater than 47')	6.9	5.0
Air*	7.7	

*Sweep width based on test results involving helicopters only.

(b) *Night Detection Aids.* If it is known or there is a reasonable probability that survivors can make a night signal, night visual searches should be conducted. Searches during the early stages potentially yield a high POD. Cloud cover, wind, and obscurations to visibility have less detrimental effects on night detection aids. Even a flashlight may be seen without NVGs and with NVGs even the light from a cell phone screen display can be detected. On clear nights, pyrotechnics have been sighted in excess of 40 nautical miles. Sweep width should be based on the most likely VDSD to be used, and limited to slightly less than twice the estimated range at which survivors can detect the SRU. Estimated sweep widths for night detection aids are given in Table H-22, H-23 and H-24. Hand held red flare detectability varies by type of SRU, and also by time on task for surface SRUs. Estimated sweep widths for hand held red flares are given in Table H-23. Life ring and life jacket strobe light detectability varies by type of SRU and time on task, and also by wind speed for surface SRUs. Estimated sweep widths for life ring/life jacket white strobes (50,000 peak candlepower) are given in Table H-24.

Table H-22 Visual Sweep Width Estimates for Night Detection Aids

Device	*Estimated Sweep Width (NM)*	*SRU Type*
Strobe (2,000 candlepower peak)	0.5	Air or surface
Cyalume personnel marker light	1.0	Air or surface
Electric flashing SOS lantern or hand flashlight	3.0	Air or surface
Tracer bullets	4.0	Air or surface
Red Very signals	8.0	Air or surface
Aircraft marine markers	8.0	Air or surface
Red pen gun flare	8.0	Air or surface
Red meteor (star) or parachute flare (10,000 candlepower)	10.0 or twice limit of survivor/ SRU visibility	Air or surface

Table H-23 Visual Sweep Width Estimates for Hand Held Red Flare (500 candlepower)[1]

SRU Type	*Time on Task (hr)*	
	< 3	*≥ 3*
Small boat (CG 47' MLB or less)	10.7	10.2
Vessel (CG greater than 47')	13.0	12.6
Air*	15.4	

*Sweep width based on test results involving helicopters only.

Table H-24 Visual Sweep Width Estimates for Life ring/Life jacket White Strobe (50,000 peak candlepower)[1]

Surface SRU	*Time on Task (hr)*	
Wind Speed (kts)	*< 3*	*> 3*
<10	3.9	2.1
10-15	2.6	1.1
*>15**	1.3	0.5

Air SRU**	*Time on Task (hr)*	
	< 1	*> 1*
	4.4	3.9

*Values for this category were extrapolated from test data.
**Based on test results with helicopters only.

H.3.5.6 EPIRB/ELT Sweep Widths

(a) The detection range data obtained from various sources may be tabulated as maximum, average, or minimum ranges:

(1) *Maximum detection range* - range at which a target is first detected which is the maximum of a series of such ranges taken on the target.

(2) *Minimum detection range* - range at which a target is first detected which is the minimum of a series of such ranges taken on the target.

(3) *Average detection range* - range that is the average of a series of ranges at which a target is first detected.

(b) The following guidelines, listed in order of preference, are recommended for developing an EPIRB/ELT sweep width:

(1) When minimum detection range is known: W = (1.7) x (minimum detection range).

(2) When average detection range is known: W = (1.5) x (average detection range).

(3) When maximum detection range is known: W = (1.0) x (maximum detection range).

(4) When no detection range is known: W = (0.5) x (horizon range), using horizon range table (Table H-39).

(c) If search aircraft VHF/UHF antennas are located on top of the aircraft or in the tail, the sweep widths determined by these rules should be reduced by 25 percent.

(d) Sweep width should be cut in half if searching in mountainous regions.

H.3.5.7 Radar Sweep Widths. Radar is primarily used for maritime search. Most aircraft radars available for SAR would be unlikely to detect typical search objects on land except for metal wreckage or vehicles in open desert or tundra. Sweep width depends on the type of radar, distance to the horizon based on radar antenna height, environmental clutter and noise, radar cross section of the search object, radar beam refraction due to atmospherics, and sensor operator ability.

This section provides sweep widths for a limited range of radar systems, search object types and sea conditions. For other radars, search objects and sea conditions, the manufacturer's detection performance estimates should be used when available. Manufacturers should have completed extensive testing of their products, and may be able to provide detection capabilities for particular objects and specified environmental conditions. If this information is not available, the SMC may ask radar operators for estimates of sweep width based on operational experience. An experienced radar operator familiar with the assigned radar should be able to offer fairly accurate estimates of effective (not maximum) detection range. Radar operators should be told that the effective detection range is the range at which they believe the search object will certainly be detected under prevailing conditions. Sweep width can be calculated as about twice this estimate of effective range. Sweep width estimates for small fiberglass or wooden craft that may be capsized are based on the assumption that the object has no engine or significant metal equipment exposed. Another way to estimate sweep width is to estimate the range beyond which the number of a given type of object that are detected will equal the number missed at closer ranges if it is assumed that such objects are uniformly distributed over the sea surface. Twice this range is the effective sweep width.

(a) **Significant Wave Height** is the height of seas that will typically be reported by an experienced mariner and was used in the development of the radar sweep width tables. Sweep widths for significant wave heights over 5 feet are not reported below because little data has been collected under these conditions, and most radars show excessive sea return (clutter) in these conditions.

(b) **Surface Vessel Radar.** The following information should be considered when planning searches utilizing surface vessel radars:

(1) The effective search range of radars varies greatly. (The AN/SPS-64 (V) was found to be more effective for small objects than the AN/SPS-66 model.)

(2) The AN/SPS-64 (V) and AN/SPS-66 radars both provided better search performance against small objects when the 3 NM range scale was used than when the 6 NM scale was used.

(3) The AN/SPS-73 radar was evaluated on the 6 NM range scale in low sea state only. While the AN/SPS-64 (V) and AN/SPS-66 radars were evaluated against small boats, the AN/SPS-73 was evaluated only against life rafts. A comparison of the low sea state sweep widths indicates that better search performance can be expected when using the AN/SPS-73.

(4) Surface vessel radar sweep widths for small search objects should only be applied in low sea states as tabulated below. For example, radar sweep width for 4-10 person life rafts without radar reflectors is nil when winds exceed 15 knots.

(5) Radar reflective devices significantly improved detection probability.

(6) The decision of whether or not to utilize the surface vessel radar in a search, especially if it requires dedicating a crewperson who could be used for visual search, should be based on a comparison of the radar sweep width to those for other available sensors. Surface radar searches will generally be preferred when visibility is poor, sea state is low to moderate, and the search object is equipped with a radar reflector. Radar sweep widths deteriorate rapidly with the onset of precipitation, higher winds and/or higher seas.

(7) Visual scanners should concentrate on the area in the immediate vicinity of the search unit during low visibility radar searches to avoid missing objects that pass close aboard

through the area of heavy radar sea return.

(c) **For Surface Vessel Radar (SVR)**, the sweep widths in Tables H-25 and H-26 can be used, based upon limited at-sea testing with the AN/SPS-64(V), AN/SPS-66 and AN/SPS-73 radars. Because the AN/SPS-73 sweep widths achieved against life rafts are substantially higher than those achieved by the AN/SPS-64(V) against small boats, it is recommended that the life raft sweep width values also be used for small boats until more specific information is available for the AN/SPS-73.

(1) ***For intermediate-size objects in significant wave heights less than 5 feet, the information from Table H-28 must be interpolated***. For significant wave heights greater than 5 feet, an experienced radar operator on the basis of sea state and search object characteristics should estimate sweep width.

(2) When windy conditions cause heavy sea clutter, SVR search patterns oriented with major search legs in the crosswind direction and crosslegs in the downwind direction provide the best radar coverage. However, sea conditions may inhibit searching in this manner.

(3) Although the AN/SPS-66 small boat radar is no longer in service, no sweep width data is yet available for the AN/SPS-69 or SINS radars that replaced it. In the absence of new information, the AN/SPS-66 sweep widths may be used as conservative estimates of small boat radar sweep widths.

Table H-25 Sweep Widths and Recommended Settings for AN/SPS-73 Radar (4-10 person life rafts with and without radar reflectors)

		SWEEP WIDTHS FOR AN/SPS-73 RADAR (Nautical Miles)			
WEATHER	OBJECT TYPE	On scene Surface Winds (kts)			
		<5	to 10	to 15	>15
No Rain or Drizzle	Raft w/ reflector	10.6	8.6	5.8	unknown
	Raft w/o reflector	5.1	2.5	0.9	nil
Moderate Rain	Raft w/ reflector	8.3	4.7	1.7	unknown
	Raft w/o reflector	4.3	1.5	0.3	nil

RECOMMENDED SETTINGS		
	Range Scale:	6 NM range scale
	Pulse Width:	M1 pulse width (AUTO)
	STC:	Zero
	FTC:	Less than 80% for no rain, at least 80% for rain
	Persistence:	No higher than 15
	Interference Rejection:	ON at 100%

Table H-26 Sweep Widths for Surface Vessel Radar (NM)

Object Type	*Significant Wave Height (ft)*	*Sweep Width (NM) Surface Vessel Radar System*	
		AN/SPS-64(V	*AN/SPS-66*
Small (20 feet or less) fiberglass boats, without radar reflector or engine/metal equipment	0 to 1	1.4	0.8
	>1 to 5	1.1	0
Small (20 feet or less) fiberglass boats, with radar reflector or engine/metal equipment	0 to 1	5.0	2.0
	>1 to 5	1.6	0.4
Medium to large vessels (40 feet or over) with significant amounts of reflective material	0 to 3	13	9.5

(d) **Forward-Looking Airborne Radar (FLAR).** Research has been conducted on various fixed wing aircraft to determine the detection capabilities of FLARs for SAR operations. From detection data collected under realistic search scenarios estimates of sweep width have been calculated.

(1) The AN/APS-137 FLAR is an X-band, air-to-surface Inverse Synthetic Aperture Radar (ISAR) that provides high resolution, small-target detection, weather avoidance, sea surveillance, and Doppler display. The AN/APS-137 system has special selectable features that enhance system performance against weak targets. Sweep widths for conducting and planning AN/APS-137 (aircraft) SAR searches are summarized in table H-27 with consideration of the following general recommendations:

a. Search altitude - 1500 feet or lower.
b. Search speed - 180-220 knots IAS.
c. Use only 16 NM range scale for life raft searches.
d. Search full radar display, do not limit search by track spacing.
e. Screen cursor may hide weak targets.
f. Refresh radar screen when 1/4 of display in front of the aircraft is off-screen.

Table H-27 Sweep Widths for Forward-Looking Airborne Radar (AN/APS-137)

16 Nautical Mile Radar Range Scale (Sweep Width in Nautical Miles)										
Object Type	*On scene Surface Winds (kts)*									
	< 5	*to 10*	*to 15*	*to 20*	*to 25*	*to 35*	*to 45*	*to 55*	*to 65*	*> 65*
4 to 10 person life raft	12.1	8.6	3.1	0	0	0	0	0	0	0
17 to 25 foot recreational boat	13.6	11.9	8.2	2.8	0	0	0	0	0	0
26 to 35 foot recreational boat	16.6	16.3	15.4	14.2	12.6	9.5	3.9	0	0	0
36 to 50 foot recreational boat	21.0	20.7	19.9	18.9	17.5	14.7	9.8	3.5	0	0

32 Nautical Mile Radar Range Scale (Sweep Width in Nautical Miles)										
Object Type	*On scene Surface Winds (kts)*									
	< 5	*to 10*	*to 15*	*to 20*	*to 25*	*to 35*	*to 45*	*to 55*	*to 65*	*> 65*
17 to 25 foot recreational boat	17.4	15.7	12.0	6.6	0	0	0	0	0	0
26 to 35 foot recreational boat	22.1	21.7	20.9	19.7	18.1	14.9	9.3	2.1	0	0
36 to 50 foot recreational boat	29.0	28.7	27.9	26.9	25.5	22.7	17.8	11.5	3.8	0

(2) The RDR-1300 model radar is found on the HH-65 and HH-60 aircraft. This radar is comparable to the APN-215 and the sweep width tables corresponding to the APN-215, Table H-28, are applicable. For searches using the RDR-1300, APN-215, APS-133 and APS-127 FLAR (Tables H-28 and H-29) the following guidance is provided:

a. Sweep widths for small objects in significant wave heights of 5 feet or greater decrease rapidly to zero.

b. Detection range is more often limited by either clutter or signal-to-noise ratio than by horizon distance.

c. AN/APS-127 searches should be conducted at lower altitudes whenever flight operations permit, particularly when seas are greater than two feet, because higher altitudes tend to enhance sea return.

d. The AN/APS-127 provides a useful detection capability for life rafts when the 10NM scale is used. The 20NM range scale may degrade detection capability at each range interval but the doubling of the range scale leads to a greater sweep width. Either the 10 or 20NM range scale is effective against 24 to 43 foot boats.

Table H-28 Sweep Widths for Forward-Looking Airborne Radar (AN/APS-133, AN/APN-215)

Object Type	*Significant Wave Height (ft)*	*Sweep Width (NM) Radar System*	
		AN/APS-133 MAP-1 and MAP-2 Modes	*AN/APN-215 SEARCH-1 and SEARCH-2 Modes*
Small (20 feet or less) fiberglass boats, without radar reflector or engine/ metal equipment	0 to 1	7	4
	>1 to 3	2	2
Small (20 feet or less) fiberglass boats, with radar reflector or engine/metal equipment	0 to 1	8	6
	>1 to 3	3	3
Medium to large (40 to 100 feet) targets with significant amounts of reflective material	0 to 1	40	40
	>1 to 5	4	4
Metal targets longer than 100 feet	0 to 1	>50	>50
	>1 to 5	16	16

Table H-29 Sweep Widths for Forward-Looking Airborne Radar (AN/APS-127)[2]

Object Type	*Range Scale(NM)*	*Search Altitudes(FT)*	*Significant Wave(FT)*	*Sweep Width(NM)*
6 to 10 person life rafts	10	500 to 4500	< 2	5.4
			2 to 5	1.8
			> 5	nil
24 to 43 foot boats	10	500 to 1000	< 2	12.8
			2 to 5	10.8
			6 to 10*	6.3
			> 10*	3.1
		1100 to 2400*	< 2	11.2
			2 to 5	9.2
			6 to 10	4.7
			> 10	2.3
		2500 to 5000	< 2	8.5
			2 to 5	7.2
			6 to 10*	3.5
			> 10*	1.5
6 to 10 person life rafts	20	500 to 4500	< 2	7.0
			2 to 5*	1.8
			> 6*	nil
24 to 30 foot boats	20	500 to 4000	< 2	14.1
			2 to 5*	7.0
			6 to 10*	4.9
			> 10*	2.4
31 to 43 foot boats	20	500 to 4000	< 2	24.9
			2 to 5*	15.3
			6 to 10*	7.0
			> 10*	3.5

*Values for this category were extrapolated from test data.

(e) **Side-Looking Airborne Radar (SLAR).** The MSS-5000 SLAR, which is a digital display/record upgrade to the AN/APS-135 SLAR, is currently available for use on up to two HC-130s at CGAS Elizabeth City. Unlike conventional search radars that constantly refresh the image of a large area, SLAR takes "snapshots" of the areas immediately to either side of a moving aircraft. The result is a moving surface map display that depicts a single "look" at any given location.

(1) Recommended sweep widths for SLAR on Coast Guard aircraft are shown in Table H-30. Specific findings of the research that are of interest to SAR planners are:

a. SLAR models tested are capable of detecting 180-foot ships nearly 100% of the time in seas up to at least 6 feet and ranges up to 30 NM.

b. Objects as small as 16-foot boats with metal equipment (engine, gas tanks, frames, etc.) can be detected better than 90% of the time in seas less than 3 feet and 30% - 50% of the time in seas of 3-6 feet. These objects can be detected in low sea states out to the 30 NM swath width limit.

c. Four to ten person life rafts can be detected 40% to 70% of the time in seas less than 3 feet, but can be detected less than 15% of the time in seas of 3 to 6 feet.

(2) Presently these SLAR equipped aircraft are the primary iceberg surveillance platforms for the International Ice Patrol (IIP).

(3) SLAR has limited use during a search. SLAR is essentially an aerial surveying system. ***To adequately survey an area, the aircraft must fly level and straight. The SLAR aircraft or other SRUs must then identify any objects detected on the stored radar image.***

(f) **Sweep widths for Side-Looking Airborne Radar (SLAR)**, based on tests of the AN/APS-94D SLAR systems, are given in Table H-30. Limited tests of the AN/APS-135 conducted with IIP indicate that the MSS-5000 should perform somewhat better than the sweep widths tabulated below.

(1) Sweep widths are based on altitudes of 2,500 to 4,000 feet for objects under 40 feet long, and 8,000 feet for objects over 40 feet long, with range scales no greater than 27 NM.

(2) SLAR is usually capable of searching large areas to either side of the aircraft and includes a digital record of the search that can be replayed for extended analysis.

(3) Search legs should be aligned upwind and downwind so that the radar signal is aimed crosswind at all times. This tactic allows the largest possible area to be searched without contending with heavy upwind sea clutter.

(4) When time and resources are sufficient to conduct multiple searches of an area, search tracks for the second search should be offset from the first search to compensate for the blind zone adjacent to aircraft ground track. The commence search point (CSP) for the second search is offset a distance at least equal to the blind zone width, which is approximately twice the search altitude.

Table H-30 Sweep Widths For Side-Looking Airborne Radar (NM)

Target Type	*Significant Wave Height (ft)*	
	0 to 1	*>1 to 5*
Fiberglass or wooden boats, 20 feet or less, without radar reflector or engine/ metal equipment	16	<6
Fiberglass or wooden boats, 20 feet or less, with radar reflector or engine/metal equipment	21	6
Life rafts, 4 to 10 persons without radar reflectors	12	<5
Objects, 40 to 100 feet, with significant metal equipment	47	24
Metal targets longer than100 feet	57	54

H.3.5.8 Other Sensor Sweep Widths

(a) **Forward-Looking Infrared (FLIR) Systems.** FLIR detects thermal (heat) energy and can be used day or night. It is adversely affected by rain and moderate to heavy fog because water readily absorbs thermal energy. Section 5.6 of this Addendum lists which Coast Guard aircraft carry FLIR capability. The MARFLIR system is carried by most WHECs and WMECs, and FLIR is becoming available on some CPBs and WPBs.

(b) **FLIR Sweep Widths.** Sweep widths and recommended system settings for MARFLIR, based on limited testing with life rafts, are given in Table H-31. Sweep widths should be approximated, using an experienced operator's best estimate of effective detection ranges for other FLIR systems, search object types and field of view/scan width limits. Operators should be told the effective detection range is the range at which they believe the object will certainly be detected under prevailing conditions. Sweep width should not exceed the effective azimuthal coverage of the FLIR system in use, regardless of object size. Figure H-14 illustrates a means of estimating FLIR sweep width using input from an experienced sensor operator.

(1) No sweep width data are yet available for Coast Guard airborne FLIRs.

(2) All FLIR systems have a limited field of view (FOV), and most offer multiple magnifications. Higher magnification means smaller FOV.

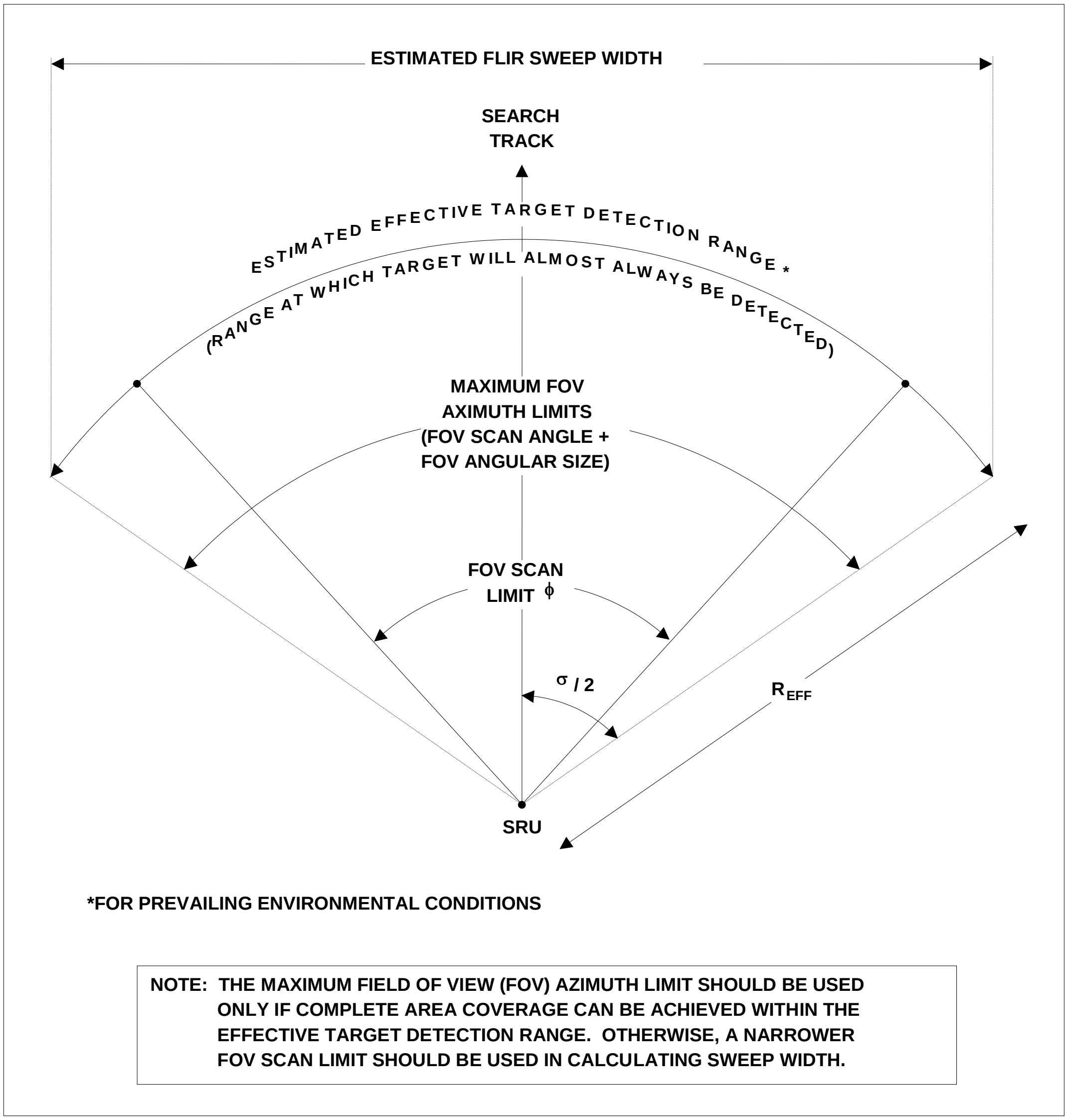
(3) ***Longer detection ranges achieved by using high magnification/small FOV must be balanced against the effective area coverage that can be achieved without leaving gaps***.

(4) Many FLIRs have automated scan modes that can be set by the operator to help achieve more consistent area coverage. Options vary from system to system.

Table H-31 Sweep Widths and Recommended Settings for MARFLIR (4-10 person life rafts).

<table>
<tr><td colspan="3">SWEEP WIDTHS FOR MARFLIR
(4-10 person life rafts)
(Nautical Miles)</td></tr>
<tr><td colspan="2">Daylight (nm)</td><td>Sweep Width at Dusk/Night (nm)</td></tr>
<tr><td colspan="2">5.0</td><td>3.0</td></tr>
<tr><td>RECOMMENDED SETTINGS *</td><td colspan="2">Sensor: FLIR
Polarity: White Hot**
Level Control: Automatic**
Zoom: ½ to ¾ of maximum zoom
Extender: Off
Scan Rate: 30 to 45 degrees per minute***
Scan Limit: 000ºR ± 90º</td></tr>
</table>

***	Search unit speed is assumed to be 10 knots.**
** Use of Black Hot polarity requires manual level control.
*** The 45-degrees/minute scan rate should only be used under favorable conditions, i.e., when high contrast is anticipated between the raft and background.



ϕ = FOV SCAN LIMIT (ANGLE THROUGH WHICH FLIR CAMERA SCANS) = 60 8

σ = MAXIMUM FOV AZIMUTH LIMITS (FOV SCAN ANGLE + FOV ANGULAR SIZE) = 90 8

R_{EFF} = ESTIMATED EFFECTIVE TARGET DETECTION RANGE = 3 nm

ESTIMATED SWEEP WIDTH = 2 SIN (σ / 2) x R_{EFF} = 2 SIN (45 8) x 3 nm = 4.2 nm

Figure H-14 Estimated FLIR Sweep Width

(c) **Night Vision Goggles (NVG).** Many SAR incidents occur or become known to the Coast Guard during the afternoon or night. The greatest benefit of NVG is that this sensor enables searchers to conduct effective searches at night, thus search planners will not have to wait until first light the following day to begin effective visual searches. This will increase the probability of survival for those persons in distress.

(1) **NVG Search Sweep Widths for Helicopters.** Select the base sweep width (BSW) for Boat, Raft or PIW search object from Table H-32. Illuminated search is a NVG search using one or two helicopter landing lights, or where available, an IR source of illumination, during the search. Select the appropriate environmental situation correction factors from Table H-32a for PIW or Table H-32b for boat/raft. Enter the base sweep width and environmental correction factors in the following equation to calculate the NVG sweep width:

$$BSW \times MVPHS \times CLDC \times VIS \times \left(\frac{Hs + WHCAPS}{2} \right) \times FATIGUE = SWEEPWIDTH$$

Correction factor for number of searchers: Base sweep widths always assume a 4-person NVG search. ***If only 2 or 3 persons are searching with NVGs, a correction factor must be applied***. For Boat/Raft targets the correction factor is 0.8, and for PIWs the correction factor is 0.9. The correction factor should be applied to the sweep width calculated above.

(2) **NVG Search Sweep Widths for Vessels.** Table H-33 provides sweep width estimates for unlighted targets from a 210' WMEC. The values provided can be used as a guide for other unlit targets of similar size and for use of NVGs used from other surface craft.

(3) Other considerations for NVG use:

a. During searches with NVGs for lighted targets, the sweep width should be a value equal to the lesser of the distance to the visual horizon or the estimated meteorological visibility.

b. During searches for the green chemical Personal Marker Lights, NVGs should not be used because the filters used filter the green chemical light wavelength.

c. Night searches should not be conducted from small boats with NVGs used as the primary search sensor. The use of NVGs during searches from small boats has found to be of limited value and are not recommended because the lookouts are prone to seasickness when using NVG, but they are effective from aircraft.

d. When the moon is up but clouds are present, searchers on scene will have to judge the amount of moonlight reaching the surface and report which phase on a clear night corresponds most closely.

Table H-32 Base Sweep Widths (BSW) for NVG - Helicopters

Search Object		Search Type: Illuminated	Search Type: Non-Illuminated
PIW [1]	w/o PFD or retro-reflective material	0.05	0.01
	w/ PFD	0.6	0.1
Rafts (canopies with retro-reflective material)	1 or 2-person	0.7	0.6
	4-person	0.9	0.8
	6-person [2]	1.0	0.9
	8-person	1.1	1.0
	10-person	1.2	1.1
	15-person	1.4	1.3
	20-person	1.6	1.4
	25-person	1.7	1.5
Boats (no lights or retro-reflective material)	8 to 12 ft	0.4	0.4
	13 to 19 ft [3]	0.8	0.8
	20 to 25 ft [4]	1.2	1.1
	26 to 35 ft	1.8	1.6
	36 to 45 ft	2.2	2.1
	46 to 55 ft	2.5	2.3

1–values are estimates 2–based on measured data 3–based on 18-ft skiff data 4–based on 21-ft skiff data

Table H-32a Environmental Situation Correction Factors for PIW

Environmental Condition		Search Type: Illuminated	Search Type: Non-Illuminated
Moon Visible & Phase (MVPHS)	> 75%	1.1	1.4
	25 to 75%	1	1
	Moon not Visible or < 25%	0.9	0.7
Cloud Cover (CLDC)	< 25%	1.1	1.1
	25 to 75%	1	1
	> 75%	0.9	0.9
Visibility (VIS)	≥ 2 nm	1	1
	> 0.5 to < 2 nm	0.8	0.7
	≤ 0.5 nm	0.6	0.3
Significant Wave Height (Hs)	0 to < 3 ft	1.2	1.7
	3 ft	1	1
	> 3 to 6 ft	0.8	0.5
Whitecaps (WHCAPS)	None	1.1	1.3
	Few	1	1
	Many	0.9	0.8
Fatigue Factor (FATIGUE)	Rested (0 to 3 hr NVG search)	1	1
	Fatigued/Very Fatigued (> 3 to 6 hrs)	0.9	0.9

Table H-32b Environmental Situation Correction Factors for Boat/Raft

Environmental Condition		Search Type	
		Illuminated	Non-Illuminated
Moon Visible & Phase (MVPHS)	> 75%	1.15	1.32
	25 to 75%	1	1
	Moon not Visible or < 25%	0.88	0.76
Cloud Cover (CLDC)	< 25%	1.27	1.27
	25 to 75%	1	1
	> 75%	0.82	0.82
Visibility (VIS)	≥ 2 nm	1	1
	> 0.5 to < 2 nm	0.83	0.83
	≤ 0.5 nm	0.57	0.57
Significant Wave Height (Hs)	0 to < 3 ft	1.28	1.28
	3 ft	1	1
	> 3 to 6 ft	0.74	0.74
Whitecaps (WHCAPS)	None	1.13	1.13
	Few	1	1
	Many	0.87	0.87
Fatigue Factor (FATIGUE)	Rested (0 to 3 hr NVG search)	1	1
	Fatigued (> 3 to 4 hrs on NVGs)	0.9	0.9
	Very Fatigued (> 4 to 6 hrs)	0.8	0.8

Table H-33 Sweep Width Estimates for Unlighted Targets from 210' WMEC

Target	Seas at and Below 5 Feet	Seas Above 5 Feet
4 Person life raft	0.5	0.2
6 Person life raft	0.8	0.3
8 Person life raft	1.0	0.4
10 Person life raft	1.5	0.6
15 Person life raft	1.5	0.7

H.3.5.9 Multisensor Sweep Width Considerations

(a) Environmental parameters limit all types of search methods. Multisensor searching, both sensor and combinations of sensor and visual, can be used to mitigate environmental limitations. Table H-34 outlines various ways in which radar, infrared, and visual searches can be combined to complement each other and possibly overcome some environmental conditions.

(b) Sweep width values for various combinations of search sensors, based on the type of conditions, type of target, and sensors used, are presented in tables that follow.

(c) Combined sensor searches should be planned so that sensor capabilities complement each other. Search patterns and track spacing should be selected on the basis of the effectiveness of the different SRU sensors available. The most effective sensor should be favored and controllable parameters, such as speed and altitude, should be selected to maximize the performance of the most capable sensor.

(d) Multisensor searches are normally assigned only if they provide the maximum sweep width possible with the available personnel. Scanners should not be manning sensors ineffective for the search conditions if they might be used as visual scanners.

(e) Visual searching may supplement sensor coverage by filling in blind zones created by antenna configuration and physical or operational limitations of the electronic equipment.

Table H-34 Environmental Limitations and Multisensor Search

Environmental Limitation	*Visual*	*Radar*	*Infrared*
Darkness	Very limited detection capability	Short- and long-range target detection, but no identification	Short-range target detection/identification of long-range radar targets after closing
Poor visibility (daylight)	Detection and identification to limit of visibility	Short- and long-range target detection, but no identification	May extend limits of visibility when haze limits detection by naked eye
High sea state	Reduced effectiveness, but some ability to distinguish target from whitecaps	Detection of medium/ large targets only Many false targets	Short-range target detection/identification Better than visual search only at night or with high thermal contrast target

H.3.5.10 SLAR/Visual. The multi-sensor sweep width tables assume searching at 200 knots at 2000 feet altitude. Combined sweep widths for metal-hulled objects over 40 feet long are estimated to be the same as for SLAR search alone.

Table H-35 SLAR/Visual Weather Conditions

Parameter	*Good Conditions*	*Fair Conditions*
Wind Speed	8	15
Significant Wave Height (ft)	0.5	2
Visibility (NM)	10	5
Cloud Cover (%)	50	100
Time on Task (hr)	2	2
Search Speed (knots)	200	200
Search Altitude (ft)	2000	2000

Table H-36 SLAR/Visual Sweep Widths (NM)

Object Type	*Environmental Conditions*	
	Good	*Fair*
High-Contrast (e.g. white), 16- to 21-ft Fiberglass or Aluminum Boat with Engine and/or Other Metal Equipment	22.0	21.8
Medium-Contrast (e.g. Blue), 16-ft Fiberglass Boat Without Engine or Other Metal Equipment	17.1	16.8
Low-Contrast (e.g. Black), Life Raft without Metal Equipment or Canopy	13.7	13.3

* "Good" and "Fair" environmental conditions from Table 4-19.

H.3.5.11 SVR/Visual. Combined sweep widths for targets with a radar cross section of at least 50 square meters are estimated as twice the radar horizon range in conditions up to sea-state 3. For vessels with antenna heights above 30 feet, sweep widths in the tables should be considered as minimum values since the radar horizon will be longer for these SRUs.

Table H-37 Small Boat Visual Sweep Width for Targets With Radar Reflectors

Environmental Conditions	*High-Contrast 16-Ft Boat or Life Raft w/ Canopy*	*Medium-Contrast 16-Ft Boat or Life Raft w/o Canopy*	*Low-Contrast Life Raft w/o Canopy*
Good Weather; 0.5-ft Seas	3.6	3.2	3.0
Fair Weather; 3-ft Seas	1.1	0.8	0.7
Light Rain (1 mm/hr); 1-ft Seas	3.0	2.6	2.5
Moderate Rain (4 mm/hr); 1-ft Seas	2.2	1.8	1.6
Heavy Rain (16 mm/hr); 2-ft Seas	0.8	0.7	0.6
Moderately Heavy Snow (4 mm/hr of water); 2-ft Seas	0.7	0.6	0.6
Dense Fog (100-ft visibility); 0.5-ft Seas	1.9	1.9	1.9

Note: Sweep widths are rounded to nearest 0.1 nautical mile.

Table H-38 Small Boat Visual Sweep Width for Targets Without Radar Reflectors

Environmental Conditions	*High-Contrast 16-Ft Boat or Life Raft w/ Canopy*	*Medium-Contrast 16-Ft Boat or Life Raft w/o Canopy*	*Low-Contrast Life Raft w/o Canopy*
Good Weather; 0.5-ft Seas	3.5	3.0	2.9
Fair Weather; 3-ft Seas	*	*	*
Light Rain (1 mm/hr); 1-ft Seas	2.7	2.3	2.1
Moderate Rain (4 mm/hr); 1-ft Seas	2.1	1.6	1.4
Heavy Rain (16 mm/hr); 2-ft Seas	0.4	0.3	0.3
Moderately Heavy Snow (4 mm/hr of water); 2-ft Seas	0.2	0.2	0.1
Dense Fog (100-ft visibility); 0.5-ft Seas	0.4	0.4	0.4

Note: Sweep widths are rounded to nearest 0.1 nautical mile.
* The AN/SPS-66 radar was unable to detect targets without radar reflectors in these conditions. Visual sweep width alone applies.

Table H-39 WPB SVR/Visual Sweep Width for Targets With Radar Reflectors

Environmental Conditions	*High-Contrast 16-Ft Boat or Life Raft w/ Canopy*	*Medium-Contrast 16-Ft Boat or Life Raft w/o Canopy*	*Low-Contrast Life Raft w/o Canopy*
Good Weather; 0.5-ft Seas	5.5	5.1	5.1
Fair Weather; 3-ft Seas	1.7	1.6	1.6
Light Rain (1 mm/hr); 1-ft Seas	4.3	4.1	3.9
Moderate Rain (4 mm/hr); 1-ft Seas	2.5	2.2	2.2
Heavy Rain (16 mm/hr); 2-ft Seas	0.8	0.7	0.7
Moderately Heavy Snow 4 mm/hr of water); 2-ft Seas	1.7	1.7	1.7
Dense Fog (100-ft visibility); 0.5-ft Seas	3.6	3.6	3.6

Note: Sweep widths are rounded to nearest 0.1 nautical mile.

Table H-40 WPB SVR/Visual Sweep Width for Targets Without Radar Reflectors

Environmental Conditions	*High-Contrast 16-Ft Boat or Life Raft w/ Canopy*	*Medium-Contrast 16-Ft Boat or Life Raft w/o Canopy*	*Low-Contrast Life Raft w/o Canopy*
Good Weather; 0.5-ft Seas	4.9	4.3	4.1
Fair Weather; 3-ft Seas	1.3	1.2	1.2
Light Rain (1 mm/hr); 1-ft Seas	3.3	2.7	2.6
Moderate Rain (4 mm/hr); 1-ft Seas	2.1	1.6	1.4
Heavy Rain (16 mm/hr); 2-ft Seas	0.4	0.3	0.3
Moderately Heavy Snow (4 mm/hr of water); 2-ft Seas	0.3	0.2	0.2
Dense Fog (100-ft visibility); 0.5-ft Seas	0.8	0.8	0.8

Note: Sweep widths are rounded to nearest 0.1 nautical mile.

Table H-41 Height of Eye vs. Horizon Range

Height feet	Nautical miles	Statute miles	Height feet	Nautical miles	Statute miles	Height feet	Nautical miles	Statute miles
1	1.1	1.3	120	12.5	14.4	940	35.1	40.4
2	1.6	1.9	125	12.8	14.7	960	35.4	40.8
3	2.0	2.3	130	13.0	15.0	980	35.8	41.2
4	2.3	2.6	135	13.3	15.3	1,000	36.2	41.6
5	2.6	2.9	140	13.5	15.6	1,100	37.9	43.7
6	2.8	3.2	145	13.8	15.9	1,200	39.6	45.6
7	3.0	3.5	150	14.0	16.1	1,300	41.2	47.5
8	3.2	3.7	160	14.5	16.7	1,400	42.8	49.3
9	3.4	4.0	170	14.9	17.2	1,500	44.3	51.0
10	3.6	4.2	180	15.3	17.7	1,600	45.8	52.7
11	3.8	4.4	190	15.8	18.2	1,700	47.2	54.3
12	4.0	4.6	200	16.2	18.6	1,800	48.5	55.9
13	4.1	4.7	210	16.6	19.1	1,900	49.9	57.4
14	4.3	4.9	220	17.0	19.5	2,000	51.2	58.9
15	4.4	5.1	230	17.3	20.2	2,100	52.4	60.4
16	4.6	5.3	240	17.7	20.4	2,200	53.7	61.8
17	4.7	5.4	250	18.1	20.8	2,300	54.9	63.2
18	4.9	5.6	260	18.4	21.2	2,400	56.0	64.5
19	5.0	5.7	270	18.8	21.6	2,500	57.2	65.8
20	5.1	5.9	280	19.1	22.0	2,600	58.3	67.2
21	5.2	6.0	290	19.5	22.4	2,700	59.4	68.4
22	5.4	6.2	300	19.8	22.8	2,800	60.5	69.7
23	5.5	6.3	310	20.1	23.2	2,900	61.6	70.9
24	5.6	6.5	320	20.5	23.6	3,000	62.7	72.1
25	5.7	6.6	330	20.8	23.9	3,100	63.7	73.3
26	5.8	6.7	340	21.1	24.3	3,200	64.7	74.5
27	5.9	6.8	350	21.4	24.6	3,300	65.7	75.7
28	6.1	7.0	360	21.7	25.0	3,400	66.7	76.8
29	6.2	7.1	370	22.0	25.3	3,500	67.7	77.9
30	6.3	7.2	380	22.3	25.7	3,600	68.6	79.0
31	6.4	7.3	390	22.6	26.0	3,700	69.6	80.1
32	6.5	7.5	400	22.9	26.3	3,800	70.5	81.2
33	6.6	7.6	410	23.2	26.7	3,900	71.4	82.2
34	6.7	7.7	420	23.4	27.0	4,000	72.4	83.3
35	6.8	7.8	430	23.7	27.3	4,100	73.3	84.3
36	6.9	7.9	440	24.0	27.6	4,200	74.1	85.4
37	7.0	8.0	450	24.3	27.9	4,300	75.0	86.4
38	7.1	8.1	460	24.5	28.2	4,400	75.9	87.4
39	7.1	8.2	470	24.8	28.6	4,500	76.7	88.3
40	7.2	8.3	480	28.1	28.9	4,600	77.6	89.3
41	7.3	8.4	490	25.3	29.2	4,700	78.4	90.3
42	7.4	8.5	500	25.6	29.4	4,800	79.3	91.2
43	7.5	8.6	520	26.1	30.3	4,900	80.1	92.2
44	7.6	8.7	540	26.6	30.6	5,000	80.9	93.1
45	7.7	8.8	560	27.1	31.2	6,000	88.6	102.0
46	7.8	8.9	580	27.6	31.7	7,000	95.7	110.2
47	7.8	9.0	600	28.0	32.3	8,000	102.3	117.8
48	7.9	9.1	620	28.5	32.8	9,000	108.5	124.9
49	8.0	9.2	640	28.9	33.3	10,000	114.4	131.7
50	8.1	9.3	660	29.4	33.8	15,000	140.1	161.3
55	8.5	9.8	680	29.8	34.3	20,000	161.8	186.3
60	8.9	10.2	700	30.3	34.8	25,000	180.9	208.2
65	9.2	10.6	720	30.7	35.3	30,000	198.1	228.1
70	9.6	11.0	740	31.1	35.8	35,000	214.0	246.4
75	9.9	11.4	760	31.5	36.3	40,000	228.8	263.4
80	10.2	11.8	780	31.9	36.8	45,000	242.7	279.4
85	10.5	12.1	800	32.4	37.3	50,000	255.8	294.5
90	10.9	12.5	820	32.8	37.7	60,000	280.2	322.6
95	11.2	12.8	840	33.2	38.2	70,000	302.7	348.4
100	11.4	13.2	860	33.5	38.6	80,000	323.6	372.5
105	11.7	13.5	880	33.9	39.1	90,000	343.2	395.1
110	12.0	13.8	900	34.3	39.5	100,000	361.8	416.5
115	12.3	14.1	920	34.7	39.9	200,000	511.6	589.0

H.3.6 Enclosed, Coastal, and Riverine Waters

H.3.6.1 Drift in enclosed and coastal waters is derived by adding leeway and current vectors for the incident area in the same way as described above for the open ocean, except that wind current is not computed. Currents in enclosed and coastal waters tend to be more complex and variable than in the open ocean.

H.3.6.2 Leeway speed is calculated using the leeway speed values from Table H-7 and equations in Paragraph H.3.4(a). Leeway direction is computed using the leeway divergence angles from Table H-7. In many river situations the wind at the water surface is extremely unpredictable due to surrounding topographic features. Usually the river current is the primary drift factor and often overwhelms any leeway the object may have. ***When dealing with drift on rivers, the SMC must decide whether leeway estimates are necessary or appropriate.*** Usually leeway estimates are needed only when the river is wide, the current relatively slow, and the surrounding terrain is not much higher than the river and relatively flat.

H.3.6.3 Two currents normally encountered in coastal environments are tidal and wind-driven currents. However, other currents should be included in calculations if their effect is significant.

(a) After leeway, tidal currents cause the greatest drift for most objects. Procedures for determining tidal current vectors are provided with the worksheets in this Appendix, and the appropriate tidal current manual.

(b) Wind current, normally present where the wind has a long enough fetch to generate sufficient stress on the water surface, is difficult to quantify. The tidal current manual for the East Coast of the United States has a wind current table based on historical data. Most other areas have no data. Whether to compute a wind current depends on SMC local knowledge and the environmental parameters. Wind current for enclosed and coastal areas, including water depths less than 100 feet and distances closer than 20 miles from shore, is not normally calculated because of variability and short fetch distances. On some larger or deeper lakes, such as the Great Lakes, wind current can be determined with reasonable accuracy.

H.3.6.4 In many instances, responding to SAR cases on rivers is the responsibility of local authorities. However, the Coast Guard is often asked to assist with SAR operations and in cases on the major inland waterways the Coast Guard may be SMC.

(a) Drift in rivers is very complex. It is primarily due to river currents, which can be highly variable. River currents tend to be turbulent; eddies and hydraulics are common. Depending on the surrounding topography, winds over the river itself are often highly variable as well. The methods for estimating leeway in the open ocean do not apply. Rivers are rarely straight and floating debris tends to collect along the banks in certain locations. Search objects can get hung up on obstacles or trapped in eddies, remain in place for some period of time and then break loose again to continue drifting. It is even possible in some circumstances for objects to be found somewhat upstream of where they started drifting. Local knowledge is particularly important when rivers are involved. NOAA and other agencies, including state and local, may actively monitor river currents and heights. In many areas there are local agencies with SAR responsibilities and/or volunteer SAR teams who possess valuable experience and knowledge. Units likely to become involved with SAR cases on rivers in their AORs should be familiar with all sources of local knowledge, SAR assets, and data.

(b) When determining where to search, the maximum downstream and upstream limits of where the search object could be at the datum time should be estimated. The river and both banks should then be searched. Generally the search area will grow with time in the downstream direction. However, due to the complexity of riverine drift it is not safe to assume that the upstream end of the search area can be moved downstream based only on the passage of time. Leeway is often negligible when compared to the other forces acting on the search object. If leeway is judged to be a significant factor, it should be used to extend the downstream and upstream limits of the search area. Since objects adrift in rivers often spin around due to turbulence in the current, wind at the water's surface is often unpredictable due to local topography, rivers are rarely straight, and drift is constrained by the river banks, leeway divergence and total probable error of position circles are not considered relevant. When searching a river, particular attention should be paid to the banks, especially when shoreside assets are unable to search them well. Areas where debris has collected are also of high interest since the same forces that brought the debris to that location could have brought the search object there as well. Detection of search objects located in debris or along a river bank is often much more difficult (i.e., the effective sweep width is significantly smaller) than detection of the same objects adrift in the middle of the river.

H.3.7 Computing Subsequent Datums

(a) ***If the first search fails to locate the survivors, additional searches must be planned and carried out***. Since virtually all objects exhibit leeway divergence, a drift update from a single initial position produces two datums. If additional searching is required, it is not immediately obvious how to proceed when two datums are available as starting points. Several possibilities suggest themselves:

(1) Compute the datums for the next search by starting with the original initial position.

(2) Compute new datums by using each of the two first search datums as initial positions for the next drift interval.

(3) Choose a position halfway between the two first search datums as the initial position for the next drift interval.

(b) The first choice may require computing each of the two drift trajectories in steps in order to account for changes in the environmental factors over time and space. This method allows the search planner to account for updates in wind and current data since the previous datums were computed. ***Because the last portion of a drift update that is being used to plan a search must necessarily use forecast rather than actual observed data, this could be important, especially when forecasts prove to be inaccurate***. The disadvantage, especially for manual methods, is that the longer the drift intervals from the initial position to the planned search time, the greater the amount of data and computations that are necessary. It is also possible for constantly veering or backing winds to eventually cause the datums to start converging rather than continue diverging.

(c) The second choice has several disadvantages. First, it does not provide for re-computation when forecast data is replaced by observed or analysis data. Second, it produces a binary explosion of calculations: One initial position produces two datums, these then produce four datums, these then produce eight datums, etc. An apparent solution to this problem is to assume that objects never change tack with respect to the wind, i.e., an object with leeway to the right of the down wind direction always has leeway to the right of the down wind direction. This is more in line with the first choice, but the possibility of converging datums remains.

(d) Although the third choice is also a compromise, it is still a viable solution when the forecast data used to plan the search proves to be accurate. When that is not the case, the two datums should be re-computed from more accurate environmental data before proceeding with the next drift update. The only remaining problem is how to establish the probable error (X_2) for the new "initial position." As long as the datums are not too far apart (either a small distance in nautical miles or less than four times the total probable error of position), a reasonable estimate of the probable error is the radius of a circle centered halfway between the two datums that just includes the individual probable error circles for each datum as shown in Figure H-15. This actually overestimates the probable error of position somewhat, but there is no easy way to obtain a more accurate estimate for the radius of a circle that contains just 50% of the possible search object positions. An added advantage to this method is regularity. Each drift update always starts with a single initial position and produces two datums.

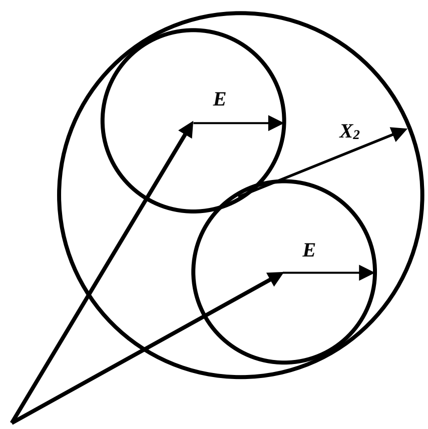


Figure H-15 Establishing a Starting Position and Position Error for Subsequent Drift

Section H.4
Search and Rescue Optimal Planning System (SAROPS)

The Search and Rescue Optimal Planning System (SAROPS) is a suite of computer-based tools to aid the search planner in developing an optimal search plan. ***SAROPS is the preferred method for planning coastal, oceanic and Great Lakes searches and shall be used in these regions whenever practicable***.

In the discussion that follows, the term "SAROPS" is used in two ways. Sometimes it is used to describe the entire suite of SAR tools that have been implemented in the Coast Guard's Common Mapping Framework (CMF). The CMF is based on the ArcGIS suite of geographic information system (GIS) products. The Coast Guard's SAR tools are currently the only applications that have been implemented within the CMF. SAROPS is also one of the individual SAR tools. Specifically, SAROPS in this context consists of the Simulator (SIM) and the Planner. Although there is some potential for confusion, it should be clear from the context what is meant when the term "SAROPS" is used.

The SAROPS software is hosted on a number of "servers" around the Coast Guard that are dedicated to supporting SAROPS and search planners. These servers are accessed from Command Center standard workstations through Remote Desktop Protocol (RDP). Information on SAROPS server locations and names is available from the Command, Control and Communications Engineering Center (C3CEN) in Portsmouth, VA. Once connected, users log in to a SAROPS server in exactly the same way they log in to their standard workstations.

H.4.1 Initiating and Closing/Suspending a SAROPS Case.

Before SAROPS can be used, the CMF must be initiated. Once the user logs in to a SAROPS server, they will find a CMF icon on the desktop. Double-clicking this icon brings up the Common Mapping Framework. The user will see toolbars with various buttons, a "Display" window with "Layers" (also called a "Table of Contents" or TOC in ArcGIS terminology), a "SAR Tools" window with a "Cases" folder that contains an "Untitled Case" followed by a number of SAR tools, including SAROPS, with folders where data associated with using those tools will be stored, and a large window showing a map of the world in Mercator projection. At the bottom of the screen is a "time slider," some empty data fields, and some buttons similar to those found on sound or video recording/playback devices. Figure H-16 below shows the initial SAROPS screen.

H.4.1.1 A new SAROPS case may now be initiated in one of two ways. The user may right-click on the words "Untitled Case" and then select "Properties" to bring up the Case Properties window. ***At this point the user shall assign a meaningful Case Name. Special characters shall not be used in case names. Letters, numerals, blanks, and the underscore are the only characters that should be entered in this field since it will be used in various file names created by SAROPS.*** The default status is "Open." ***The person opening the SAROPS case shall enter his/her rank/rate and name in the "Opened By" field.*** The Unit Case No. should be entered, along with the MISLE Case No. ***If these data items are not available initially, the SMC must revisit this page as soon as practicable after they are available and enter them.*** The remaining blank fields for location, nature of distress, number of persons and vessel/aircraft ID are self-explanatory and should be filled in. Figure H-17 shows the Case Properties window. Contents of the Case Name, Location, and MISLE Case No. fields are used in the Subject line of the SAROPS Search Action Plan (SAP) report. "Number of Persons" is used in Paragraph 1.C. of the SAP report. This report conforms to the SAP format given in Appendix C.

H.4.1.2 The second way to initiate a case is to right-click on the word “Cases” at the top of the SAR Tools window, select “File” and then “New.” In this instance, it is recommended that the original “Untitled Case” be removed by right-clicking on the words “Untitled Case” and selecting “Remove.”

H.4.1.3 ***Whenever a case is closed or active search is suspended pending further developments, the SMC shall perform a final “Subsequent Search” run through the “Simulator” to cause the final cumulative POS values to be computed and final SAROPS Summary and POS Reports to be generated. The SMC shall then re-visit the Case Properties page, modify the case status to “Closed” or “ACTSUS” as appropriate, indicate who closed/suspended the SAROPS case, and ensure the Unit Case No. and MISLE Case No. fields are filled with the correct data. The SMC shall then “Export” the SAROPS case and attach the exported “.sar” file to the correct MISLE Case for archive record purposes***. SAROPS case file management practices and procedures are described in the “case_management.ppt” file found on the desktops of all SAROPS servers.

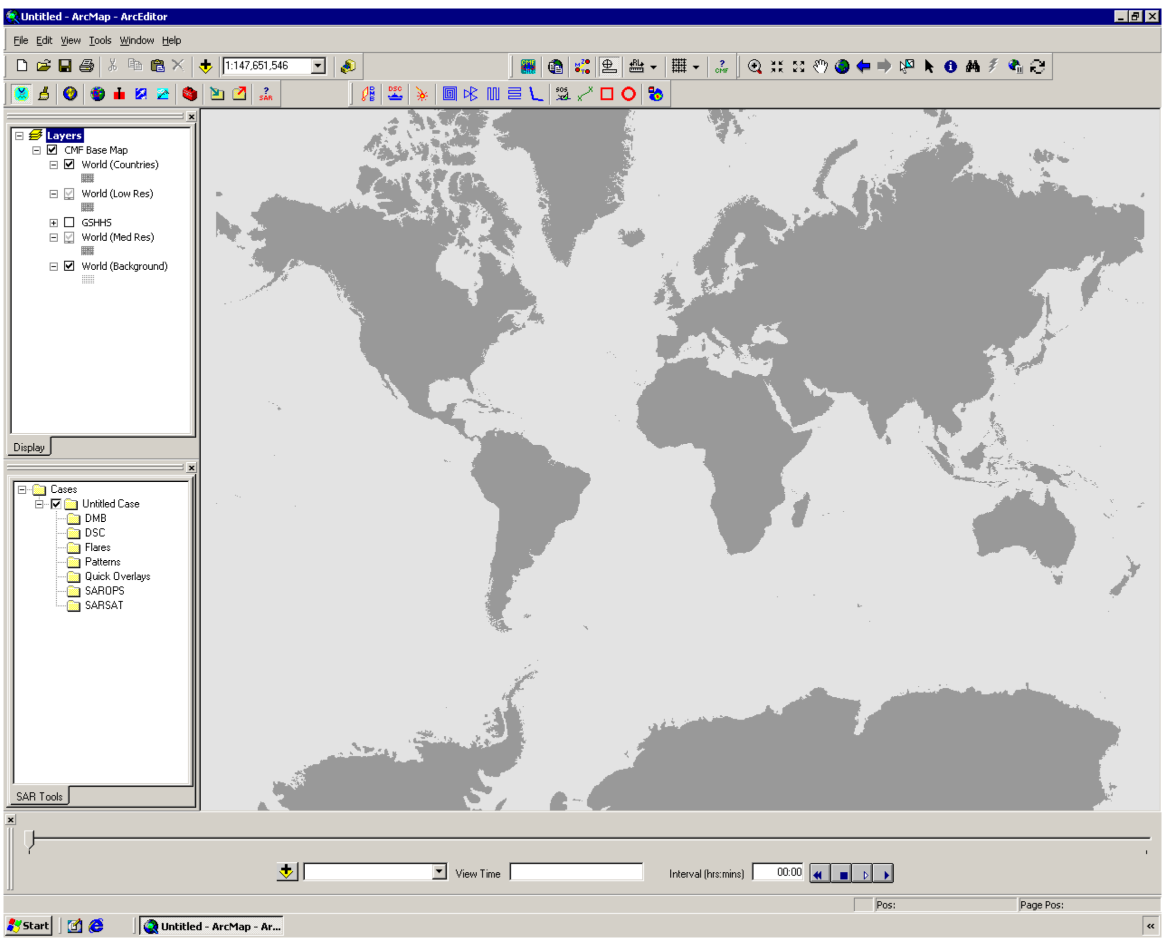


Figure H-16: Initial SAROPS Screen

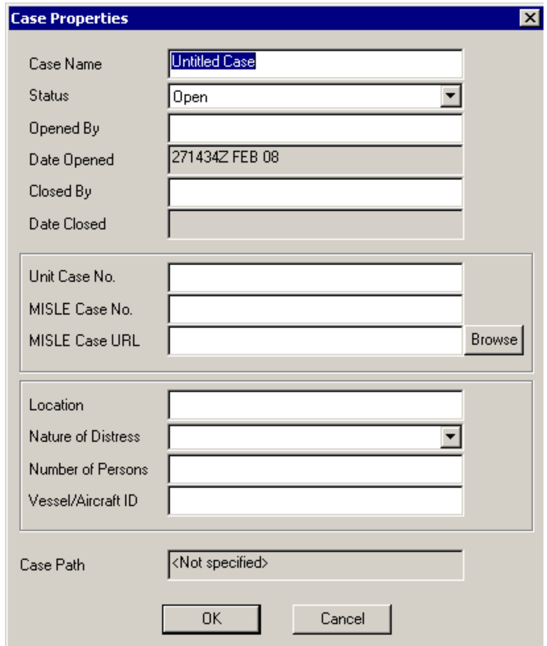


Figure H-17: SAROPS Case Properties

H.4.2 Initiating and Performing a SAROPS "Run"—Simulator Component. The SAROPS "run" interface is set up as a "wizard" that follows the general workflow for developing a search plan. As the user completes the data entry required for each window and any sub-windows it may have, they select "Next>" in the lower right corner to proceed to the next window. The user may also select "<Back" in the lower left corner to go to the previous window to review, add, modify, or delete a data entry.

Note: If the distress incident location is based on flare sighting data, it would be prudent for the user to use the "Flares" tool to estimate the initial area prior to initiating the SAROPS run. If the location is based on radio or other lines of bearing (LOBs), the range and bearing tool under "Quick Overlays - New" may be used to plot the LOBs of interest. If the location is to be estimated from nominal range rings around radio reception towers, the range ring tool under "Quick Overlays – New" may be used to plot the range rings of interest. These tools are also generally accessible directly from buttons on the "SAR Tools" tool bar.

H.4.2.1 Simulator Component. Each SAROPS "run" has two major components—the Simulator (SIM) component and the Planner component. The Simulator, as its name implies, simulates

(a) Pre-distress motion (if any) of the missing craft to generate possible distress positions and times,

(b) Post-distress motion (drift) based on winds, currents, and leeway,

(c) Completed searches to update search object probabilities.

H.4.2.2 Planner Component. The Planner is used to plan the next search based on the SRUs that the human search planner believes will be available for the next search. Planner seeks to provide an optimal search plan within the following constraints:

(a) The amount of effort each SRU can provide on scene (search endurance × search speed),

(b) De-confliction of search areas to prevent overlaps,

(c) Minimum track spacing limits based on SRU type.

H.4.2.3 Search Epochs. A search epoch is the span of time covered by a search action plan (SAP). Search epochs are designated by letters (Alpha, Bravo, Charlie…) and search pattern assignments within epochs are designated by numerals (A-1, B-3, C-2, etc.). The epoch's planned commence search time (CST) is often used as the simulation end time. SAROPS provides a 12-hour planning window beyond the simulation end time to accommodate the next search epoch. At a minimum a new SAROPS run (drift calculation) and corresponding search epoch must occur at least twice in each 24-hour period following the Alpha run. In addition to accommodating separate day and night search epochs, this practice will assure the latest available environmental data is being used for drift and other computations. Planning of each search epoch shall be based on a fresh SAROPS simulation run that includes all previously completed searches

(a) Day and night search epochs. Effective sweep widths for daylight visual search and night searches with or without NVGs are significantly different. Consequently, separate search epochs for planning day and night searches are necessary. Search sorties/patterns within the same epoch may be split at the day/night boundary if necessary. However, visual searching during periods of twilight is not recommended except in cases of extreme urgency (e.g. PIW in cold water), when the search object is likely to have visual signaling devices, or when it is impractical to interrupt searching just to avoid twilight.

(1) Ideally, search epochs will commence and/or conclude at or near sunrise and sunset.

(2) CST values may be earlier than simulation end time.

(3) End Search Time (EST) values may not occur after simulation end time plus 12 hours.

(4) If any portion of a visual search assignment with the un-aided eye occurs during darkness, SAROPS will automatically adjust the daylight visual detection sweep widths to no more than ten (10) percent of their daylight values for the entire pattern to compensate for searching at night without night vision devices. Therefore, either separate day and night epochs or splitting of sorties/patterns at the day/night boundary shall be done in all cases that involve both daylight and night searches.

(5) In some situations there will be sufficient on scene endurance available to permit a SRU's search efforts to continue searching through the day/night transition. In those situations the sortie shall be divided into day and night search segments, either by using the split sortie function or treating the two segments as separate sorties, one in the daylight search epoch and the other in the night search epoch. Either way, NVGs shall be specified for the night search segment if/as appropriate. This will ensure that appropriate detection probabilities are incorporated in each segment of the SRU's search.

(b) Change in search epochs due to change in on scene environmental conditions. On scene environmental conditions can change significantly in the course of a search, thereby inducing corresponding changes in sweep width values. However, the SAROPS interactive planner utilizes a single set of environmental data for planning all searches within the same epoch.

(1) Table H-10, weather correction factors, describes wind and sea conditions that induce significant changes in sweep width. In the course of a search, whenever on scene environmental conditions transition from one set of conditions specified in table H-10

to another, regardless of whether conditions are better or worse, a new search epoch shall be initiated. In this scenario, the search epoch must incorporate an appropriate simulation end time to ensure that searches planned for times subsequent to the change in on scene conditions take those environmental changes into account.

(2) Similarly, when visibility either doubles or is reduced by half, a new search epoch should be initiated. This constitutes preliminary guidance subject to revision subsequent to more thorough analysis of specific impacts of incremental changes in visibility on probability of success (POS).

(3) In scenarios in which environmental changes are less than those set forth in Table H-10, planning for additional sorties within the same epoch may proceed.

(4) It is important to ensure actual search performance and on scene environmental conditions are used to evaluate each pattern in each search epoch. This is accomplished when each pattern is reviewed prior to running the simulator for the next search epoch. For each pattern requiring review, the CST and end search time (EST) must be adjusted to reflect actual start and end times. In addition, the actual amount of the search pattern completed must be specified and the environmental data must be adjusted to reflect the conditions reported on scene for that pattern. For aircraft searches, the actual altitude flown must be specified for each pattern.

(5) Accounting for changes in on scene environmental conditions reported during a search when a pattern is reviewed is more difficult. It is acceptable to evaluate the entire pattern based on the least favorable conditions reported on scene as this will induce a more conservative sweep width. Alternatively, the pattern may be split manually by (1) entering a percent complete that reflects the portion of the pattern completed under the initial set of environmental conditions, and (2) manually creating one or more additional patterns corresponding to the remainder of the pattern actually performed, incorporating revised on scene environmental data for each additional pattern. The latter is achieved by utilizing the add button on the previous searches screen.

(c) The policies, procedures and guidance set forth above do not preclude use of shorter search epochs. For example, it may be appropriate to plan morning and afternoon searches using subsequent search to create a new search epoch for the afternoon. This offers the advantage of depicting the effects of the morning search on the probability grid while planning the afternoon search. Shorter search epochs also make it easier to accommodate changes in on scene environmental conditions when environmental changes are likely. In complex searches utilizing multiple SRUs, shorter search epochs may be easier to manage by confining the number of search areas/patterns per epoch to a reasonably small number. However, day/night transition should still be taken into account when defining search epochs.

H.4.2.3.1 Naming of externally developed search patterns. Search patterns should be developed using the SAROPS planner whenever practicable. The SAROPS planner optimizes employment of resources and assists in providing the greatest opportunity for locating the object of the search. On occasion searches will be undertaken either prior to SAROPS planning efforts or by other agencies operating independently but which report their results. In both instances the search planner should document these search efforts and account for them as appropriate.

(a) Whenever practicable, these patterns shall be added during the “previous searches” step of

SAROPS simulation data entry. When added in this step or developed externally using the patterns tool and then imported, the names of these patterns are automatically prefixed with "EXT" to identify patterns developed without the aid of the SAROPS interactive planner.

(b) The "EXT" prefix cannot be changed by the search planner. "EXT" search pattern names shall be sequentially numbered as they are entered.

(c) If a search pattern is added or imported for documentation purposes but the effect on POS is to be ignored, such as when the search planner has low confidence in the reported search data or is uncertain of the capabilities of the search sensors employed, the user may select "ignore." A brief reason for selecting "ignore" shall be recorded in the "comments" text field.

H.4.2.4 Modifying Runs. During the planning stage, inputs to a "run" may be modified and the Simulator and/or Planner components re-run as many times as necessary***. If the Simulator is re-run for any reason, the Planner must also be re-run to avoid any possibility of a mismatch between the Simulator and Planner runs***. When the user selects "Subsequent Search" to start planning for the next search epoch, the current run is "locked" and a new "run" is created using the next letter designator (e.g., Alpha run is locked, Bravo run is created).

H.4.2.5 Initiating a SAROPS "Run". The first SAROPS "run" for a case is initiated by right-clicking on the word "SAROPS" under the case name and selecting "New." This will create the Alpha run. (All runs for subsequent search epochs should be created using "Subsequent Search," which is one of the options when a "run" under "SAROPS" is right-clicked.) When the **Run Properties** window appears, ***the search planner shall enter his/her rank/rate and name in the "Planner" field. Appropriate comments shall be entered in the "Comments" field as free text.*** This text will be used in Paragraph 1.A. of the SAROPS SAP report. Select "Next>" to proceed to the **Search Objects** window.

H.4.2.6 Selecting and Describing Search Objects. The **Search Objects** window is where the search planner selects and describes the search objects that could have resulted from the distress incident. Both search object leeway parameters and detection parameters (basically capacity/size) are defined at this point. The idea is to obtain, in one place, all of the descriptive information about each search object that is necessary for determining its leeway parameters and estimating its effective sweep width. Of course, effective sweep width also depends on the sensor(s) in use and the environmental conditions on scene, but at this juncture we are only collecting information about the search object type(s) that pertain to this case.

(a) The upper portion of the **Search Objects** window contains the entire leeway taxonomy that is presently available. Most search objects of interest may be found in this list. The listed objects are cross-referenced to a database containing the estimated leeway parameters (leeway rate and divergence values) for each object type. When the window is first opened, the list is "collapsed" to show only major categories. These may be expanded by one or more additional levels to show specific types of objects that can be selected and added (using the "Add" button immediately below the taxonomy list) to the "Selected Search Objects" list in the lower portion of the **Search Objects** window. If none of the objects in the list has leeway properties sufficiently similar to the actual search object, the user may select "User-Defined Search Object" and enter the appropriate leeway parameters and detection parameters.

(b) The lower list in the "Selected Search Objects" section represents the types of search objects that could have resulted from the distress incident that has created the need for a search plan. Up to four object types may be added to the lower list. When an object is selected from the upper list and added to the lower list, if its leeway parameters are already in the SAROPS database, those values will be retrieved and the "Leeway" box to the right on the same line will be checked to indicate the leeway rate and divergence values have been obtained and entered. ***If this box is not checked, the user must click on the "Selected Search Object" type by "Name" in the lower list, select the "Leeway" button immediately below the "Selected Search Objects" list, enter the "Leeway Rate" and "Average Divergence Angle" in the fields provided, and select "OK." Placing the cursor over a search object type "Name" in the "Selected Search Objects" list will cause its leeway and detection parameters to appear for a few seconds so the user may see exactly what values are being used***.

(c) Most types of search object have a large range of possible sizes. ***Therefore, the user must click on the object "Name" in the lower list, select the "Detection" button immediately below the lower list, and enter the required data***. If the selected object type is a Life Raft, the user may enter the capacity (number of persons the raft was designed to hold) and the length, beam, and [cabin] height fields will automatically fill with default values. However, if the user has the specific dimensions of the raft, these fields may be edited to show the more accurate data—which will be used when estimating sweep width. If the search object is a vessel of some type, entering a length will cause default values for beam and height to appear. These may also be edited by the user if more accurate data is available.

(1) Once both the "Detection" and "Leeway" boxes are checked for each of the "Selected Search Objects," the user may select "Next>" to proceed to the **Scenarios** window.

H.4.2.7 Describing Scenarios. A Scenario is defined as a description of what may have led up to the distress incident. The reason for developing Scenarios is to allow SAROPS to compute a large sample of possible distress positions and times consistent with the available information and associated uncertainties about the actual distress incident. Scenario development is a critical success factor for planning any search, regardless of what search planning tools may be available. It requires careful analysis of the available information, assessment of each item's relevance, reliability, and importance, and making judicious assumptions to fill the inevitable gaps so that one or a few consistent, coherent "situational pictures" emerge. Four types of Scenarios are presently available in SAROPS: "LKP" (Last Known Position [distress position]), "LKP + DR" (Last Known Position plus Dead Reckon course and speed to the time of distress), "Area" (such as a fishing or operating area), and "Voyage" (intended voyage or flight plan of an overdue or unreported vessel or aircraft).

(a) **Multiple Scenarios may be entered**: If the time and place of the distress incident are accurately known, then a single Scenario may be sufficient. However, if a vessel could have been fishing in one of two possible fishing areas at the time of the distress, then two Scenarios will be needed. No limitation on number of Scenarios is imposed. However, rarely will more than three or four be needed and often one or two will be sufficient. When multiple Scenarios are used, they may be ***weighted*** relative to one another using a scale of 0 to 10. The default weight is always 5. If all Scenarios are equally weighted (regardless of whether all are assigned a weight of 5 or all are assigned some other value), they will all have the same influence. However, if one Scenario is given a weight of 3 and a second Scenario is give a weight of 9, it means the second Scenario is three times as likely to have occurred as the first Scenario.

(b) **<u>Scenarios are mutually exclusive</u>**: That is, the vessel or aircraft could not have done all of the things described in both of the two different Scenarios. For example, a craft departed point A bound for one of two possible destinations but has not arrived at either and is now overdue. The craft could not have gone to both at the same time or via the same route. That is not to say that some legs of the two routes cannot be identical. That may be possible and it is allowed. However, no craft can be in two different places at once.

(c) **<u>The list of Scenarios in this window is initially blank</u>**: Selecting the "Add" button below the list causes the available Scenario types to appear in a pop-up menu. Selecting one of these types causes another window to appear with the data fields necessary to describe a Scenario of that type. At this point the user may give the Scenario a name. Users are encouraged to replace the default value of "Scenario #" (where # is a number) with an appropriate descriptive name. The user may also assign a weight if he already has other Scenario(s) in mind and does not intend to assign them all the same weight.

(d) **<u>LKP Scenario</u>:** The simplest Scenario is the LKP. It is used whenever the position and time of the distress incident are approximately known. It consists of a position (latitude, longitude) which can be entered via the keyboard or by using the crosshair cursor provided immediately to the right of the "LKP" field. The probable error (X) of this position is entered in the next field in nautical miles. Below the "LKP" field is the "LKP Time" field. It is recommended that the time always be entered or modified using the clock-face button immediately to the right of the field. This brings up a "Calendar" tool from which the date may be selected from the current month. Both month and year may be modified using the fields above the calendar. Below the calendar are fields for specifying the time in hours, minutes and zone. Any time zone may be used to enter a time value, but all times are converted immediately to Zulu. To the right of the "LKP Time" field is the "Time Error" field. This indicates the amount of possible error (plus or minus) associated with the "LKP Time." A time error of +/- one hour means that the craft could have been at the LKP as early as one hour prior to "LKP Time" (but no earlier) and as late as one hour after "LKP Time" (but no later).

(1) The distribution of particles representing search objects around a LKP follows a circular bivariate normal distribution scheme. This is the same distribution that the manual method always assumes. The size of the distribution is characterized by the probable error (X) of the position. According to the definition of "probable error," a circle of radius X will contain half of the particles while the other half will fall outside that circle but inside a circle with a radius of about 3X. If a 3-D graph of the probability density were made, it would look like a circular hill with its peak at LKP and tapering off from there to a height of zero all the way around at a distance of about 3X from the center. Figure H-23 shows a 3-D graph of a circular bivariate normal probability density distribution.

(2) Below the fields used to describe the LKP is a list of the "Selected Search Objects" from the **Search Objects** window. Like Scenarios, search objects may be assigned weights and also like Scenarios the default weight in all cases is 5. To change a search object's weight, the user can right-click on that object's name in the list and select a weight from the menu that pops up. The chosen weight and the "Wgt %" will both appear. The sum of the values in the "Wgt%" column will always equal 100. Object weights reflect the relative probabilities, in the search planner's judgment, of the different object types resulting from the Scenario. That is, object weights are assigned

on a per-Scenario basis. The object most likely to result from a distress in one Scenario may be the least likely to result from a different Scenario. This provides the search planner maximum flexibility, if needed.(e) **LKP + DR Scenario:** The premise for this Scenario is that the missing craft's last known position was transmitted and received while the craft was still "ops normal" and that either it contained the craft's actual or intended course and speed or that such information was available from a voyage/flight plan. Later, the craft was able to transmit a distress call but no position was given. The "LKP +DR" Scenario just adds a "Distress Time," "Motion Type" (Rhumb Line or Great Circle), minimum, cruise, and maximum speeds, course, and course error to the "LKP" Scenario fields just described. In this type of Scenario and in the Voyage type of Scenario, speeds are in knots made good over the ground and courses are in degrees true made good. SAROPS does ***not*** attempt to estimate the influence wind and current may have on a craft moving under its own power. Minimum speed is the slowest the search planner thinks the craft would go, cruise speed is the most likely speed it would go, and maximum speed is the fastest the search planner thinks the craft would go.

(f) **Area Scenario:** The "Area" Scenario is nearly as simple as the LKP Scenario. It consists of "Area Time" (distress time) and time error fields followed by a list of positions that correspond to the corner points or vertices of a polygon that defines the "Area" where the distress is assumed to have occurred. Points may be added to the list individually from either the keyboard or the crosshair cursor with the "Add" button. If the area can be defined by points already plotted on a chart or computed and plotted by one of the SAR Tools, the "Auto" button provides a convenient way to construct the desired polygon. Selecting "Auto" changes that button's label to "Stop" and makes the cursor "hot." The mouse may then be used to position the cursor over a plotted point, and clicked to add that position to the list of corner points, moved to the next point, clicked, etc. until all desired points have been added. Then the cursor is moved to the "Stop" button and given a last click to get out of "Auto" mode.

(1) ***"Area" polygons must be "well-formed."*** This means that no two sides of the same polygon may cross each other. Although the software may not prevent a user from attempting to enter an ill-formed polygon, the simulation results will ***not*** be valid. ***Search planners shall not attempt to enter ill-formed polygons***.

(g) **Voyage Scenario:** The "Voyage" Scenario is by far the most complex. Voyages (or flights) may originate at a position/time with probable position error and time error or they may originate from an area with a time and time error. The voyage or flight may consist of a single leg between a departure position or area and a destination position or area. A voyage/flight may contain a number of legs via "waypoints" between departure and destination and these "waypoints" may be either positions or areas. "Add Point" and "Add Area" buttons are provided and these bring up windows for entering the necessary data in the same fashion as already described above. "Waypoints" should appear in the order the missing craft intended to pass through them, with the departure at the top of the list and the destination at the bottom. After the departure information has been entered, adding "waypoints" (points or areas) also requires entering speed and "motion type" (rhumb line vs. great circle) information about the nominal track from the previous "waypoint" to the one being entered. Speeds on legs connecting "waypoints" are specified with minimum, cruise, and maximum values on a per-leg basis. That is, speeds are allowed to vary from one leg to the next. Speeds are always interpreted as speeds made good. SAROPS does ***not*** attempt to estimate the influence wind and current may have on a craft moving under its own power. “Waypoints” may also be assigned “Dwell” or loiter times with associated time errors. For example, a fishing vessel’s intentions may have been to leave port, go to a fishing area, engage in fishing operations for 18 ±6 hours (that is, fish for some period of time between 12 and 24 hours) and then return to port. When the vessel does not return, it is suspected a distress occurred sometime during its intended voyage. SAROPS can simulate the entire voyage, including the time spent fishing, to develop a set of possible distress positions and times, update them for drift to the SIM End Time (usually the planned commence search time) and for twelve more hours beyond that (as described later), and help the search planner develop an effective, efficient search plan. Buttons are also provided in the “Voyages” window to move “waypoints” up or down in the list to change their order, to edit “waypoints” that have already been entered, and to delete “waypoints.” As “waypoints” are added, the distance from the previous “waypoint” and the expected ETA at the new “waypoint” are computed and displayed. Leg lengths are based on the center-to-center distance between successive waypoints. ETAs are computed on the basis of the expected departure time and cruise speeds on all legs. The total length of the voyage/flight is also computed and displayed, along with the earliest and latest ETAs at the destination.

(1) When SAROPS simulates voyages/flights, it creates for each particle an “Originating Craft” and a complete voyage/flight path with legs, times, and speeds selected from within the ranges specified by the user. SAROPS then selects a distress time that falls between the selected departure time and the computed arrival time at the destination. If no hazards (described in the next section) are present, the selected distress time is drawn from a uniform distribution of times between departure time and time of arrival at the destination. In other words, any given time in this range is as likely as any other time for the distress to have occurred. If hazards are present and have an “Intensity” other than “None,” then distress is more likely during periods of time when the Originating Craft would have been involved with a hazard.

H.4.2.8 Describing Hazards. The user may designate certain geographic areas as “hazardous,” meaning that if the missing craft’s track crosses that area during a voyage/flight, it is more likely to experience a distress incident while in the hazardous area than out of it. _Note that **Hazards** only affect **Voyages**_. Hazards do not affect any other Scenario types. When the user selects “Add” in the **Hazards** window, ***they must first choose either “Circle” or “Polygon.”*** Based on this choice, the user is then presented with the fields necessary to describe the hazardous area. ***Search planners shall assign a meaningful “Hazard Name” and then shall assign an “Intensity” value***. Four “Intensity” levels are allowed. “None,” the default, means the hazard has no effect. This choice is provided so a user may do “what if” analysis by removing the hazard’s effects without losing the data used to describe the hazard. The other three choices are “Low,” “Medium,” and “High” to indicate how much more likely a distress incident is in the hazardous area as compared to outside the hazardous area. In the simulation, the chances that a craft will come to grief in a hazardous area is a function of the hazard’s intensity and the amount of time the craft is exposed to the hazard, i.e., how long it would take the craft to cross the hazardous area. The user may also indicate that the area is either permanently hazardous (such as a reef, shoal or continuously busy shipping lane) or only temporarily hazardous between specific dates/times (such as an area where weather/sea warnings are in effect for some period). An enhancement to accommodate moving hazards, such as storms and weather fronts, is under consideration.

(a) In the event that in the simulation there is no encounter between an “Originating Craft” and a hazard, the hazard will have no effect on that particular sample voyage.

(b) When the user has entered whatever hazards are appropriate, if any, the “Next>” button is selected to move on to the **Previous Searches** window.

H.4.2.9 Describing Previous Searches. *Previous Searches shown in this window must contain all of the data necessary to evaluate those searches*. If the previous searches were planned using the Planner component, all of the necessary search data will be imported automatically. It is also possible to import searches that were planned with the “Patterns” tool outside of a SAROPS run by using the “Import” button provided. However, this practice is discouraged. An exception may be made for initial, quick response searches planned and performed without benefit of a prior SAROPS run. This could include situations where the survivor’s location seems to be known within close limits (small search area) and the elapsed time between the distress incident and arrival of an SRU at the survivor’s estimated position is less than one hour. ***Nevertheless, whenever practicable, search planners shall use the SAROPS Planner component to plan searches***.

(a) ***Regardless of source, the search planner must review each search area/pattern before proceeding past this window. The importance of this review cannot be overemphasized!*** To review a pattern, select it from the list and then select the “Edit” button below the list. The **Pattern Properties** window will appear. ***At this point the search planner shall carefully inspect and modify as necessary all the “properties” (geometry, SRU data, on scene weather, etc.) for the selected pattern so they reflect the search that was actually performed***. If the “Geometry” properties remained unchanged, but the pattern was only partially completed, the percent completed tool at the bottom of the “Geometry” tab may be used. ***In particular, for each Previous Search pattern, the search planner shall ensure the following fields are correct for the actual search that was performed***:

(1) **Geometry Tab**

a. Type

b. CSP

c. Length

d. Width

e. Orientation

f. Track Spacing

g. First Turn

h. Percent Completed

(2) **SRU Tab**

a. SRU ID

b. Command

c. SRU Type

d. Sensor

e. On Scene Weather (all fields, as appropriate to the Sensor)

f. Details (all fields, as appropriate to the Sensor)

g. Ensure all object types in the "Search Objects" list have values in the "Sweep Width" column.

h. Actual CST (commence search time) shall be entered using the clock face button/calendar tool.

i. Actual EST (end search time) shall be entered using the clock face button/calendar tool.

(3) **Evaluate Tab**

a. ***Reviewed must be changed from "No" to either "Tentative" or "Yes**."

(b) Once all patterns have been thoroughly reviewed and the user has properly accounted for all differences between the planned and actual searching by making appropriate changes to the **Pattern Properties** for each pattern, the "Next>" button is selected to proceed to the **AOI** window.

H.4.2.10 Describing the Area of Interest (AOI). The Area of Interest (AOI) is an area defined by a period of time, parallels of latitude and meridians of longitude. Its purpose is to define a time interval and an area for which environmental data (winds and currents) are needed to estimate search object drift.

(a) ***The search planner shall enter an appropriate "SIM End Time" using the clock face button/calendar tool***. (In the manual method and with previous software tools, this would have been called "*datum time*.") A time close to the planned commence search time (CST), such as the nearest whole hour or next whole hour from the planned CST, is strongly recommended for entry into this field.

(b) The geographic extent of the **AOI** should be large enough to contain all of the possible distress positions and all of the positions where the search object(s) may have drifted between the time of the distress and the "SIM End Time" plus twelve hours. SAROPS computes a default **AOI** "box" by assuming the search object could drift in any direction at a rate of three knots. Often this covers much more area than necessary, especially for longer drift periods. However, in areas with unusually strong currents or high winds, it may be necessary to extend the **AOI** in some directions and shrink it in others. To avoid downloading excessive amounts of environmental data from the Environmental Data Server (EDS) at the Operations Systems Center (OSC), along with the associated excessive data transfer delays, users should select the "Edit AOI" button and tailor the latitude and longitude extents of the **AOI** based on local knowledge of maximum likely drift rates in various directions.

(c) The lower portion of the **AOI** window contains a Gantt or time-line chart. The green portion of the horizontal bar at the top shows the time adrift while the yellow portion shows the 12-hour "planning window" for the next search. The time of the distress is graphically displayed, along with the periods that any hazards are in effect. Once the user is satisfied with the "SIM End Time" and the geographic extent of the AOI, "Next>" is selected to go to the **Leeway Winds** window.

H.4.2.11 Retrieving/Entering Leeway Winds. Leeway Winds are surface winds that are used to compute leeway, and the name may be changed to **Surface Winds** at a later date. An Environmental Data Server (EDS) is maintained at the USCG Operations Systems Center (OSC). The EDS obtains updated regional and global surface wind products from the National Oceanographic and **Atmospheric** Agency (NOAA) and the U. S. Navy several times per day.

The products are generated by these agencies' respective computer models.

(a) When the **Leeway Winds** window first appears, the "EDS" radio button is selected and a list of surface wind products from the NOAA and Navy computer models is displayed. Only those products that are both available from EDS and have values in the **AOI** are shown.

(b) To actually download data from the EDS, highlight the desired product and then select "Get EDS Data." A blue progress bar will appear and when the download is complete, the words "Download Complete" will appear below the progress bar, and below that there will be a list of date time groups corresponding to the times for which the computer model produced results.

(c) If wind data that covers the **AOI** was obtained previously, the "Cached" radio button will be selected to indicate that data has already been "cached" locally on the SAROPS server and it may not be necessary or desirable to contact the EDS for fresh data.

(d) The "Manual" radio button may be selected if the user wants to enter wind data manually. This data is not entered for a geographic grid, just time intervals. That is, for any given time interval, the wind is assumed to be the same everywhere.

(e) The "Confidence" field in the lower left of this window allows the user to select either "High" or "Low," with "Low" being the default. "High" confidence means the user believes the wind values can vary over a smaller range than with "Low" confidence. The impact is that the resulting distribution of particles and the corresponding probability grid will be smaller with "High" confidence than with "Low" confidence. In other words, "Low" confidence allows the wind speeds and directions to take on a larger range of possible values when computing drift vectors and that will increase the rate at which the distribution of particles expands over time.

(f) Once the desired wind product has been downloaded, the user selects "Next>" to go to the **Surface Currents** window.

Note: The meteorological standard for "surface wind" over water is the wind at 10 meters (about 33 feet) above the surface. The wind products obtained by EDS all comply with this standard, and leeway parameters are based on the same standard. Direct observations from weather buoys, off-shore navigational aids, oil platforms, vessels, aircraft, and observing stations ashore should be used with caution if the observing height is substantially different from 10 meters above the water surface. Wind data from observing stations ashore may not reflect the winds over nearby waters due to buildings, trees, anemometer placement and other factors that could substantially impact the observations. However, the wind data from the selected EDS product should be in reasonable agreement (direction and speed) with on scene observations. If in doubt about any source of wind data, contact the local office of the National Weather Service.

H.4.2.12 Retrieving/Entering Surface Currents. The **Surface Currents** window is identical to the **Leeway Winds** window in layout and behavior. Only the list of products is different. Once the desired surface current product has been downloaded, selecting the "Next>" button brings up the **Review** window from which the Simulator can be run.

(a) An important feature of the surface current products is that all except the tidal (ADCIRC) products are based on coupled ocean-atmosphere models. This means they already contain the wind driven component, which is why wind data is used only for leeway. Wind current is not added to ADCIRC values because areas where tidal currents dominate are also areas where the water is too shallow for the deep-water wind current formulas to work correctly.

(b) If SLDMB trajectories and surface current data are available, the selected product should be substantially in agreement with the SLDMB data over the period adrift. Do not depend on comparisons for a single time step. Activate “Currents” under “Layers” and the appropriate “Run,” import the SLDMB data, animate the display, and compare the SLDMB movements with the surface current arrows. If there is not substantial agreement, the search planner should check other EDS products to see whether one of those is in better agreement. Deployment of multiple SLDMBs is encouraged since a single buoy may get caught in a small feature not resolved by the environmental data product in use, thus making the disagreement seem worse than it would if several buoys were deployed at different locations in the area. With several SLDMBs deployed, it is also possible to create a surface current grid from their combined data using the “Sketch Tool” (an advanced topic not discussed here).

H.4.2.13 Review and Running Simulator. The final Simulator input is entered via the **Review** window. The **Review** window displays another Gantt, or time-line, chart that shows the time period for the simulation, the time(s) of the scenario(s), the time(s) when hazards, if any, are in effect, and the time interval(s) covered by the wind and current data sets. Hours of daylight are indicated by a white background while hours of darkness are indicated by a shaded background.

(a) Three radio buttons are located below the Gantt chart and these allow the user to select one of three “Simulator Modes”—“Fast,” “Normal,” and “Comprehensive.” These buttons control how many particles will be used in the simulation. “Fast” mode creates 2,500 particles per scenario, “Normal” creates 5,000 particles per scenario and “Comprehensive” creates 10,000 particles per scenario. If more than one search object type was specified in the **Search Objects** window, each scenario’s particles are divided equally among the object types. For example, if “Comprehensive” is selected and there are two types of search objects under consideration, then 5,000 particles will be of one type and 5,000 particles will be of the other type. The effects of different object ***weights*** are handled computationally, not by adjusting particle counts. Generally, the more particles, the better the quality of the output.

(b) Selecting the “Run Simulator” button causes a number of things to occur. SAROPS creates an appropriate number of particles for each of the “Selected Search Object” types, selects for each particle a set of leeway parameters from within the allowable range of possible values, selects a distress position and time for each particle (which may require simulating the pre-distress motion of the “originating craft,” encounters with hazards, etc.), computes the drift from the distress position/time up to the “SIM End Time” on a 20-minute time step, writes out positions as of the end of every time step (so “originating craft” and drift motions may be animated), updates particle probabilities to account for previous searching, produces a color-coded probability grid on the geographic display as of the “SIM End Time” and produces a “POS Report” showing the cumulative POS values. Probability grid cells with “hot” colors have higher probability densities and hence higher probabilities of containing the search object while cooler colors represent lower probability densities and lower probabilities that the search object is contained in those cells. The time slider below the geographic display may be used to view or animate the probability grid (and winds and currents if displayed) for other times within the period covered by the simulation (earliest drift start time to SIM End Time plus 12 hours). Buttons are provided below the time slider to “rewind”, “stop/pause,” “single-step” and “play” the animation.

(c) Whenever a probability grid is produced or updated on the screen for any reason, including its appearance following “Run Simulator,” moving the time slider, etc., the “Legend” that maps colors to cellular POC values should update automatically. One indication that this may not have occurred is the preponderance of a single color. To ensure the legend has been recalculated so as to get the full spectrum of colors and as much “color contrast” as possible, the user may expand the “Run” in the Table of Contents under “Layers,” right-click on “Probability Grid” and select “Recalculate Legend” at the bottom of the pop-up menu.

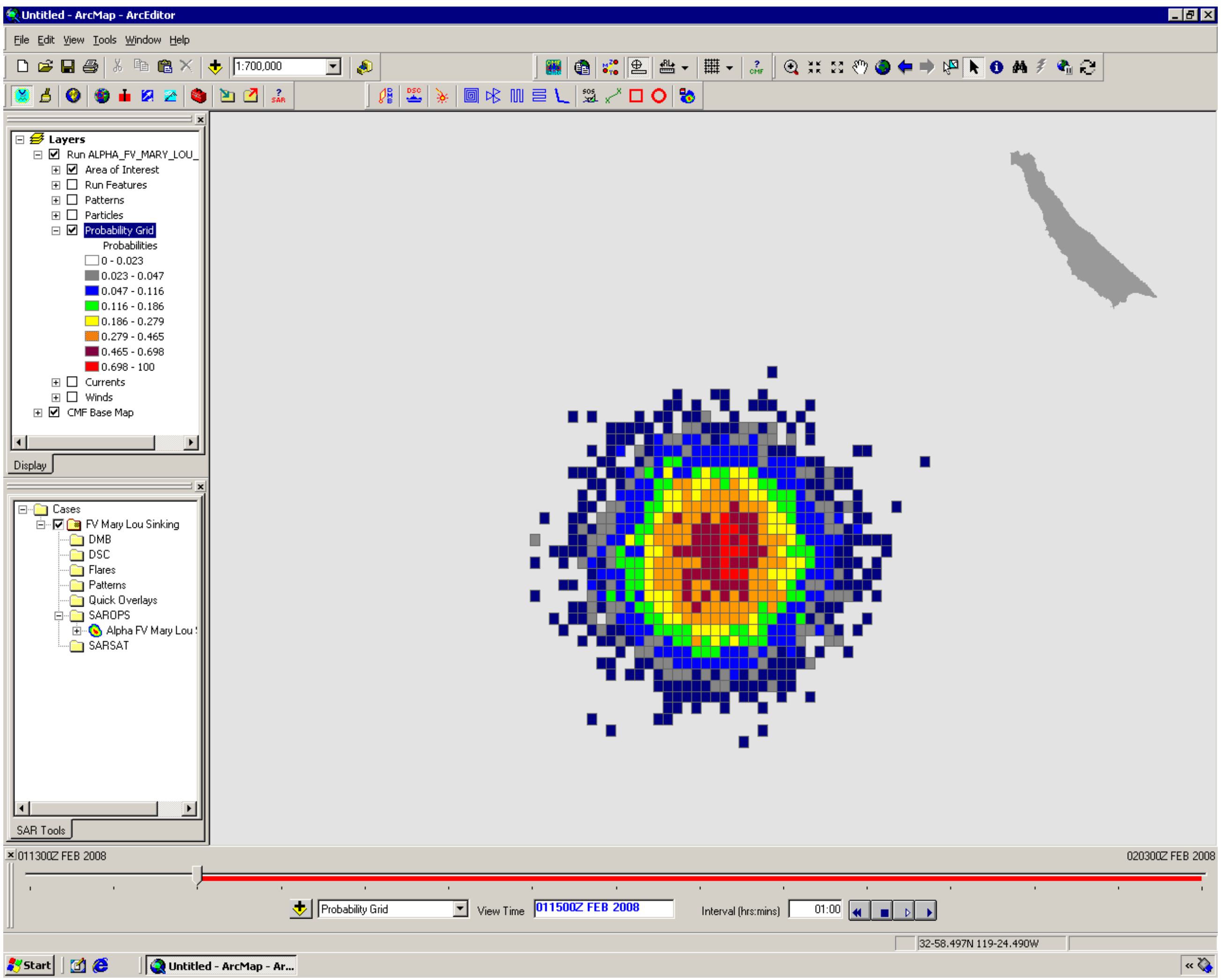


Figure H-18: SAROPS Probability Grid

The user also has the option of displaying the individual particle positions as a scatter plot.

From the Simulator POS Report (not shown) the user may either “Exit” to remove it from the screen, or the user may select “Run Planner” to proceed immediately to the Planner component. If the user chooses to “Exit”, the Planner component may be accessed by right-clicking on the “Alpha” run in the SAR Tools window and selecting “Planner.” The user may also return to the Simulator input wizard by right-clicking on the "Alpha" run and selecting "Simulator."

H.4.2.14 Simulator POS Report. The Simulator POS Report shows the POS values as of the SIM End Time ("datum time"). Note that the "as of" date-time-group (DTG) is always displayed in the gold title bar at the top of the report. If there are no "Previous Searches," all the POS values will be zero. Below the tabulated values is a Key describing how each of the numeric values should be interpreted.

H.4.3 Initiating and Performing a SAROPS "Run"—Planner Component

As just described above, the SAROPS Planner component may be started by selecting "Run Planner" from the Simulator POS Report that appears automatically at the end of a SAROPS Simulator run, or by right-clicking on the appropriate "run" under "Cases\SAROPS" in the "SAR Tools" window and selecting "Planner."

H.4.3.1 Describing On Scene Conditions. When SAROPS Planner is invoked, the first screen to appear is "On Scene Conditions." ***The user must select the type(s) of SRU(s) that he plans to use, along with the type(s) of sensor(s) to be employed***. ***Based on which sensor types are selected, the user must use the appropriate button to bring up the proper screen for entering the on scene conditions. For [daylight] visual search conditions, the user must enter the [meteorological] visibility, wind speed, sea height, and cloud ceiling***. The "Predicted" and "Observed" radio buttons are used only for record-keeping purposes and do not affect any computations. ***If NVGs are a selected sensor, then the user must select either "Helo" or "Vessel" and enter the data needed to estimate the lateral range curve parameters and the sweep widths for NVGs. If "Other" is selected, the necessary data must be entered via the "SRU Properties" screen that is invoked from the "SRUs" screen, as described in the next section.*** Once all of the data necessary to describe the general on scene conditions has been entered, the user selects "Next>" to proceed to the "SRUs" screen.

H.4.3.2 Describing SRUs. The SRU list on the SRUs screen is initially blank. To add an SRU to the list, the user selects "Add." This brings up a "SRU Properties" screen.

(a) ***The user shall enter a unique identifier for the SRU such as a vessel name, hull number, aircraft tail number, etc. The user shall enter the command that "owns" or is in tactical control of the SRU. The user shall select the SRU type from the drop down list***. The default value is "Helo." Although not all of these fields require data in order to plan the search, they are needed for the Search Action Plan (SAP). Next, the user enters the CST (commence search time). Selecting the clock-face button to the left of this field brings up the "Calendar" tool that is set to the "SIM End Time" and date by default. Selecting "OK" will cause this date and time to appear in the CST field. ***However, if the default time is not the correct CST, then the user shall enter the correct CST using the "Calendar" tool and then select "OK."***

(b) ***Next, the user shall enter the On Scene Endurance (OSE).*** SAROPS automatically computes the "Search Endurance" as 85% of this value and uses the Search Endurance together with the "Search Speed" to compute the total available search track length. The user should give careful thought to the On Scene Endurance entry. The total On Scene Endurance an SRU can provide may not be the best choice when the total area of the probability grid is small or there is a need or desire to split an SRU's available effort among two or more search areas during a single sortie.

(c) When the total area of the probability grid is small, the following factors should be considered:

(1) The number of on scene track line miles the SRU can provide.

(2) The effective sweep width(s) for the search object(s), environmental conditions and sensor(s).

(3) The minimum track spacing the SRU can reliably perform.

(d) When the total area of the probability grid is small, search planners should consider the following guidelines:

(1) Note the size and location of the probability grid at the planned commence search time.

(2) Move the time slider to the first whole hour following the planned end search time and again note its location and size of the probability grid.

(3) Imagine (or draw) a rectangle that contains the probability grids during this time interval and estimate its size in square nautical miles.

(4) Compute the available on scene track miles for the SRU (OSE × 0.85 × Search Speed) and multiply this value by the sweep width (***W***) of the search object about which the search planner has the most concern for the survivor's safety to get the available search effort, ***Z***.

(5) Multiply the available on scene track miles by the SRU's minimum track spacing to find the smallest area ($\boldsymbol{A_{minTS}}$) the SRU can search if all of its on scene track miles are used.

(6) Divide the area of the rectangle from step 3 above by the larger of ***Z*** and $\boldsymbol{A_{minTS}}$ and, if the result is significantly less than 1.0, multiply the total available OSE by this fractional value to get a more appropriate OSE value for input to Planner. Otherwise, use the actual OSE.

(e) There is no need for a great deal of precision in the above computations. Rough "eyeball" estimates will do. The goal is simply to avoid inputs that force SAROPS Planner to produce a search plan that wastes significant amounts of search effort on regions that have little or no probability of containing the search object. Such effort could be better employed in a subsequent search immediately following the first search if the first search should prove unsuccessful. It is not advisable to force Planner to produce search plans with much smaller track spacings than the SRUs can actually perform, although this issue has already been addressed to some degree by providing the minimum track spacing values that Planner is allowed to use.

(f) Another situation where the search planner may want to adjust the on scene endurance occurs when the probability grid shows two or more "hot spots" of higher probability density separated by some not too large distance and/or region of lower probability density, and there is sufficient searching effort available to cover both of them reasonably well during a single sortie. In this case, it may be prudent to make one actual SRU look like two with about half of its OSE assigned to each part. For example, a single HH65 with 2.2 hours OSE could be entered into SAROPS as ***6501a*** and ***6501b*** with one hour OSE each, leaving 0.2 hours for transit between the first and second search areas. The commence search time (CST) values would also have to be adjusted accordingly. For example, if ***6501a*** had a CST of 1100Z, then ***6501b*** would have a CST of 12:12Z. Such a split could significantly improve the POS since otherwise SAROPS would either concentrate all of the available effort on just one of the "hot spots" or spread it out over both "hot spots" ***and*** the lower probability region between them.

(g) Once the OSE has been entered, the end search time (EST) is automatically computed and displayed. ***The user must then enter the Search Speed in knots. After this value is entered, the user must select the (primary) Sensor that will be used from the drop down list of choices obtained by selecting the down arrow next to the Sensor field.*** Unless it is grayed out, the user then selects the “Details” button and fills in the appropriate information such as search altitude for Visual search. For Visual search, the “Select” button brings up a table showing sweep widths for various altitudes. The user may select an altitude from this list and then “OK” or “Cancel” and enter it directly from the keyboard in the “Search Altitude” field. Once the “Details” have been completed, the sweep width(s) for the search object(s) will be computed and displayed in the “Search Objects” section of the “SRU Properties” window.

(h) Each search object type in the simulation and its sweep width is displayed in the “Search Objects” section. There is also a check box next to each of the named search object types. If the box is checked, then objects of that type will be considered for planning purposes as Planner attempts to maximize the POS. If the box is ***not*** checked, then the SRU identified in the first field of the “SRU Properties” window is made, for planning purposes, completely “blind” to that search object type and objects of that type will ***not*** be considered by Planner as it attempts to maximize POS with that SRU. This is useful in situations where the search planner wants to concentrate the search effort (maximize the POS) for the most vulnerable search object type (such as a PIW) and then accept whatever POS results are produced for the other search object type(s). If all SRUs had only “PIW” checked, for example, then the result would be a near-optimal search plan for PIWs. Another way this feature can be used is to have Planner try to have one SRU concentrate on a particular search object type (e.g., have the helicopter concentrate on PIWs) while another SRU concentrates on a different search object type (e.g., have the fixed wing aircraft concentrate on life rafts). This is most useful if the two search object types have separated somewhat due to differing drift rates and/or directions. It is less useful in the early hours following the distress while all search object types are still well-mixed in the same general area.

(i) **Caution:** When multiple search object types are involved, SAROPS Planner will initially be “attracted” to those having the largest sweep width, all other things being equal. This is most apparent when differences in sweep width are large, such as a 6-person life raft compared to a PIW. Since Planner’s objective is to maximize overall POS, an “optimal” search where both object types are equally weighted could be very close to the same as an optimal search for just the object having the largest sweep width. It could be substantially sub-optimal for small search objects such as PIWs. If an optimal PIW search is desired, then all SRUs should have only the PIW box(es) checked. When the completed search is evaluated in Simulator as part of planning a subsequent search, all object types will be included regardless of whether some types were ignored for planning purposes during the planning phase. No information of data is “lost” by un-checking search object types on the “SRU Properties” page for the purposes of planning a search.

(j) Once the user is satisfied with all of the entries for “SRU Properties,” the “OK” button is selected to return to the “SRUs” page. At this point, the user may either add another SRU or proceed to the next step. At the bottom of the “SRUs” page are two check boxes where the user may select whether Planner is to include only adrift particles, only landed particles, or both adrift and landed particles as it tries to maximize POS. Adrift-only is the default.

The decision on whether to include "Landed" particles will depend on the circumstances of the case. If particles are becoming beached on an unpopulated or sparsely populated shore, then it may be appropriate to include "Landed" particles. A separate shoreline search in addition to an "adrift-only" search plan may also be appropriate. On the other hand, if survivors reach shore (especially if well-populated), the user may decide they would have been reported or at least are no longer in immediate danger and elect to not include "Landed" particles for SAROPS' Planning purposes. Finally, the user selects "Run Planner" to have SAROPS Planner develop a recommended search plan.

H.4.3.3 Completing the Search Plan. When "Run Planner" is invoked, the SAROPS Planner develops an initial plan as a starting point based on heuristics (rules of thumb) programmed into the Planner software. It then spends approximately 90 seconds trying to improve upon this plan as much as possible (maximize POS) while not violating certain operational constraints or rules.

(a) One rule is that aircraft patterns may not overlap one another and vessel patterns may not overlap one another. However, aircraft patterns may overlap vessel patterns.

(b) Another rule is that an SRU may not be assigned a track spacing less than the minimum specified for that SRU or type of SRU. For helicopters, the default minimum track spacing is 0.1 NM, for fixed wing aircraft it is 1.0 NM, for boats it is 0.1 NM and for cutters it is 0.5 NM.

(c) ***In addition, each search area must be sized so that the SRU's available on scene track line miles are used up in a standard complete PS or CS pattern (no partial legs allowed).***

(d) The method Planner uses for improving a search plan is to make relatively small moves (shift, rotate, stretch or squeeze search areas) to bring the plan into compliance with the operational rules while giving up as little POS as possible, and then to make similar small moves to try and improve the POS without violating the operational rules.

(e) The best (highest POS) plan to date is always saved and is replaced only when a better plan is found. If Planner finds it cannot improve the plan any further but still has some of the 90 seconds left, it will pick a completely new "initial" plan and try to develop a better plan from a different starting point. If successful, that plan will become the new "best to date" plan. Otherwise, the "best to date" plan will remain unchanged.

(f) In short, Planner uses a semi-intelligent trial-and-error process to create and evaluate hundreds of complete search plans and return the one that produces the highest POS. This means that Planner results are not guaranteed to be the absolute best possible plan, but they should produce a POS value that is very close to "perfectly optimal" for the simulated search objects and search conditions. Often the POS value will be so close to "perfectly optimal" that the difference will be insignificant—possibly only a small fraction of one percent. This is especially true when three or fewer SRUs are involved. The difficulty, and hence the amount of computing time required for developing a near-optimal plan within the operational rules increases exponentially as the number of SRUs increases.

(g) More time can be provided to Planner simply by selecting the "<Back" button to return to the previous window, then selecting "Run Planner" again without changing any of the inputs. When this happens, the user will be asked "Re-run Planner?" and an affirmative answer will cause Planner to run for another 90 seconds, starting with the rectangles it returned at the end of the previous 90-second run.

(h) When Planner completes its 90-second "run," the "Patterns" window will be displayed. Initially, this window lists the SRUs and estimated POS values as "Plan pos %." The recommended search rectangles are plotted on the geographic display with a default color of bright green.

(i) To fill a recommended rectangle with a search pattern, the user selects an SRU from the list with a left-click of the mouse, then selects the "Edit/Create Pattern" button. This will cause the recommended search pattern to be plotted on the geographic display and will also cause the "Pattern Properties" window to appear with the "Geometry" tab displayed. This tab shows the pattern title, type, center point, commence search point (CSP), length, width, orientation, magnetic compass variation, track spacing and direction of the first turn (left or right).

(j) Just below the "First Turn" section is a mostly blue button. Selecting this button puts SAROPS into geographic edit mode that allows the search planner to use the mouse to manipulate the search pattern on screen.

(k) When a pattern is edited, whether on the geographic display or by modifying the values on the "Geometry" tab, the patterns tool allows only "legal" or "well-formed" patterns. ***The search area dimension in the direction of creep must be an integer multiple of the track spacing. The dimension perpendicular to the direction of creep must be such that a whole number of search legs consumes the SRU's available on scene track length***.

(l) Near the bottom of the "Pattern Properties" window is a POS field that initially contains "Needs Refresh." Selecting the yellow calculator icon to the right of this field will cause the pattern to be evaluated and the resulting POS value will appear. This value will also appear in the "Eval pos %" column of the "Patterns" window. If no changes have been made to the Planner-recommended rectangle and resulting pattern, this value should be very close to the one returned by Planner initially as "Plan pos %." If changes are made to the recommended pattern, the calculator icon at the bottom of the "Geometry" tab will turn yellow if it is not already yellow. Selecting it will cause the POS for the modified pattern to be computed and displayed. In this way the user can attempt to improve the POS themselves.

(m) However, users should not attempt modifications until a pattern has been created for each area and the "Compute POS" button on the Patterns screen has been selected. This will display the "Total POS" for the search plan. Unless it is obvious that a significant improvement should be possible, it is unlikely that the user will be able to make any worthwhile improvements. Users are cautioned against using their extremely scarce and valuable time chasing miniscule improvements in POS values.

(n) The remaining tabs and the fields they contain should be self-explanatory. On the "Evaluate" tab, the "Reviewed" field should be left as "No" until after the pattern has actually been completed and the pattern is being reviewed as a previous search in the SIM component of SAROPS as part of planning a subsequent search.

(o) When the user has finished making any desired changes to the search pattern, "OK" is selected to return to the "Patterns" window. At this point another SRU may be selected from the list (if there is another one present) and the above process repeated to generate a pattern for that SRU.

(p) ***When patterns have been created for all SRUs, the user shall select the "Compute POS" button to evaluate the search plan as a whole***. The result will be values for "Total POS" and "Cumulative POS" in the Patterns window along with a separate "Planner:POS Report."

H.4.3.4 Interpreting POS Values in the "Patterns" Window. When the "Compute POS" button is selected SAROPS evaluates the search plan by simulating the simultaneous movements of the SRUs and the search objects (particles) and adjusting the individual particle "Pfail" values.

(a) **A relatively complex process**: For each leg of each search pattern, SAROPS computes the SRU's CPAs to each particle along with the time of each CPA. SAROPS uses "lateral range curves" that describe the "one pass" probability of detecting a search object as a function of distance at CPA. Each combination of SRU, search object type, and on scene conditions has its own lateral range curve. Pfail adjustments are made according to these curves at the time of CPA based on the distance at CPA. ***However, the software is programmed so that at least a certain minimum time must elapse between CPAs for both Pfail adjustments to be used***. If the time between CPAs is used, then only one of the adjustments (the larger "POD" of the two) is used. This is done to assure statistical independence between detection opportunities and prevent "double counting" detection opportunities on the insides of turns, etc. Users need not be concerned with these details other than having some assurance that the software developers considered and addressed these issues.

(b) **Plan POS%:** When Planner computes and evaluates search plans in its quest for the "best" (highest POS) plan, it uses only a subset of the particles in the simulation. This "down-sampling" is done for reasons of computational efficiency to increase the number of different plans that can be tried, without sacrificing the validity of the result. However, it does open the possibility that the **Plan pos%** and the **Eval pos%** will not be exactly the same. A **Plan pos%** value is provided for each pattern in the search plan. It represents the chances that the SRU performing that pattern will detect the search object. It is assumed, for the purposes of these computations, that the pattern is performed alone as if the other patterns in the plan did not exist.

(c) **Eval POS%:** When the "Compute POS" button is selected, SAROPS evaluates the search plan based on ***all*** of the particles in the simulation. This value is computed with the same assumptions as the **Plan pos%** and is generally the same as the **Plan pos%.** However, it may differ slightly due to rounding and/or the fact that all particles are being considered rather than just the subset used during the planning phase of the Planner run. Users should not be concerned by small differences between the **Plan pos%** and **Eval pos%**.

(d) **Total POS:** This is the POS value associated with the current search plan, assuming with 100% certainty that the search object is still afloat and detectable and that the probability grid as of the earliest CST accurately represents the probability density distribution for the search object's location at that time. In short, if we consider only the probability grid for this search, including any adjustments from previous searching, and assume the POC for the probability grid taken as a whole is 100%, then the **Total POS** represents the chances for finding the search object with this search plan. **Total POS** represents the combined effects of all patterns in the search plan.

(e) **Cumulative POS:** The **Cumulative POS** represents the chances that, by the end of this search if everything goes as planned, the search object will/should have been located if all the data and assumptions used to date are accurate.

H.4.3.5 The POS Report. The POS Report contains the same total POS (called "Plan Total") and

Cumulative POS values as the Patterns window, but it contains other information as well. If the user scrolls to the top of the POS Report, the previous Simulator POS Report as of the SIM End Time [DTG] will appear. This is followed by the Planning POS Report as of the latest End Search Time for the search that was just planned. This report contains the projected POS values if the plan is carried out.

H.4.3.6 Promulgating the Search Action Plan. Once the a "run" (Alpha, Bravo, etc.) has been completed through the Planner stage, the details for each search pattern can be found by expanding "run" in the "SAR Tools" window (Cases/SAROPS/[Epoch Case Name, e.g., Alpha Mary Jane Overdue]).

(a) The name of each pattern in the search plan will be displayed below the "run" name. Right-clicking on the pattern name brings up a menu of choices. Selecting "Summary" allows the user to choose from three formats. The "Standard Format" is a human-readable textual description of the pattern and its properties. Also available are NMEA (National Marine Electronics Association) format for navigational system inputs and CRD (Common Route Definition) format which is a burgeoning standard for routes and is consumed now by the FalconView (aircraft) and Vega (cutters) systems.

(b) ***Users shall promulgate a formal Search Action Plan (SAP) in accordance with Section 3.4.12.1 and Appendix C of this Addendum***. SAROPS produces a nearly complete SAP report for this purpose. ***The SMC shall ensure the necessary additional data is entered into the SAP and that it is transmitted to all participating units and other appropriate parties***. The SAP report is formatted so that it may be copied and pasted into a message form or an e-mail for further transmission. It may also be printed and faxed. Voice transmission is allowed but discouraged. Sometimes it cannot be avoided, such as voice transmission to an SRU already en route or at the scene. ***In such cases, SRUs must be advised of any other SRUs in the area and their search area assignments as a matter of safety***. Section H.8 contains further information on SAPs.

H.4.4 Subsequent Searches

Right-clicking on a SAROPS "run" brings up a menu where one of the options is "Subsequent Search." Selecting this option causes the existing "run" to be "locked" and creates and opens a new "run" for the next search epoch. For example, selecting "Subsequent Search" from the Alpha "run" will cause it to be "locked" and will create and open a Bravo "run." As the case progresses, this can be done for as many search epochs as necessary. ***Search planners shall use the "Subsequent Search" option to plan each successive search during a case.***

H.4.5 Closing/Suspending, Exporting, and Archiving

H.4.5.1 ***When a case is closed or active search is suspended pending further developments, the SMC shall perform the following steps***:

(a) Using the "Subsequent Search" option from the run used to plan the final search, create a new "run" as if preparing to plan another search.

(b) Enter data using the simulator wizard windows as needed, including any modifications needed to accurately describe the previous (final) search, updated environmental data, etc.

(c) Ensure the "SIM End Time" is set for some time after the last SRU departed scene and run the simulator. This will create a final "Simulator POS Report" that computes the final POS values.

(d) Right-click on the case name at the highest level under "Cases" in the "SAR Tools" window and select "Properties." Ensure all fields have been completed accurately, and then select "OK."

(e) "Export" the case to a .sar file.

(f) Attach the .sar file to the corresponding case files in MISLE.

Section H.5
Search Plan Variables

The goal of search planning is to cover as much of the search area as possible with a reasonable POD with the ultimate aim to maximize POS. Area coverage is a function of area size, corrected sweep width, and the number, speed, and endurance of SRUs used. POD and Coverage are measures of the thoroughness of a search. Coverage is a function of corrected sweep width and track spacing for search patterns with straight, parallel, equally spaced search legs. For other types of patterns, Coverage is a function of corrected sweep width, distance covered by the SRU while searching in the area, and the size of the area covered. POD is a function of Coverage. POS is a measure of search effectiveness. The planner should balance area size and coverage (POC and POD), along with pattern orientation and CSP, so that POS is maximized.

H.5.1 Number of SRUs

H.5.1.1 An optimal search plan should always be developed as time permits. Every effort should be made to obtain sufficient and suitable SRUs to attain a reasonable POS, especially on the first search.

H.5.1.2 The first SRUs dispatched are usually alert SRUs, and are normally sent to datum or on a trackline search. Backup and standby SRUs are dispatched next. Supplementary SRUs may be requested from other activities.

H.5.1.3 When sufficient SRUs are not available, optimal use of those that are available becomes even more important. Developing an optimal search plan is more important when resources are scarce than when they are plentiful.

H.5.2 Search Time Available

H.5.2.1 The amount of search time available (*T*) is of paramount importance. Since survival rates normally decrease with time, the SMC is always working against the clock. Two major controlling factors for computing search time available are SRU endurance and amount of daylight available. Optimal search plans minimize the average time required to find survivors as well as maximize POS.

H.5.2.2 **Search Endurance** of the individual SRUs is normally more critical for aircraft. To calculate on scene endurance for an SRU, total mission endurance should be determined, contacting the parent agency if necessary. Time needed for transit to and from the assigned search area is deducted from total endurance, to obtain on scene endurance. Search endurance can be assumed to be 85 percent of on scene endurance, allowing 15 percent for identifying sighted objects, navigating turns at the ends of search legs, etc.

(a) Generally, diversion to identify a target will have no appreciable effect on area coverage as long as the SRU "fixes" the location and time of departure from the search pattern and returns to the same point to resume search within a reasonably short time.

(b) When SRUs operate far from home base, they can sometimes be deployed to an advance base so more time will be available for searching, and less time will be spent en route to and from the search area. If an extended search is anticipated, the search planner should consider deploying augmented or double crews to maximize asset availability.

H.5.2.3 Sunset is the usual cut-off point for visual search with the unaided eye. Every time the SRU diverts, available daylight is reduced. Search object detectability changes after sunset. Searching after sunset is normally restricted to using NVGs, searching for visual detection aids (e.g., flares, strobe lights) or using electronic sensors (e.g., radar), dictating changes in track spacing to obtain desired coverage for the optimal search.

H.5.3 SRU Ground Speed

SRU ground speed (*V*) is important when calculating attainable area size. The faster the SRU moves, the larger the area covered per unit time at a given track spacing. However, increased speed may adversely affect endurance, which would tend to reduce the total area covered. Increased speed may also adversely affect POD by reducing the effective sweep width and hence the coverage factor for a given track spacing. ***When deciding what search speed to assign, the search planner must carefully assess the capabilities of the SRU, the effects on sweep width, and how on scene endurance and total available SRU track length on scene will be affected***.

H.5.4 Track Spacing

Track spacing (*S*) is the distance between two adjacent parallel search legs as shown in Figure H-19. It directly influences coverage (*C*). Corrected sweep width (*W*) is a measure of detection capability and will vary with search object type, SRU/sensor type, and environmental conditions. For search patterns that use straight, equally spaced parallel tracks, coverage is computed as the ratio of the corrected sweep width to the track spacing ($C = W/S$). ***The more difficult an object is to detect, the closer together the search legs must be to achieve a given coverage. See Figure H-21***.

NOTE: In darkness or extremely low visibility, surface search craft should periodically stop their engines and conduct an auditory search. If it is known or if there is a high probability that the PIW has night detection aids, a search may be conducted with track spacing compatible with the sweep width for the type of detection aid

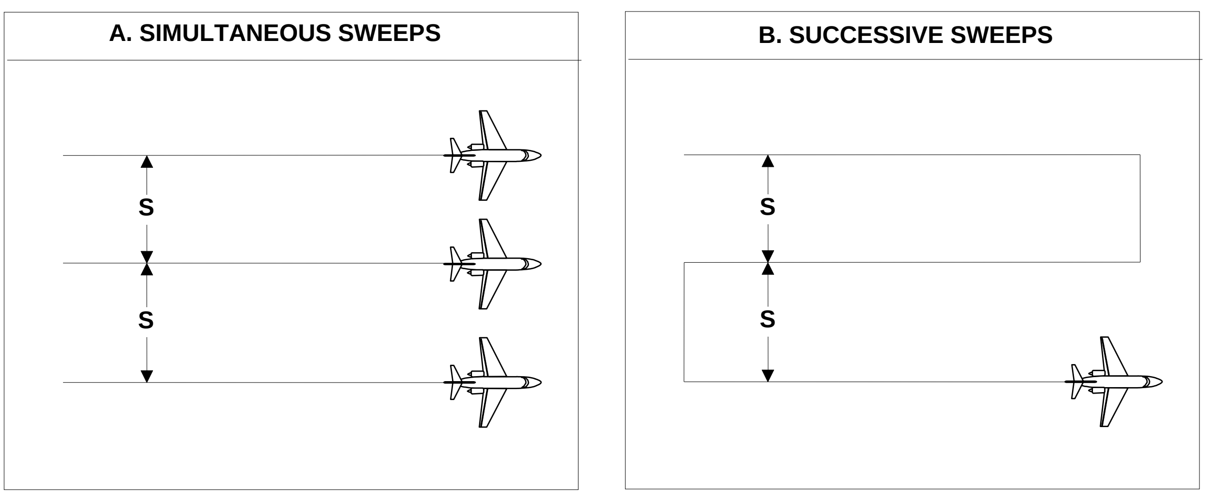


Figure H-19 Track Spacing

H.5.4.1 POD and Track Spacing Relationship. POD can be increased by decreasing track spacing (which increases coverage), but decreased track spacing means that either less area can be covered, that more time is needed to cover the same area with the same number of SRUs, or that more SRUs are needed to cover the same area in the same amount of time. If additional time and/or SRUs are not available, then only reducing the amount of area covered can increase POD. Conversely, increasing track spacing can expand the area covered, but this will decrease POD. The ideal “compromise” between area covered and POD is the one that produces the maximum POS.

H.5.4.2 Track Spacing Practical Limits. The practical limits of SRU turning radii and navigational accuracy limit how much track spacing can be reduced. Optimum track spacing yields maximum POS during the time available, consistent with the economical use of available SRUs.

H.5.4.3 Track Spacing for Coast Guard Search Platforms. The most frequent search platforms used by Coast Guard resources for coastal SAR cases are small cutters (WPB), boats (MLB/RB-M/UTM), and helicopters (HH-65/HH-60). It is recommended that Coast Guard units copy and laminate the appropriate sweep width tables from appendix H for each SRU and include them in the SRU pilot or coxswain kit as a quick on scene reference for initial searching while more thorough search planning is being conducted.

H.5.4.4 Persons in the Water (PIWs). In most cases, a track spacing of 0.1 NM is the lower practical limit for accurate surface navigation. For initial response coastal surface PIW searches when the probable error of the PIW’s position at CST is estimated to be 0.5 NM or less, a track spacing of 0.1 NM is recommended in the absence of a formal search plan from the cognizant Sector, District, or Area SMC. For larger estimated probable errors, the track spacing should be increased proportionally for such initial response searches. For unassisted visual searches under these circumstances, helicopter SRUs should perform multiple searches of the assigned search area to achieve a coverage equivalent to that of the recommended surface search track spacing since frequent tight turns are not conducive to effective scanning. Areas assigned to helicopters should provide for at least one minute of level flight at search speed for each search leg. As soon as more formal search planning methods (e.g., SAROPS) are brought to bear (which could be for the initial response), the assigned track spacing should be consistent with maximizing POS.

H.5.5 Coverage Factor (*C*)

Coverage Factor (*C*) is a measure of search thoroughness or how well an area was searched. It is used as an entering argument when calculating POD.

H.5.5.1 For patterns of straight equally spaced parallel tracks relative to the search object, the relationship of coverage to sweep width and track spacing is:

$$Coverage\,Factor\left(C\right)=\frac{Sweep\,Width\left(W\right)}{Track\ Spacing\left(S\right)}$$

H.5.5.2 Sweep width and track spacing are measured in the same units (nautical miles or yards), and *C* is dimensionless. The general relationship among coverage, sweep width (*W*), search speed (*V*), search endurance (*T*) and the amount of area (*A*) covered is:

$$Coverage\,Factor\,(C) = \frac{W \times V \times T}{A}$$

H.5.5.3 ***Again, the units of measure must be consistent, such as W in nautical miles, V in knots, T in hours and A in square nautical miles***. This equation may be used to compute coverage regardless of the type of search pattern or lack of one, so long as the searching effort is spread over the area covered in a reasonably uniform fashion.

H.5.5.4 Higher coverage factors indicate more a more thorough search. Coverage factors of 0.5 and 1.0 are compared in Figure H-20. If adequate coverage of the desired area cannot be obtained with the available assets, then additional SRUs should be found expeditiously.

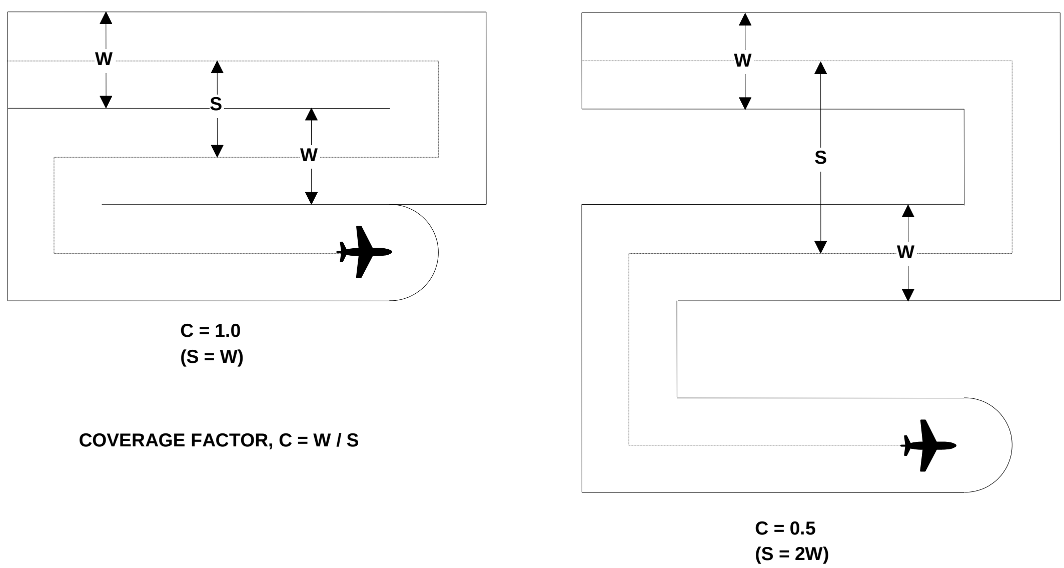


Figure H-20 Coverage Factors

H.5.6 Measures of Search Effectiveness

POS is used as the measure of search effectiveness, **NOT** POD. Although POD has been in the search planning vocabulary and used with the manual search planning method for many years, POS has always been the true measure of search quality.

H.5.6.1 **Probability of Success (POS)** depends on two factors: (1) the probability that the object is in the area searched (POC) and (2) the probability of detecting that object if it is present (POD). In simple terms, Probability of Success is the product of the Probability of Containment and the Probability of Detection: POS = POC x POD.

(a) As discussed earlier, SAROPS computes POS by modeling the detection process at a much more detailed level. The "safety factors" given in earlier guidance were really optimal search factors that maximized the POS for the levels of effort required to search the recommended search area with a coverage of 1.0. Major shortcomings were that POS and the goal of maximizing its value were not explained, methods for computing its value were not provided because no method for estimating POC was provided, and no provision was made to accommodate levels of effort other than those required to cover the recommended search areas at a coverage of 1.0. This left POD as the only apparent measure of search results, but its limitations in this role were not explained.

(b) POS estimation requires both POD and POC estimates. It is the probability that a given search will succeed in locating the search object. Cumulative POS is the probability that the search should have succeeded by now if all the facts and assumptions that went into developing the search plans and evaluating the search results were substantially correct. Attaining a high POS value without finding the search object is a clear indicator that all of the case data and assumptions need to be carefully reviewed to determine whether an error has been made, whether a plausible scenario was left out, whether some elements of the case data were given more or less credence than they deserved, etc.

H.5.6.2 **Probability of Detection (POD)** is the statistical measure of search sensor detection performance. It is a function of sweep width and track spacing. It is a conditional probability meaning that it is the probability of detecting the search object, assuming it is in the search area.

(a) Probability of Detection is a function of coverage and the total number of searches in an area, and describes the thoroughness of a single search or the cumulative thoroughness of multiple searches of the same area relative to the search object. In maritime SAR, cumulative POD has relatively little meaning because search object motion has a significant random component due to the unpredictable vagaries of winds and currents and search object responses to these forces. Cumulative POD is much more useful when looking for stationary objects using search areas that have fixed boundaries—a common situation in land search.

(b) For any search planned with the manual method, the optimum search radius determines the size of the optimum search rectangle for the amount of search effort that is available on scene. This in turn determines the optimum coverage. There are two optimal search factor curves in the *IAMSAR Manual*-one for “ideal” search conditions and one for “poor” or more correctly “normal” search conditions. These optimal search factor curves are based on the two POD vs. Coverage curves shown in Figure H-21. Intermediate values may be used if conditions are between “ideal” and “normal”. If in doubt, use the “normal” curves.

(1) Normal conditions include any situation significantly less than ideal. Anytime the corrected sweep width for a search object is less than the maximum uncorrected sweep width for that object, conditions are less than ideal and a value less than the ideal should be used. When the corrected sweep width for a search object is less than 90% of the maximum possible value for that object, the normal conditions curve should be used. Additional discussion on POD curves may be found in the *IAMSAR Manual*.

The “Ideal Search Conditions” curve in Figure H-21 is based on the assumptions that search patterns will be executed precisely, sweep width is accurately known and constant throughout the search, and the search object is in the search area. The “Normal Search Conditions” curve in Figure H-21 relaxes the first assumption but still requires that the searching effort be spread approximately uniformly over the area. The other two assumptions remain intact.

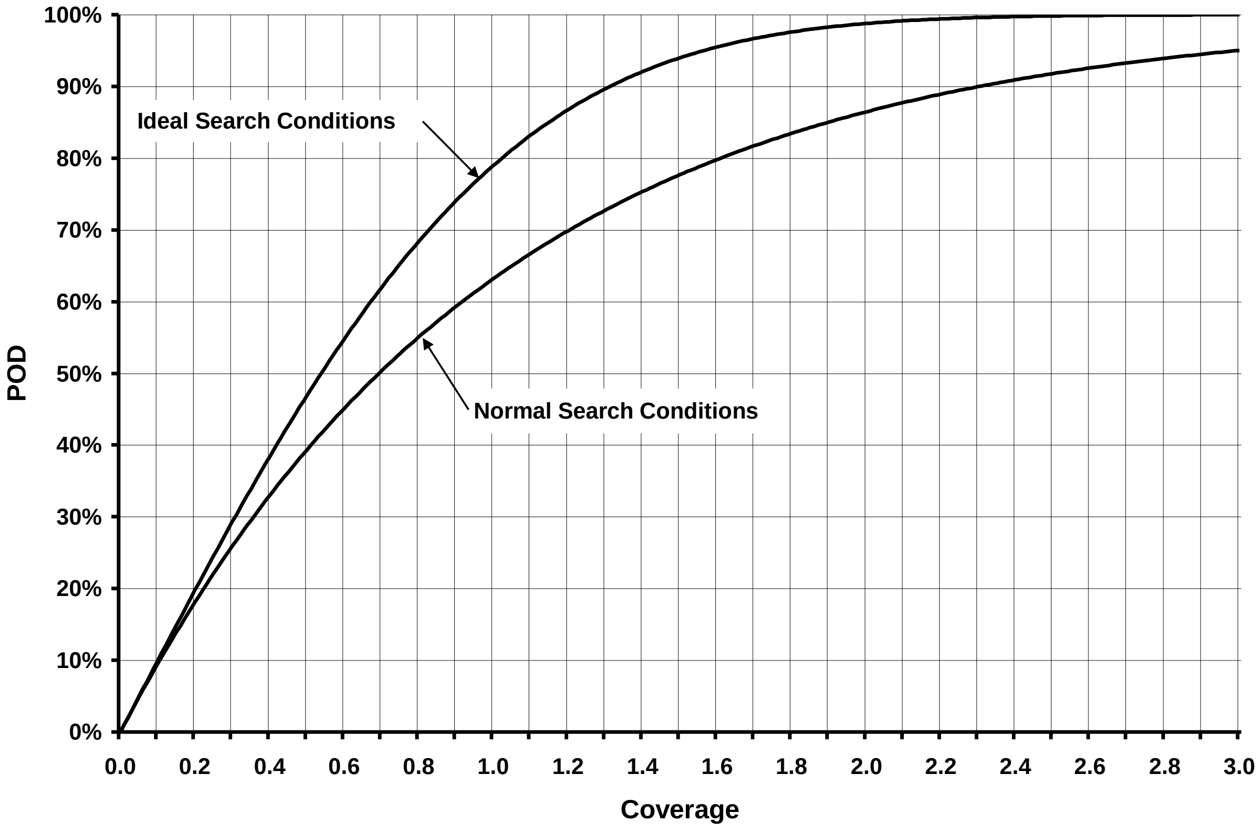


Figure H-21 Maritime Probability of Detection
(Average Probabilities of Detection Over an Area for Ideal: Visual Searches Using Perfect Parallel Sweeps Relative to the Object Under Ideal Conditions Normal: Any Other Object/Sensor/Conditions With A Known Corrected Sweep Width)

(c) Cumulative POD may be calculated from the following equation:

$$POD_{cum} = 1 - \left(\left(1 - POD_1\right) \times \left(1 - POD_2\right) \times \ldots \times \left(1 - POD_n\right)\right)$$

The subscripts 1, 2, …, n indicate that the POD values are for the first, second, …, nth search of the same area relative to the search object. Although maritime search areas usually do not have fixed boundaries, even relative to the updated datum positions, it is reasonable to assume that the cumulative POD value applies in the near vicinity of the updated datum positions used to plan the searches.

(1) An easier way to estimate cumulative POD is to use the “normal search conditions” POD curve as follows:

a. If all POD values were obtained from the “normal search conditions” POD curve, then simply add the coverage factor values used to obtain those PODs and use this “cumulative coverage” like any individual coverage value to obtain the cumulative POD from the “normal search conditions” POD curve.

b. If some POD values were obtained from the “ideal search conditions” POD curve, it is necessary to first find the corresponding coverage factors for the “normal search conditions" curve. This is done by entering the graph in Figure H-21 from the left with the POD value, moving right to the "normal search conditions POD curve then down to the horizontal axis to get the equivalent "normal search conditions" coverage. Once all coverage values have been referenced to the "normal search conditions" POD curve, they may be added to get an equivalent "cumulative coverage" and used like any other coverage to get the cumulative POD from the "normal search conditions" POD curve.

c. If the "cumulative coverage" is greater than 3.0 and therefore off the graph in Figure H-21, the formula for the "normal search conditions" POD curve is

$$POD_{Normal} = 1 - e^{-C}$$

where *e* is the base of the natural logarithms. Most scientific hand-held calculators have an "exponential function" or "EXP" key that computes the value of e^x where x is the value entered by the user. Simply enter the coverage or cumulative coverage as a negative number, press the "EXP" or "e^x" key and subtract the result from 1.0 to get the POD or cumulative POD.

(2) A high Cumulative POD for subsequent searches of an area without locating the search object may indicate the object was not in or has moved out of the search area, has sunk, or has changed characteristics and requires a reevaluation of search area and coverage (e.g., primary target changes from a fishing vessel to a liferaft).

(d) For searches involving multiple resources, the total available effort and the optimal search factor, area, coverage factor and track spacing are computed using the procedures given in Chapter 4 and Appendix L of the *IAMSAR Manual*. This coverage factor may be used with the appropriate curve of Figure H-21 to determine POD for the total area searched. If the search is unsuccessful, the search area should be expanded, using the procedures given in Chapter 4 and Appendix L of the *IAMSAR Manual*. The POD for that particular search may be determined as before.

(e) Inland search POD is discussed in the *IAMSAR Manual* and the *National SAR Supplement*.

H.5.6.3 **Probability of Containment (POC)** is described as the probability that the search object(s) are contained in a particular area. POC values for rectangles centered on the datum position(s) may be inferred from the assumed distribution of possible search object positions around the datum(s). In order to estimate POS for a search it is necessary to have an estimate of the POC for the search area. Figure H-22 shows a graph of POC vs. Search Factor (f_s) for single point and divergent datums. The search radius R is the product of the search factor and the total probable error of position ($R = f_s \times E$).

(a) The optimal search factor curves in the *IAMSAR Manual* were computed for single point datum (square) search areas but are used for both single and divergent datums for the sake of simplicity and because the loss of POS for divergent datums is generally small when compared to the "true" optimal value. It may be possible to improve the POS slightly in the case of divergent datums by modifying the search factor somewhat. A few trials using POC values from the appropriate divergent datums curve in Figure H-22 below and POD values from the appropriate curve in Figure H-21 should show whether this is worth pursuing. Such trials would involve the following steps:

(1) Using the search factor found from the *IAMSAR Manual* optimal search factor curves,

obtain the POC from the most appropriate divergent datums curve above, multiply the search factor by *E* to get the search radius, compute the area of the resulting rectangle, compute the coverage attainable with the available resources, obtain the expected POD from the appropriate curve in Figure H-21 and compute the expected POS (POS = POC x POD).

(2) Choose a modified search factor and find the corresponding POC from the most appropriate divergent datums curve above, multiply the search factor by *E* to get a new search radius, compute the area of the resulting rectangle, compute the coverage attainable with the (same) available resources, obtain the expected POD from the appropriate curve in Figure H-21 and compute the new expected POS (POS = POC x POD).

(3) Compare the two POS values and choose the search radius that produces the higher POS.

(4) Repeat this process, if desired, until improvements in POS are no longer significant.

(b) Using computer simulation (SAROPS) we can develop more general and more realistic containment probabilities (POC) mapped to a cellular grid based upon drift and scenario assumptions. SAROPS is also able to compute and show the effects of unsuccessful searching on such "probability maps" and use this information to help plan subsequent optimal searches. No other tool has this capability.

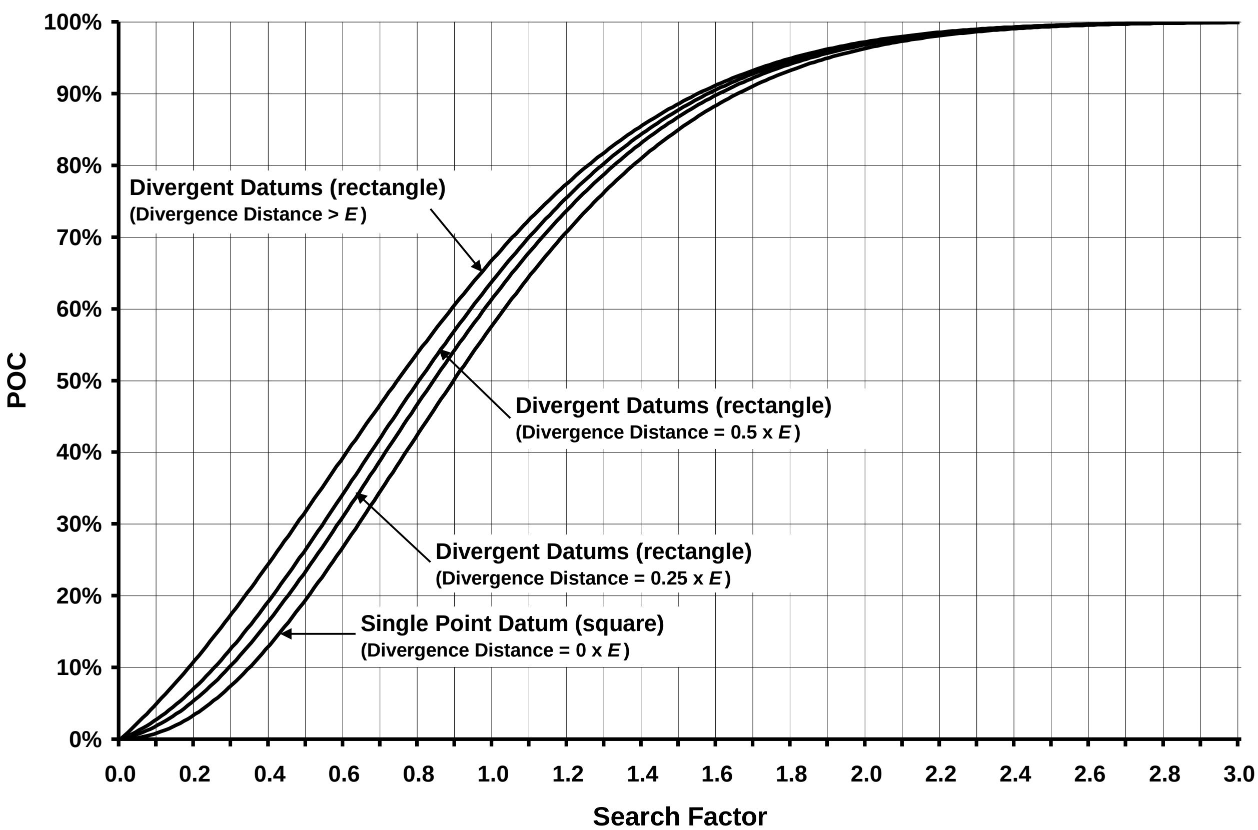


Figure H-22 Probability of Containment (POC) For Single Point and Divergent Datums

NOTE:
- POS measures search effectiveness.
- POD measures detection performance.
- POC measures the likelihood of the search object to be in one region versus another.

H.5.6.4 The Value of Using POS. POS calculates search effectiveness by incorporating POC (e.g., the SAROPS weighted particle file) with the POD. POD only measures a sensor's effectiveness; that is, it is used to estimate how well one searched an area, but it does not incorporate the likelihood that the object will actually be in the particular area searched. POS does. The following examples will clarify this discussion:

(a) Searching an area that has no chance of containing the search object (POC = 0) will not be successful no matter how high the POD. Even if POD was 100% (which is not realistic) the POS is still zero (0 x 1 = 0).

(b) To give a more realistic example, if there is a 50% chance of the search object being in an area, then searching that area with a coverage factor of 1.0 (POD of 78%) produces a POS of 39% (.5 x .78 = .39). Even if POD was 100% (again unrealistic), the POS for this search rises to only 50% (.5 x 1 = .5) and no farther because there is still a 50% chance that the search object was not in the search area.

POS balances options of looking very carefully in a small area for the object against looking less thoroughly over a larger area for the same object. As an analogy, think of looking for a misplaced set of keys. One could meticulously look for the keys in the sofa; moving pillows, pulling apart cushions, and putting one's hands under the sofa (high POD but low POC). Or, one could use the same time searching for the keys by scanning the tops of the sofa, mantel, bookcase and the rest of the family room and kitchen, concentrating on the most likely spots (lower POD but high POC). If it is known that the keys were lost in the sofa, option one would yield a higher POS due to both a high POC and a high POD. If one were unsure where the keys were last seen or lost, then option two would probably yield a higher POS.

H.5.6.5 Determining POS. A comparison of the Manual Solution with the SAROPS Solution will make the "math" involved easier to understand.

(a) Manual Solution. The manual solution incorporates POC and POS, however, it has heretofore done so in a way that was hidden from the search planner. Search planners prior to the advent of CASP and later the *IAMSAR Manual* and most recently SAROPS, did not use POC and POS because there was no practical way to compute them manually. Only by searching the recommended Optimum Search Area generated by the Total Probable Error solution and safety factors at a coverage of 1.0 was one assured of having an optimal plan. Since the exact recommended area was rarely searched because effort levels were different from those required for exact compliance with these parameters, most searches were somewhat sub-optimal. POC and POS were not readily computable and were therefore ignored! This left the unfortunate, and incorrect, impression that POD is THE statistic in terms of measuring search effectiveness. It is not. As previously stated, POS is the measure of overall search quality/effectiveness. It combines the Probability of Containment (POC) factor and the POD factor (coverage) to give a true measure of the search's chances for success (POS).

(1) The manual solution assumes a "circular bivariate normal" search object location probability density distribution about each computed datum position prior to the first search. (For one datum, it looks similar to a 3-D "bell curve" shape - see Figure H-23.) The computed "total probable error of position" is the radius of the 50% containment contour. That is, it is assumed there is a 50-50 chance of the object being located inside a circle whose center is at datum and whose radius equals the total probable error of position. For the first search effort, this radius is multiplied by the optimal search factor for the amount of search effort that is available.

(2) The search area computed by applying the optimal search factor produces the optimal or near-optimal search square or rectangle. Again, this is based on a circular bivariate normal distribution of possible search object positions around the datum(s). The POC for the resulting square or rectangle may be estimated from the curves in Figure H-22. As shown in Figure H-24, an optimal search factor of 1.1 produces a POC of 64.75% prior to any searching.

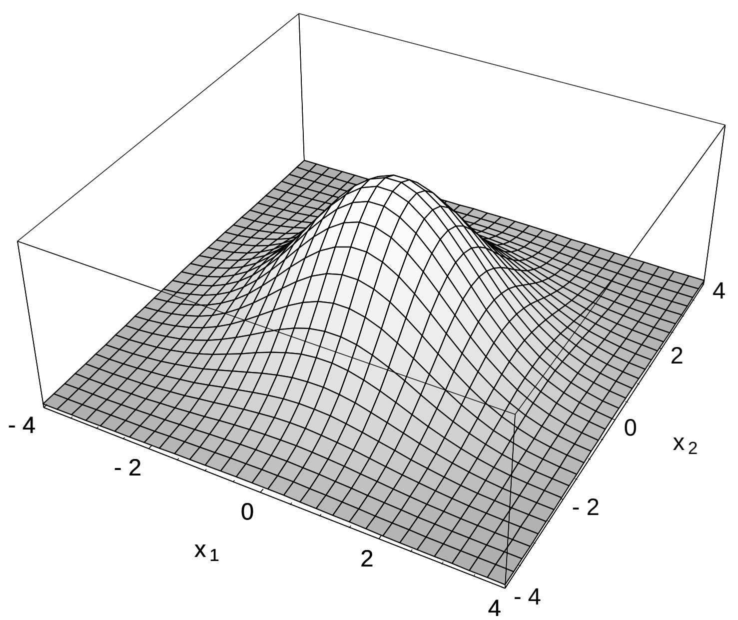


Figure H-23 Manual Solution Probability Density

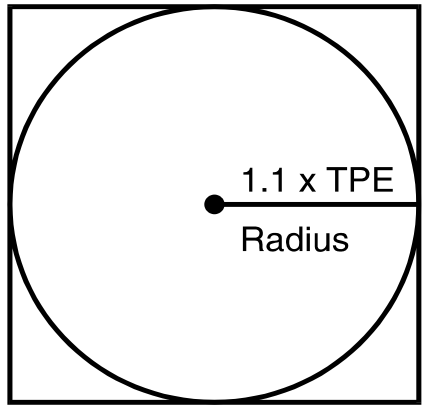


Figure H-24 Manual Solution for Square Search Area - Based on an Optimal Search Factor of 1.1

(b) SAROPS Solution. SAROPS is designed to provide a search plan that optimizes POS.

(1) SAROPS generates a particle file that computes the POC based upon drift assumptions. SAROPS produces probability density distributions that do not follow one of the standard distributions from statistics. Instead, SAROPS starts out with an “initial” distribution that is usually one of the standard types, but then computes thousands of independent drift trajectories and “maps” the results. Based upon the probability distribution of particles in a drift-updated SAROPS file, different cells will have varying probabilities of containing the search object. In other words, each cell has its own unique likelihood (probability) of containing the object. An overall POC for a search area is determined by summing the probability of each individual gridded cell the area contains.

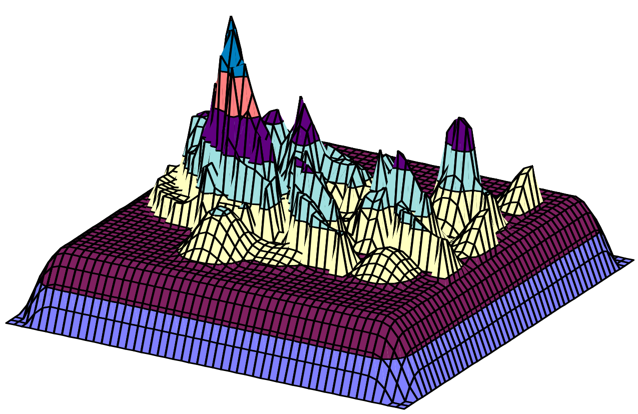


Figure H-25 SAROPS Probability Density Distribution

(2) POC is based upon the distribution of replications contained in the search area according to the SAROPS scenario. POS accounts for both POC and POD. That is why it is a better measure of search effectiveness than POD alone. The following example demonstrates the value of POS verses POD.

Example of POD vs. POS

	Area	POC	x	POD	=	POS
1	2571 SqNM	85%	x	40%	=	34%
2	1964 SqNM	70%	x	51%	=	36%
3	1080 SqNM	35%	x	78%	=	27%

(3) In this example, area 1 has an 85% chance of containing the object. If it can be searched with the available effort to attain a POD of 40%, it would yield a Probability of Success of 34%. Contrast this result with area 3, which if searched with the same effort produces a higher POD (78%) but has a much lower POC (35%) and yields a Probability of Success of only 27%. However, SAROPS demonstrates in this case that it is better to go with the third alternative and use the available effort to search a moderate area with a moderate POD, than to search a smaller area with a higher POD or a larger area with a lower POD. Exactly how much area should be searched and which area(s) should be searched at which coverage level(s) in order to maximize the POS in any given case will depend on the nature of the probability distribution and the amount of search effort available. Although it is necessary to be aware of the POD, POS is the better measure of search effectiveness.

(c) The following examples were actually taken from SAROPS' predecessor, CASP, but they illustrate the usefulness of SAROPS and how POS information can guide search-planning decisions when developing a search area. If SAROPS is used as a search-planning tool, then the highest POS should guide the effort, not POD or POC.

(1) A look at a series of abbreviated probability maps offers a comparison of search effectiveness for equal amounts of effort to search. A simple working definition of effort is Sweep Width multiplied by SRU trackline miles. In the example, the effort number represents the cumulative amount of area (in square miles) contained within the cell and all cells above it in the list, multiplied by the coverage factor. Coverage is a function of sweep width and track space; C = W/S. The smaller the track spacing, the higher the coverage factor and hence the greater the amount of effort needed to cover the same area. The sample output table below is provided for use with 3 examples that follow.

Sample CASP Outputs:

Cells In Order of Probability Density				Coverage 1.0 Cumulative		Coverage 1.5 Cumulative	
NR	PROB	SE Corner		Effort (SqNM)	POS	Effort (SqNM)	POS
1	17.67	41-00 N	68-00W	301.1	13.7	451.7	16.5
2	10.83	41-00N	68-20W	602.2	22.1	903.3	26.7
3	9.59	41-20N	68-00W	901.8	29.7	1352.7	35.6
4	8.60	41-20N	67-40W	1201.4	36.3	1802.1	43.9
5	8.09	41-20N	68-20W	1501.0	42.6	2251.4	51.2
6	6.25	41-00N	67-40W	1802.1	47.6	2703.1	57.4
7	4.19	41-00N	68-40W	2103.2	50.7	3154.8	60.9
8	2.43	41-20N	68-40W	2402.8	52.6	3604.2	63.2
9	2.17	41-20N	67-20W	2702.4	54.5	4053.5	65.2

<u>Example 1:</u> Compare Efforts of Approximately 900 SqNM

Coverage Factor of 1.0 (POD of 78%)	**Coverage Factor of 1.5 (POD of 94%)**
Top 3 cells 901.85 SqNM POC top 3 cells = 38.09 POS = POC x POD = 38.09 x .78 = 29.7	Top 2 cells 903.3 SqNM POC top 2 cells = 28.5 POS = POC x POD = 28.5 x .94 = 26.7

CASE F/V LUCKY STAR
DATUM TIME 311830Z OCT 91

	70 -20W	70 -0W	69 -40W	69 -40W	69 -0W	68 -40W	68 -20W	68 -0W	67 -40W
42-0N		6	2	2	20	140	193	165	165
41-40N	65	111	74	97	243	809	3 959	860	217
41-20N	202	194	139	192	419	2 1085	1 1767	625	206
41-0N	91	90	107	156	169	186	69	23	4
40-40N									

In this case, it would be better to search the area contained by the top three cells, POS of 29.7, with a lower POD (0.78) than to search the area in the top two cells, POS of 26.7, with the higher POD (0.94).

Example 2: Compare Efforts of Approximately 1800 SqNM

Coverage Factor of 1.0 (POD of 78%)	Coverage Factor of 1.5 (POD of 94%)
Top 6 cells 1802.1 SqNM POC top 6 cells = 61.03 POS = POC x POD = 61.03 x .78 = 47.6	Top 4 cells 1802.1 SqNM POC top 4 cells = 46.69 POS = POC x POD = 46.69 x .94 = 43.9

CASE F/V LUCKY STAR
DATUM TIME 311830Z OCT 91

	70 -20W	70 -0W	69 -40W	69 -40W	69 -0W	68 -40W	68 -20W	68 -0W	67 -40W
42-0N – 41-40N		6	2	2	20	140	193	165	165
41-40N – 41-20N	65	111	74	97	243	5 809	3 959	4 860	217
41-20N – 41-0N	202	194	139	192	419	2 1085	1 1767	6 625	206
41-0N – 40-40N	91	90	107	156	169	186	69	23	4

In this case, it would be better to search the area contained by the top six cells, POS of 47.6, with a lower POD (0.78) than to search the area in the top four cells, POS of 43.9, with the higher POD (0.94).

Example 3: Compare Efforts of Approximately 2700 SqNM.

Coverage Factor of 1.0 (POD of 78%)	Coverage Factor of 1.5 (POD of 94%)
Top 9 cells 2702.4 SqNM POC top 9 cells = 69.82 POS = POC x POD = 69.82 x .78 = 54.5	Top 6 cells 2703.1 SqNM POC top 6 cells = 61.03 POS = POC x POD = 61.03 x .94 = 57.4

CASE F/V LUCKY STAR
DATUM TIME 311830Z OCT 91

	70 -20W	70 -0W	69 -40W	69 -40W	69 -0W	68 -40W	68 -20W	68 -0W	67 -40W
42-0N		6	2	2	20	140	193	165	165
41-40N	65	111	74	97	8 243	5 809	3 959	4 860	9 217
41-20N	202	194	139	192	7 419	2 1085	1 1767	6 625	206
41-0N	91	90	107	156	169	186	69	23	4
40-40N									

In this case, it would be better to search the area contained by the top six cells, POS of 57.4, with a higher POD (0.94) than to search the area in the top nine cells, POS of 54.5, with the lower POD (0.78). This happens because the probability of finding the search object in cells 7, 8 and 9 has decreased to the point where it is more productive to search the smaller area, cells 1-6, with a higher POD (closer track spacing).

These are highly simplified examples that were chosen to illustrate why simple rules like having all SRUs search at a coverage of 1.0 are insufficient. SAROPS Planner will search for and return areas and coverages for the available SRUs that are very nearly optimal in the sense of maximizing POS, without being restricted to covering or not covering whole cells or orienting patterns in one of the four cardinal directions. In addition, SAROPS will properly account for the simultaneous motions of search objects and SRUs , something no other search planning tool has ever done.

Section H.6
Search Area and SRU Assignment

The SMC determines what constraints the search variables place on the optimal search area so the area that can actually be covered may be calculated. This obtainable search area may be subdivided into smaller regions for SRU assignment. If a search is unsuccessful, the SMC should reevaluate all information, modify the search plan, and search again, unless it is determined further effort is unlikely to be successful and search efforts should be suspended.

H.6.1 Allocating Effort

Varying the rate of search effort can control the assignment of SRUs to achieve maximum search effectiveness. Some situations call for an initial maximum search effort over wide areas. However, a maximum search effort cannot be mounted every time an overdue is first reported, nor can the SMC continue with a lesser effort when preliminary searches fail. The SMC carefully weighs the limitations of time, terrain, weather, navigational aids, search object detectability, suitability of available SRUs, search area size, distance between search area and SRU staging bases, and the desire to maximize POS. Of all the factors involved, one or more may prove so important that the others become secondary. These controlling factors are considered first in preparing an attainable search plan.

H.6.1.1 When a distress is either known or strongly suspected, the time available for effective search will usually be limited, and a maximum effort search should be completed within this time. It is usually preferable to search an area with many SRUs from the onset when chances for success are highest. First searches should be planned to locate survivors rapidly while they are still in a condition to use radio, visual, or other signaling aids, and battery transmission life of locator beacons is good. SAROPS is the recommended tool for planning searches. However, to estimate the number of SRUs required, or if the manual method is used, the following procedure is recommended:

(a) Plot a region large enough to reasonably ensure that the survivors are included (POC $\geq$ 80%) as a first approximation to the optimal search area.

(b) Use the area of the region as the total available effort, Z_{ta} (this amount of effort is sufficient to produce C = 1.0 for the first approximation).

(c) Using the *IAMSAR Manual* method for effort allocation, find the optimal search area for this level of effort. The resulting POS should be at least 62% for ideal search conditions and at least 50% for normal search conditions since those are the values obtained for coverage factor 1.0 and 80% POC.

(d) Fix the time by which the search should be completed.

(e) Calculate SRU hours required to search the area within the allocated time.

(f) Dispatch sufficient SRUs to search the area within the allocated time. If insufficient SRUs are available, re-compute the optimal search area and coverage based on the amount of effort that is available.

(g) If unsuccessful, obtain additional resources and optimally allocate the additional search effort they can provide. Review all available data to determine whether the datum position(s) should be revised.

(h) Do not reorient the search or change SRU search assignments, if avoidable, after the search plan has been transmitted to the SRUs. Once a large-scale search is ordered and SRUs dispatched, reorientation of the search area for that search may be difficult and wasteful. Planning should be thorough and adhered to.

(i) Resist the temptation to redeploy SRUs whenever new leads or doubtful sightings are reported. After assigned SRUs have been dispatched, additional SRUs should be dispatched to investigate new leads.

H.6.1.2 Overdue craft can produce very large initial estimates of the region(s) and time(s) where and when the distress incident may have occurred. An aggressive investigative effort should be undertaken to reduce the uncertainty about the time and place of possible distress incidents as much as possible. This is usually done by finding the last sighting or other indicator of when and where the missing craft was last known to be safe.

H.6.1.3 If a large-scale search is necessary, SAROPS is the search-planning tool of choice. After computing a drift update for the desired commence-search time, obtain an optimal search plan from SAROPS for the amount of effort that will be available on scene. Inspect the plan for operational feasibility and safety considerations, adjust as needed, and promulgate the plan to the SRUs. If SAROPS is not available, the IAMSAR Manual method, as amended by this Appendix may be used.

H.6.2 Partitioning the Search Area

The computed search area is divided into sub-areas to be searched by SRUs, the number of sub-areas depending on the number of SRUs available. The size and orientation of the sub-areas depend on the capabilities of the SRUs and on environmental factors, such as the drift, sun or swell direction. Elongated search areas are better for navigation than small squares.

H.6.2.1 **Establishing Individual Search Area Sizes Manually.** This is done by means of:

$A_n = V \times S \times T$. *To determine sub-area dimensions:*

(a) The estimated search subarea length (l') will be the smaller of:

(1) $\sqrt{A_t}$; or

(2) The distance that could be covered in 30 minutes for fixed-wing aircraft; or

(3) The distance that could be covered in 20 minutes for helicopters.

(b) The estimated width is $w' = \frac{A_n}{l'}$.

(c) The number of required track spacings is $n' = \frac{w'}{S}$.

This figure is rounded to the nearest even or odd whole number, n. If n is an even number the SRU completes its search pattern on the same side of the search area as it started, but if n is odd the SRU finishes on the opposite side. This factor should be considered if SRU endurance requires that the end search point be as near as possible to a refueling base.

(d) The subarea width is then w = n x S, and the length is $l = \frac{A_n}{w}$.

H.6.2.2 **Search Area Designation (Naming Convention).** Searches that extend beyond the initial response are generally divided into "epochs" or intervals of time when SRUs are on scene searching, separated by intervals when no SRUs are searching. When almost all searching was done during daylight, search epochs were separated by periods of darkness and search plans covered one day at a time. More recently with the advent of NVGs, searching can be done around the clock. An additional complication is that in some situations, there are sufficient assets available to keep SRUs on scene and searching continuously with no obvious breaks that could be used to separate search epochs. In fact, there are times when this cannot be avoided due to the times when various SRUs are available. Nevertheless, it is often highly desirable to assign search patterns that are to be performed more or less simultaneously as a group with their own epoch designator. The primary objective for designating search areas is to enhance clarity of communications and reduce the potential for confusion. ***If SRUs are expected to be on scene searching continuously, the search planner must choose the search epochs carefully with this in mind***. Normally, search epoch boundaries will occur when the minimum number (zero in the ideal case) of SRUs are on scene searching. ***Search epochs shall be designated using a letter (A, B, C…) sequentially for each specified interval of time (e.g., afternoon assignments for [date] or search assignments for 1200R to 1800R [date]).*** The search plan for each epoch should be based on updates for drift and prior searching as of a time within one hour of the starting time for the epoch. In SAROPS, the SIM End Time would normally correspond to the epoch start time. ***In the course of a search if a new independent update is established due to new information or other circumstances, search assignments based on that update shall continue with the next epoch letter designation for that case. Sub-areas/patterns/assignments for specific search units (or combination of units) shall be numbered sequentially and associated with the search epoch by preceding the number with the letter designation of the search epoch and a hyphen (A-1, A-2, etc.).***

H.6.2.3 Describing Search Areas. ***SRUs must be able to plot the search area on the basis of information received from the SMC***. Several standard methods are used to describe search areas:

(a) *Boundary Method.* Any square or rectangular area oriented east/west or north/south can be described by stating the two latitudes and two longitudes. While an area defined by meridians and parallels is not exactly rectangular, this approximation is sufficient for low to middle latitudes. At high latitudes other methods should be considered for specifying rectangular areas. Any inland search area that is bounded by prominent geographical features can be described by stating the boundaries in sequence. For example:

(1) *D-7 Boundaries* 26N to 27N, 64W to 65W.

(2) A-1 Boundaries Highway 15 to the south, Lake Merhaven to the west, Runslip River to the north, and Bravado mountain range to the east.

(3) Landmark Boundaries Method. Two or more landmarks are given as boundaries of the search area along a shoreline. For example: Search area from "Port Alpha" South Jetty, south to the Tower to 10 NM offshore (Figure H-26).

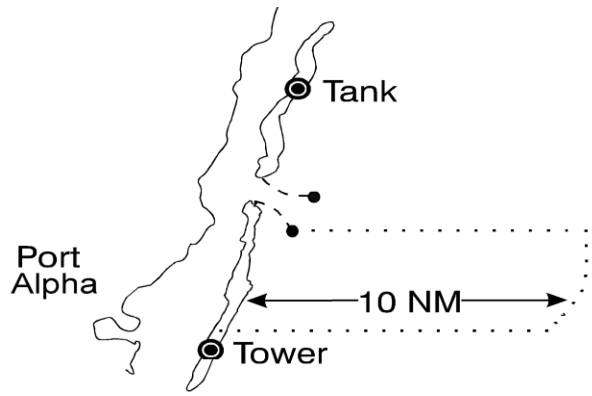


Figure H-26 Landmark Boundaries Method

(b) *Corner Point Method.* This can be used for any area (except circular areas) that can be described by stating the latitude and longitude, or geographical features, of each corner, in sequence. For example:

(1) *E-7 corners 23 15N* 74 35W to 23 10N 73 25W to 22 20N 73 25W to 22 25N 74 25W to origin.

(2) A-6 corners Stony Tavern to Red River Bridge to Gunder Cave to origin.

(c) *Center Point Method.* Convenient for describing all but irregular search areas and quickly transmitted, this method gives latitude and longitude of the center point and the search radius, if circular, or the direction of the major axis and applicable dimensions, if rectangular. For example:

(1) *23 15N 74 35W, 12NM.*

(2) 23 15N 74 35W, 060° true, 144 X 24 NM.

(3) Center Point-Landmark. The center point may be designated by a bearing and distance from a geographic landmark. For example: Center point bears 060°M, 10 NM from "Port Alpha" South Jetty light, major axis 000°M, 6 NM by 6 NM (Figure H-27).

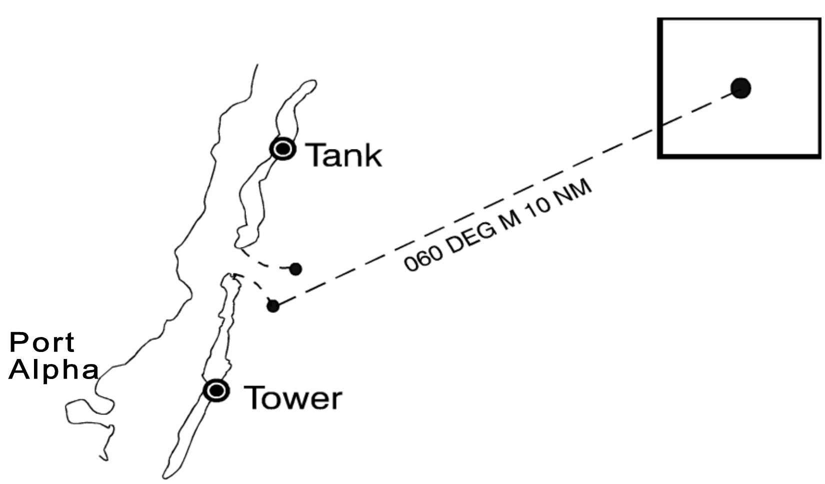


Figure H-27 Center Point-Landmark

(d) The Boundary Method or Corner Point Method is preferred over the Center Point Method because the latter requires more plotting and makes detection of plotting errors more difficult. Also, if plotted on a chart of different projection from the SMC's (e.g., Lambert Conformal vs. Mercator), it may result in overlaps with adjoining areas, which may not have boundaries or corner points in the region of adjacency that correspond with those of adjoining areas.

(e) *Track Line Method.* Search areas may be described in this method by stating the track and the width of area. For example:

C-2 trackline 24 06N 78 55W to 24 50N 75 46W. Width 50 NM.

(f) *Grid Method.* Many areas are divided into grids on local grid maps. Use of these grids permits accurate positioning and small area referencing without transmitting lengthy geographical coordinates. ***However, all SRUs must have the same grid charts; SRUs could be endangered if there search areas overlap due to use of different grid systems***. The grid method is most often used in inland SAR operations. See Chapter 5 and Appendix E of reference (a) concerning CAP grids.

(g) *Georef Method.* This method may be used to describe square or rectangular areas oriented N-S or E-W that coincide with Georef grids. The Georef method is not normally used. All SRUs involved in a Georef search should possess Georef grids to avoid endangering each other.

H.6.2.4 Orienting Search Legs. The search areas and patterns returned by SAROPS are based on one criterion—maximum POS—subject to a few constraints. These constraints are the amount of effort (SRU track miles) available on scene as determined by the search endurance and search speed for each SRU, the minimum allowed track spacing for each SRU, and a "no overlap" requirement for SRUs of the same general type (aircraft patterns may not overlap those of other aircraft, vessel patterns may not overlap those of other vessels, but aircraft patterns may overlap vessel patterns). The orientations of the search legs returned by SAROPS are the ones that maximize POS subject to these constraints. However, there are other factors, too detailed for inclusion in SAROPS, to consider when orienting search legs. Ideally, search legs should be oriented to maximize search object exposure to SRUs. This is especially important in any combination of high sea state, low target freeboard, and low searcher height. Under these circumstances, search leg headings perpendicular to the seas or swells, whichever is dominant, prolong the time that objects are visible on the beam as the SRU passes. This search leg orientation is also best for minimizing roll motion of surface SRUs. Another factor to consider is search leg orientation relative to the sun for early morning and late afternoon searches when the sun angle is low. This technique is illustrated in Figure H-28. Cross-sun leg orientation is preferred so pilots are not looking directly into the sun for long periods on every other leg.

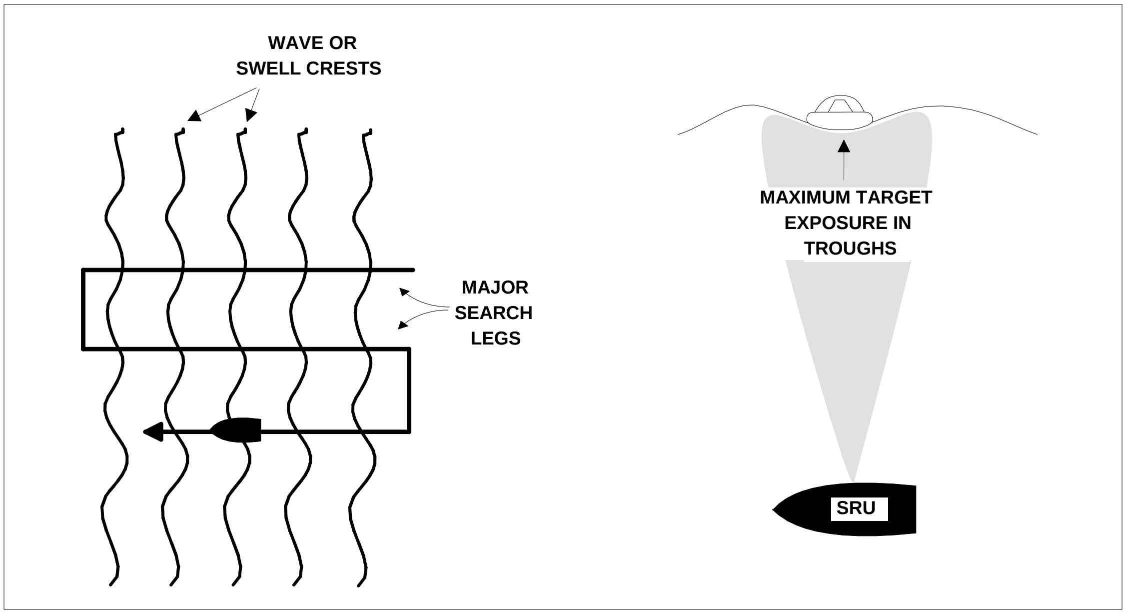


Figure H-28 Search Leg Orientation

H.6.3 Assigning SRUs to Search Areas

After dividing overall search area into sub-areas, the SMC usually assigns an SRU to each sub-area, designates search pattern execution and direction of pattern creep, and assigns search altitudes for aircraft. SRU safety is a most important consideration when search areas are being assigned.

H.6.3.1 SAROPS Planner assigns a search area to each SRU automatically, but it does not account for safety considerations. ***Therefore, search planners shall carefully review SAROPS Planner-recommended search plans and make any adjustments necessary to assure the patterns can be performed safely as a group***.

H.6.3.2 Occasionally, the SMC requires the OSC to make various search decisions, such as search pattern selection, track spacing, and individual SRU search area assignments. The SMC normally prescribes the overall search area and decides on sub-areas for SRUs.

H.6.3.3 When allocating sub-areas, each SRU should be used only for searches for which it is operationally suitable. For example, if only aircraft are available, the following considerations are relevant:

(a) Short-range or medium-range aircraft should be used for areas close to a base.

(b) Fast, long-range aircraft should be used for more distant areas.

(c) Aircraft with poor navigation capability should be used in areas with prominent landmarks, or for searches requiring constant visual reference, as in shoreline searches.

(d) During good weather, search areas in coastal waters may be laid out so aircraft can fly search legs perpendicular to the coastline. This allows aircraft without modern navigation equipment to obtain a fix at the land end of each leg. ***However, terrain clearance must be considered***.

H.6.3.4 **Commence Search Point Guidance.** All factors, including launch and recovery locations, environmental conditions and available resources, should be carefully considered when determining where to place the commence search points (CSP) for particular search areas.

H.6.3.5 Other factors to consider include:

(a) The resource's (includes aircraft, small boat and other available assets) proximity to the search area. The decision may be made to place the CSP at the point closest to the SRU's departure point in order to facilitate the start of searching as quickly as possible.

(b) The decision may be made to place the CSP at a point farthest away from the departure point, so as to have the SRU finish its search as close to its recovery point as possible. This addresses other considerations, such as: having the SRU pass through datum or one or more of the highest probability cells in the SAROPS probability grid prior to searching; inserting a SLDMB prior to searching and having the SRU finish its search as close as possible to a logistics base which would make them available for the next search or another mission.

(c) For missions with multiple air SRUs, all CSPs should be coordinated so that the minimum horizontal separation that will occur during the search is maximized. Often this is accomplished by ensuring all CSPs are positioned at the same geographic corner for each individual search area (e.g. search areas A1-A5 will all have a CSP in the southeast corner) and that all patterns have the same direction of creep. It is paramount to risk assessment and safety of flight issues that strict adherence to this rule is followed. The only caveat to the rule of adjacent CSPs would be if the SRUs for adjoining search areas were to commence their searches at significantly different times. It may be appropriate to consider separation for surface assets in situations where visibility is reduced (fog, night, and heavy precipitation).

(1) Other considerations include orienting the search areas, patterns and particularly the CSP to account for environmental factors such as looking into or away from the sun while searching, or searching into or down swell vice in the trough. ***The type of search pattern, as well as the search object's drift (direction and speed) must also be considered when determining where to place the CSP***.

(2) There are many factors to consider prior to making a final decision about where to place the CSP. ***Each SMC must maintain communications with on scene units or the OSC to determine whether the planned CSPs are in their proper places or if positions need to be modified.***

(d) The SMC normally specifies the commence search point (CSP) which, along with pattern creep and search altitude, is used to maintain horizontal and vertical separation. While SRUs should help themselves by using IFF/SIF interrogators, radar, air-to-air TACAN, and visual lookouts, the SMC and OSC also plan for safe separation between SRUs. An example of a separation plan (see Figure H-29) follows:

(1) The SMC first assigns all search patterns to creep north. This will help ensure that the aircraft in areas A-1 and A-2 maintain lateral separation of one search area width from the aircraft in areas A-3 and A-4 (assuming they begin their search at about the same time).

(2) Second, the SMC assigns the CSP as the southwest corner. This helps maintain separation between the two aircraft in A-1 and A-2, and between the two aircraft in A-3 and A-4, by a distance equal to the individual search area length (assuming A-1 and A-2 start search at about the same time, A-3 and A-4 start search at about the same time, and SRUs operate at the same speed).

(3) Third, the SMC assigns search altitudes of 500 feet for A-1 and A-4, and 1,000 feet for A-2 and A-3. This provides positive vertical separation between each aircraft and adjacent aircraft.

(4) Air-to-air TACAN channels are assigned to search areas for use by the SRUs. ***TACAN channel pairing must be 63 channels apart for air-to-air ranging operations***. If SRU equipment allows the use of TACAN Y instead of TACAN X channels, interference with shore stations is reduced. The aircraft in A-1 and A-2 and in A-3 and A-4 would be concerned with approaching each other, even with an altitude separation of 500 feet. Therefore, the SMC could pair SRUs in A-1 and A-2 on TACAN channels 20 and 83, and A-3 and A-4 aircraft on channels 30 and 93. If the paired aircraft approach a common boundary simultaneously, they can monitor distance separation.

(5) Unless there is a large difference in the commence search times of the two diagonally opposite aircraft, the SMC assumes that adequate lateral and vertical separation will be maintained as long as each aircraft properly executes the assigned search pattern. No SRU should approach another SRU at a distance of less than one-track space. The SRU flies the legs nearest the search pattern perimeter at one-half track spacing inside its search area boundary.

(e) Outside the search area, lateral and vertical separation of aircraft is provided either by air traffic control (ATC) agencies under instrument flying rules, or by the aircraft themselves under visual flying rules. Since control of air traffic by ATC in the search area is usually not feasible because of low search altitudes, overall responsibility for maintaining safe separation within the search area rests with the OSC.

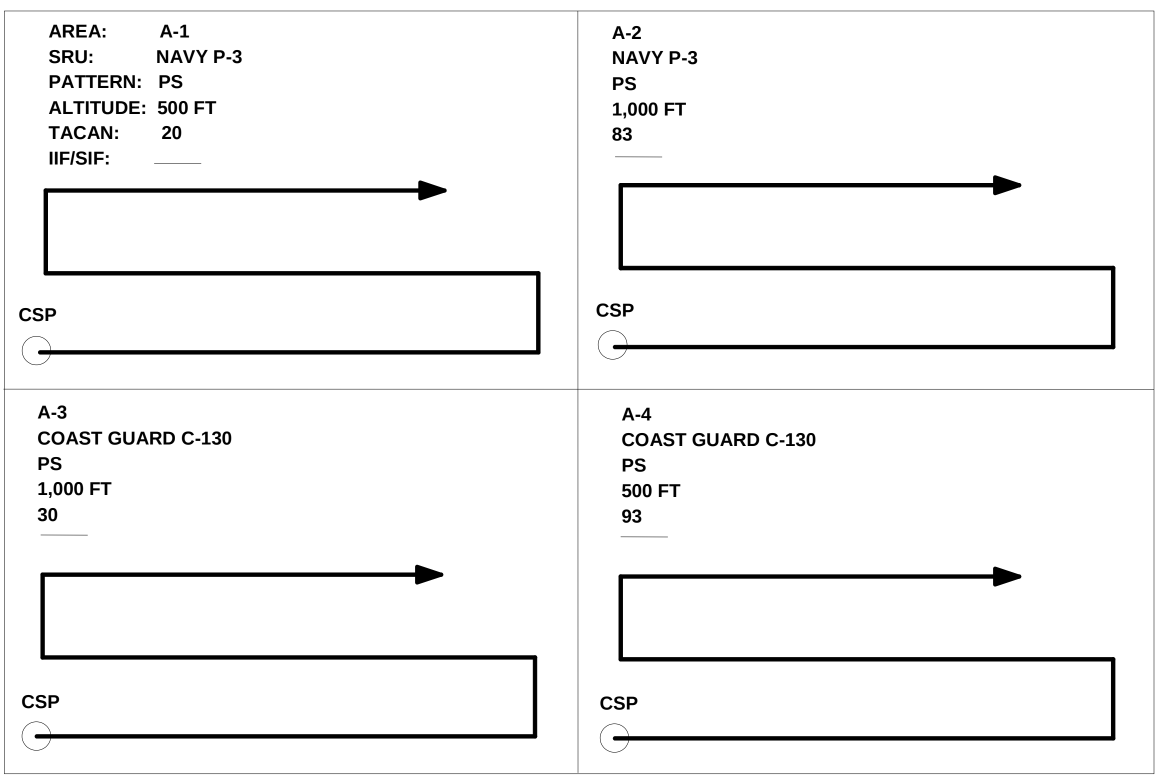


Figure H-29 Typical Assignments for SRUs

Section H.7
Search Pattern Selection

To ensure that the search area is uniformly searched, use of standard search patterns allows the SMC to calculate probable search effectiveness. This information is valuable for assigning SRUs, and for planning future searches. Any search unit can use the search patterns listed in this Appendix. The complexity of some may preclude their use by SRUs with limited navigational capability.

H.7.1 Factors in Selection

Search pattern selection depends on many factors, including accuracy of datum, search area size, number and capabilities of SRUs, environmental conditions, size of search target, and type of survivor detection aids. While the factors are interrelated, some may be more important than others. The SMC should satisfy the more important factors while meeting others as nearly as possible.

H.7.1.1 The type and number of available SRUs are controlling factors in selection of search patterns. SRU turning diameters, speeds, detection capability, and navigational accuracy have a significant impact on the uniformity of search area coverage and on POD. POD curves are valid only when SRUs follow search pattern tracks accurately.

(a) *Surface Craft.* Navigation accuracy of surface SRUs is generally not a significant problem as long as global positioning systems (GPS & DGPS), inertial, SATNAV, or radar navigation aids are available. However, DR navigation with stopwatch and log may be appropriate in areas with significant currents, especially when searching for PIWs, because this method will produce a more correct pattern *relative to the drifting search object*. Sea states of three feet or more can also adversely affect the ability of small surface SRUs to execute search patterns accurately.

(b) *Aircraft.* High-speed aircraft are more likely to accumulate turn errors, especially with narrow track spacing, because of their larger turn diameters. Low-speed aircraft are more sensitive to wind because the crosswind component will be a higher percentage of search speed. The following should be considered when planning aircraft searches:

(1) Aircraft navigation accuracy has improved due to increased use of, and improvements in, navigation computers, area navigation (RNAV), global positioning systems GPS and DGPS, and INS. More sophisticated systems can be coupled to an autopilot, enabling execution of accurate search patterns.

(2) When accurate navigation systems are not available, the type of pattern that requires minimum turns and maximum search leg length is usually selected to reduce turning errors and to ease navigation. For high-speed aircraft, patterns and search area assignments that allow turns outside the search area should be considered to allow aircraft to establish themselves on each leg, improving uniformity of area coverage.

H.7.1.2 Once large-scale search efforts are under way, redeployment of SRUs or changing of assigned search patterns becomes difficult. Careful consideration should be given to selecting patterns and designating SRUs. Unique patterns based on search circumstances may be developed.

H.7.2 Search Pattern Nomenclature

H.7.2.1 **Commence Search Point (CSP)** is the location in the search pattern where the SRU begins searching. Specifying the CSP allows the SRU to efficiently plan the en route track, and ensures that SRUS are separated and that the SRU begins search at the desired point and time.

H.7.2.2 **Search Leg** is the long leg along the track of any pattern.

H.7.2.3 **Crossleg** is the connection between two search legs.

H.7.2.4 **Creep** is the general direction in which an SRU moves through a rectangular or square area, normally the same direction as the crosslegs.

H.7.3 Search Pattern Designation

A coded system of letters is used to designate search patterns by type. The first letter designates the major pattern characteristic. The second letter denotes SRU number ("S" is a single-unit search; "M" is a multiunit search). The third letter designates specialized SRU patterns or instructions.

H.7.3.1 **Trackline Patterns (T)** are used when the intended route of the search object is known. A route search is usually the first search action since it is assumed that the target is near track, and that either it will be easily seen or the survivors will signal. The trackline pattern is a rapid and reasonably thorough coverage of the missing craft's proposed track and area immediately adjacent, such as along a datum line.

(a) *Trackline Single-Unit Non-Return (TSN)* search is made along the track or datum line. The letter "N" in the third position indicates that the pattern makes one or more searches along the track, but the search terminates at the opposite end of track from where it began. See Figure H-30.

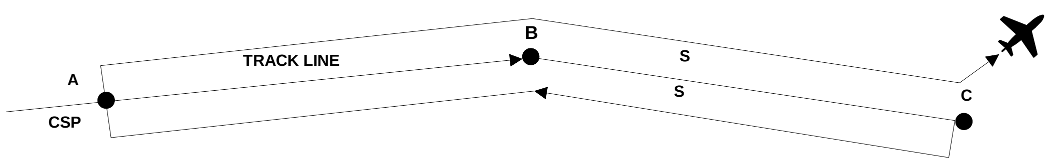


Figure H-30 Trackline Single-Unit Non-Return (TSN)

(b) *Trackline Single-Unit Return (TSR)* has the CSP offset ½-search track spacing from the trackline or datum. The SRU runs up one side and down the other, ending one-track space from where it began. See Figure H-31.

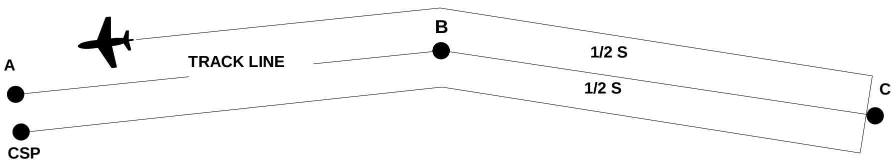


Figure H-31 Trackline Single-Unit Return (TSR)

(c) *Trackline Multi-Unit Return (TMR).* Two or more SRUs are used in an abeam formation to afford greater width coverage along track. See Figure H-32.

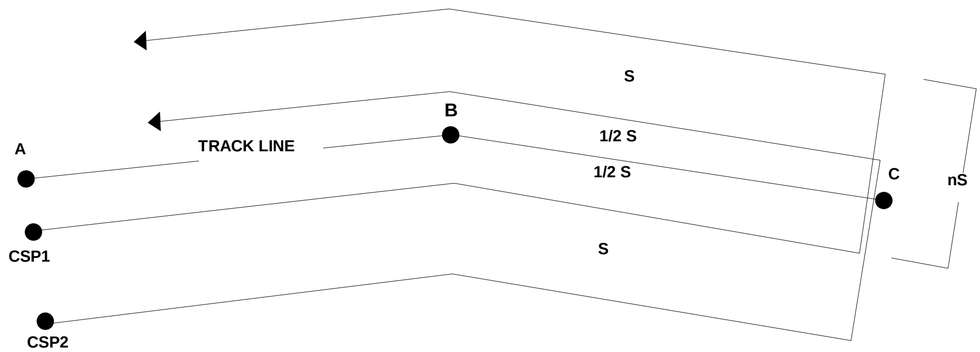


Figure H-32 Trackline Multi-Unit Return (TMR)

(d) *Trackline Multi-Unit Non-Return (TMN).* This pattern is the same as TMR except search terminates at the opposite end of track from where it began. See Figure H-33.

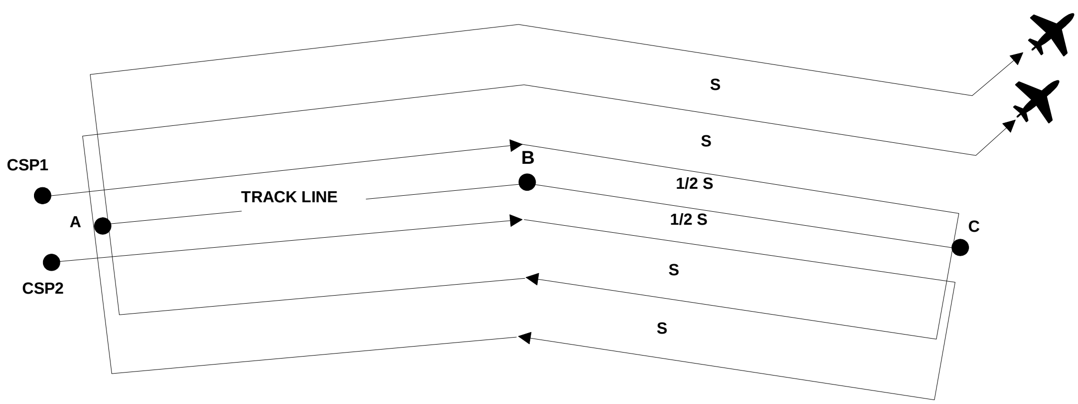


Figure H-33 Trackline Multi-Unit Non-Return (TMN)

H.7.3.2 Parallel Patterns (P) are best adapted to rectangular or square areas and have straight search legs that are usually aligned parallel to the major axis. Parallel patterns are normally used for large, fairly level search areas, where only approximate initial position is known, and when uniform cover-age is desired. Special parallel circle patterns are normally used for small underwater areas and have legs of adjacent concentric circles.

(a) *Parallel Track Single-Unit (PS)* is used by single SRUs for searching rectangular areas and is mostly used by fixed-wing aircraft. Search legs are oriented along the major axis, providing longer legs and fewer turns. See Figure H-34.

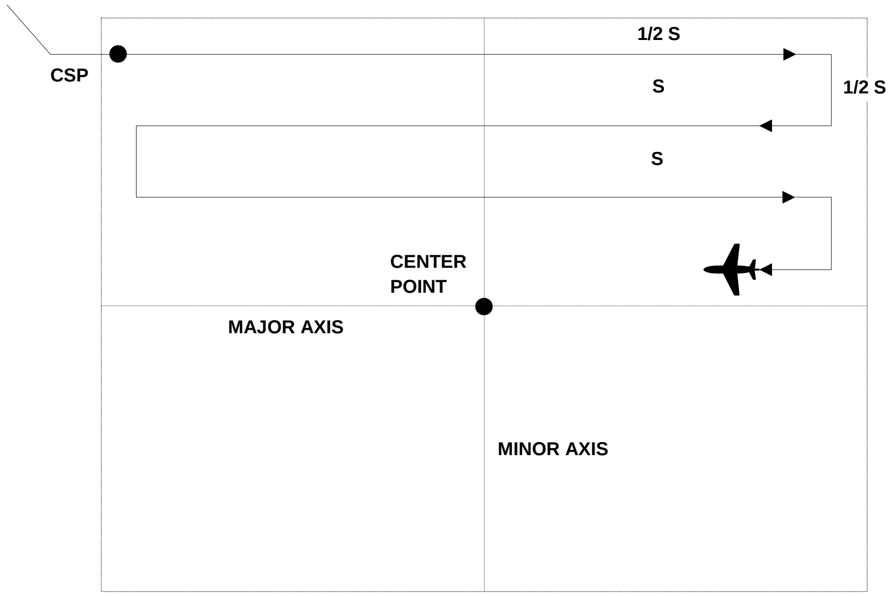


Figure H-34 Parallel Track Single-Unit (PS)

(b) *Parallel Track Multi-Unit (PM)* provides accurate track spacing and fast area coverage, and an increased safety factor for aircraft over water. One SRU is designated as guide and handles navigation, communications, and control. Turns at the end of legs should be executed by signal from the guide. Crosslegs are a distance equal to the track spacing multiplied by the number of SRUs in the team (n). See Figure H-35. Land SRUs use procedures are in reference (a).

Figure H-35 Parallel Track Multi-Unit (PM)

(c) *Parallel Track Multi-Unit Return (PMR)* is used when simultaneous sweep of an area to maximum radius is desired. It provides concentrated coverage of large areas in a minimum time period, and allows the use of aircraft with different speeds in a parallel search pattern. See Figure H-36.

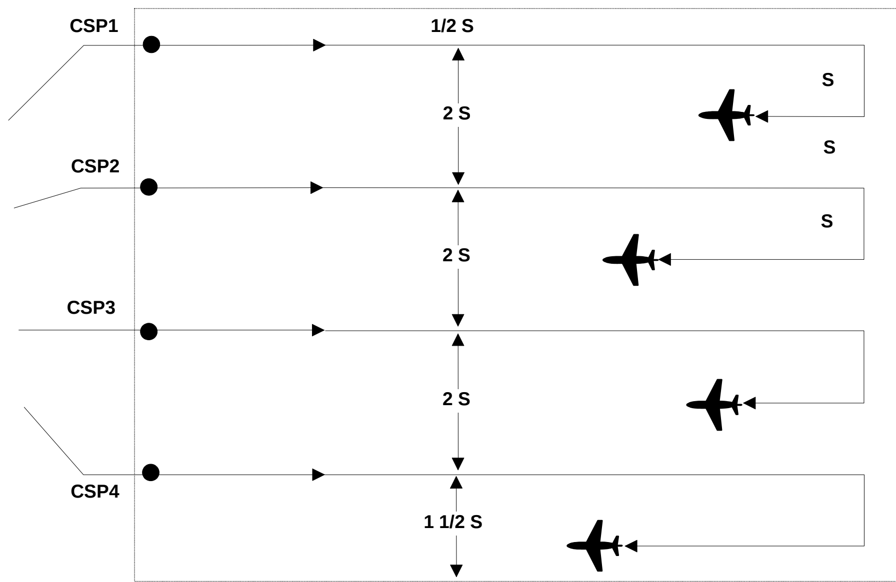


Figure H-36 Parallel Track Multi-Unit Return (PMR)

(d) *Parallel Track Multi-Unit Non-Return (PMN)* is similar to the PMR, except that SRUs continue to a destination other than the departure point. It is normally used when en route vessels are available and will alter their tracks to provide uniform coverage of the search area. See Figure H-37.

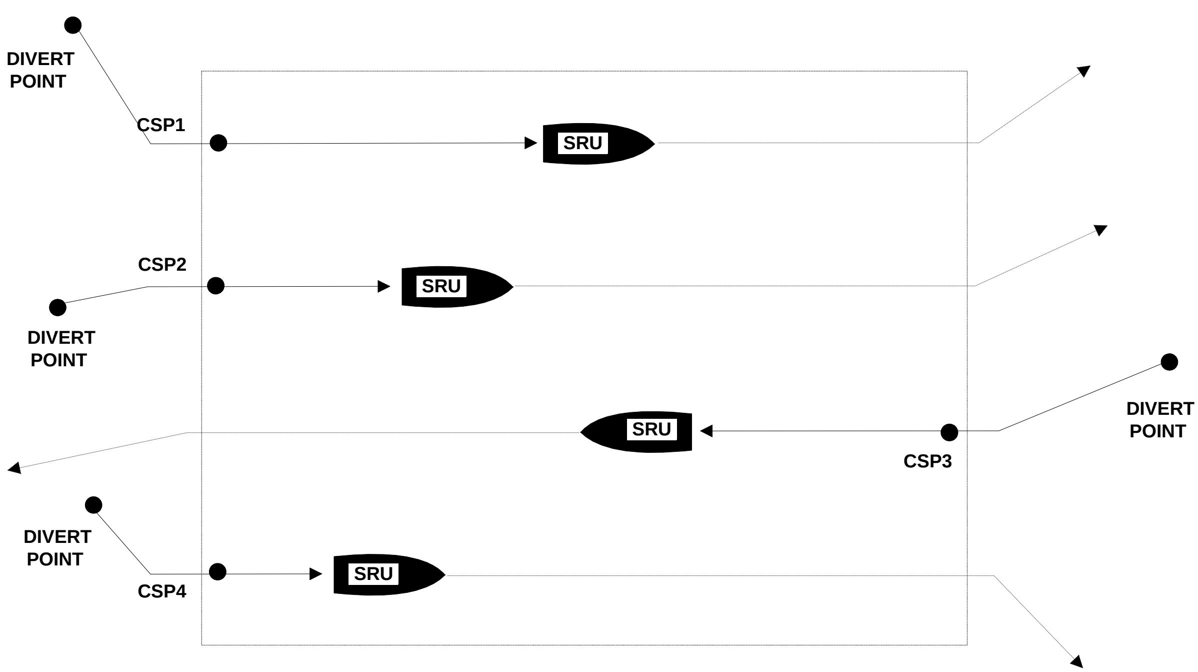


Figure H-37 Parallel Track Multi-Unit Non-Return (PMN)

(e) *Parallel Track Single-Unit LORAN (PSL)* is one of the most accurate search patterns for searching areas covered by LORAN, GPS, or similar navigational systems. ***The pattern must be oriented so legs flown by the SRU are parallel to a system of LORAN lines, or GPS point to point, and so on***. LORAN lines are selected at the track spacing desired. As each leg is flown, the selected line reading is preset on the receiver indicator. The letter "L" in the third position is used to indicate. See Figure H-38.

Figure H-38 Parallel Track Single-Unit LORAN (PSL)

(f) *Parallel Multi-Unit Circle (PMC)* is used by two or more swimmers for underwater search of small areas, generally less than 25 yards in diameter. A line or rope is knotted along its length at distances equal to the track spacing. The line is anchored in the center of the area and swimmers use the knots to maintain uniform spacing, beginning with the innermost knots for one set of circles, then shifting outward to the next set of knots. See Figure H-39.

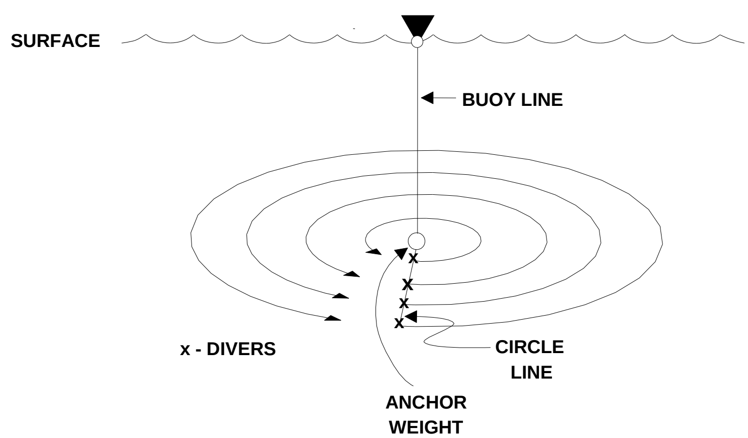


Figure H-39 Parallel Multi-Unit Circle (PMC)

(g) *Parallel Single-Unit Spiral (PSS)* is used by a single underwater swimmer for search of small areas, generally less than 25 yards in diameter. The swimmer uses a line coiled on a fixed drum in the center of the area, and swims in ever-increasing spirals, using the line to maintain proper track spacing by keeping it taut. See Figure H-40.

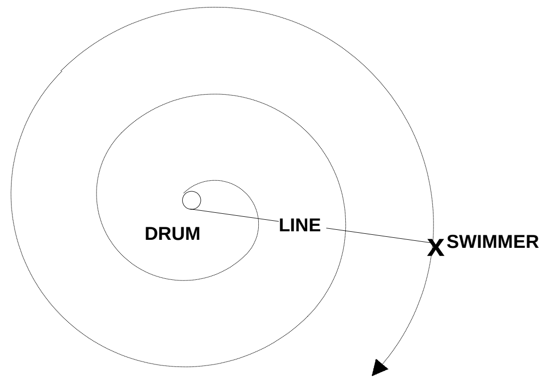


Figure H-40 Parallel Single-Unit Spiral (PSS)

H.7.3.3 Creeping Line Patterns (C) are a specialized type of parallel pattern where the direction of creep is along the major axis, unlike the usual parallel (P) pattern. They are used to cover one end of an area first, or to change direction of the search legs where sun glare or swell direction makes this necessary.

(a) *Creeping Line Single-Unit (CS).* The CSP is located 1/2 track spacing inside the corner of the search area. See Figure H-41.

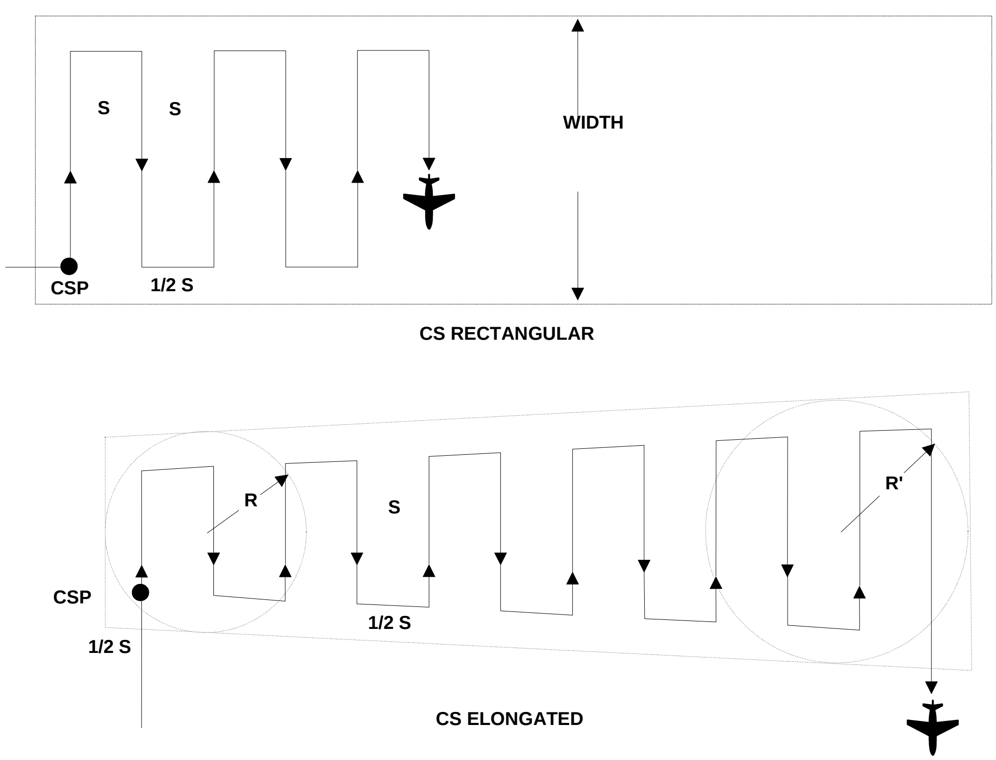


Figure H-41 Creeping Line Single-Unit (CS)

(b) *Creeping Line Single-Unit Coordinated (CSC)* is used when aircraft and either vessels or boats are available. The aircraft track is planned so that advance of successive legs of the search pattern equals that of the marine craft, and the aircraft passes over the vessel on each leg. This results in a more accurate search pattern, and enables quick rescue by marine craft once survivors are located. If the vessel is radar equipped, it should assist the aircraft in keeping on course and advise the aircraft when it is 5 miles from the end of each leg and at the time to turn onto a cross leg. Advisories of distance off course are based on an average of several fixes. Whenever the aircraft is within range, visual bearings should be taken and plotted with radar ranges. Coordinated patterns should be started before entering the search area so that full coverage of the area will be assured. See Figure H-42. See reference (a) for procedures for coordinated patterns.

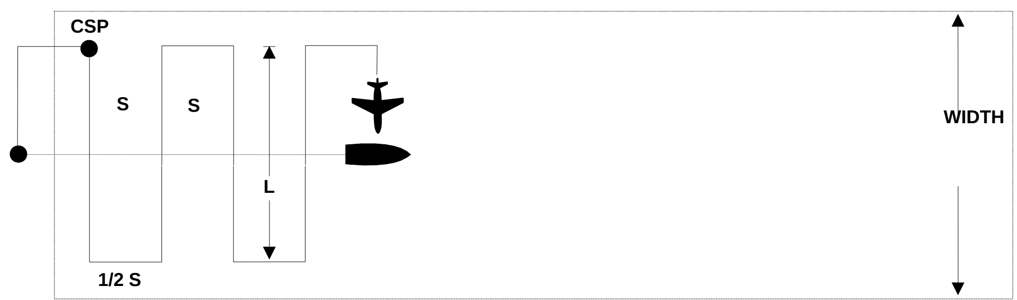


Figure H-42 Creeping Line Single-Unit Coordinated (CSC)

H.7.3.4 **Square Patterns (S)** are used to search a small area when some doubt exists about the distress position. They provide more uniform coverage than a sector search and may be expanded. Square searches are referred to as expanding square searches beginning at datum and expanding outward. If datum is a line instead of a point, the pattern may be changed to an expanding rectangle. The first leg is usually directly into the wind or current to minimize navigation errors. A precise pattern, it requires the full attention of the navigator. ***If two aircraft (the maximum that should be used) are assigned to the same area, they must fly their individual patterns at different altitudes on tracks, which differ by 45°. See Figure H-43.***

(a) *Square Single Unit -- Sierra Sierra (SS)***.**

(1) Use this pattern when confident the datum is within close limits. The first leg is normally in the direction of the search object's drift. All course changes are 90 degrees to the right.

(2) The pattern shown in Figure H-43 has 1-NM track spacing. The length of each leg is indicated. For different track spacing, multiply the distances shown in the pattern by the desired track spacing to find the length of each search leg.

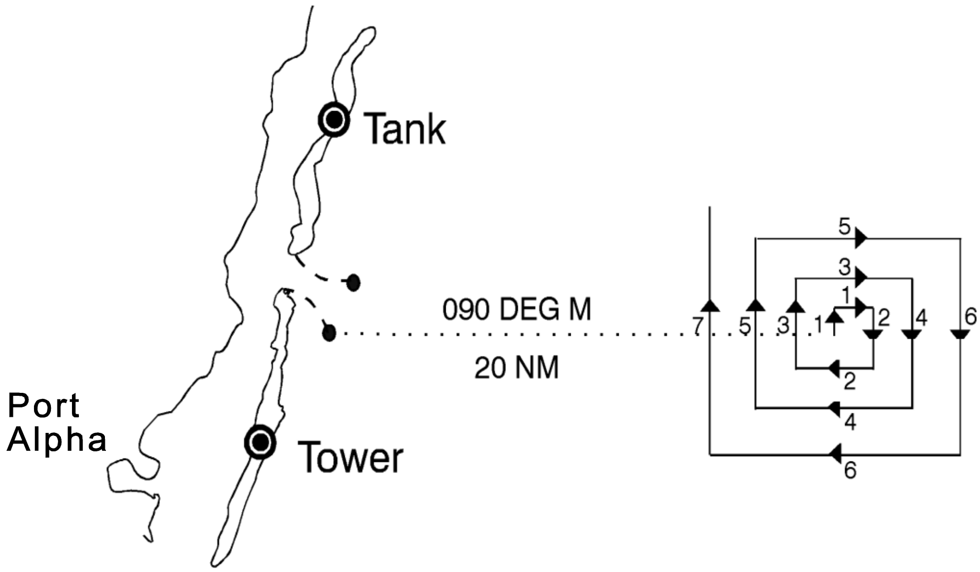


Figure H-43 Square Pattern Single-Unit (SS)

(3) To determine the time required to transit each leg, use Table H-42, Square Pattern Computations. Enter the Table with the track spacing and SRU speed. Multiply the number from the Table by the length of the search leg shown in Figure H-43 to get the time required to complete that leg at the given search speed.

Example: Track spacing = 3 NM, speed = 10 kts:

Find the length of the second southerly leg. Solution: Multiply the length of the second southerly leg of Figure H-51 (4) by the 3 NM track spacing to get 12 NM.

Find the time required to complete this search leg. Example: Enter Table H-42 with a track spacing of 3 NM and a search speed of 10 knots and read the value "18:00" (18 minutes and zero seconds). Multiply this value by 4 (leg factor in Figure H-43). The result is 72 minutes to complete the leg.

Table H-42 Square Pattern Search Computations

Track Spacing	Speed (kts)								
	3	5	8	10	15	20	60	80	90
0.5	10:00	6:00	3:45	3:00	2:00	1:30	0:30	0.225	0:20
1.0	20:00	12:00	7:30	6:00	4:00	3:00	1:00	0:45	0:40
1.5	35:00	18:00	11:15	9:00	6:00	4:30	1:30	1:075	1:00
2.0	40:00	24:00	15:00	12:00	8:00	6:00	2:00	1:30	1:20
2.5	50:00	30:00	18:45	15:00	10:00	7:30	2:30	1:555	1:40
3.0	60:00	36:00	22:30	18:00	12:00	9:00	3:00	2:18	2:00
3.5		42:00	26:15	21:00	14:00	10:30	3:30	2:405	2:20
4.0		48:00	30:00	24:00	16:00	12:00	4:00	3:03	2:40
4.5		54:00	33:45	27:00	18:00	13:30	4:30	3:255	3:00
5.0		60:00	37:30	30:00	20:00	15:00	5:00	3:48	3:20
6.0			45:00	36:00	24:00	18:00	6:00	4:33	4:00
7.0			52:30	42:00	28:00	21:00	7:00	5:18	4:40
8.0			60:00	48:00	32:00	24:00	8:00	6:03	5:20
Note: All times in minutes and seconds Note: Interpolation may be used in this table									

H.7.3.5 Sector Patterns (V) These patterns may be used when datum is established within close limits, a very high coverage is desired in the immediate vicinity of datum, and the area to be searched is not extensive. The patterns resemble the spokes of a wheel and cover circular search areas. Datum is located at the center of the wheel and should be marked with a suitable floating marker. By marking datum, the SRU has a navigation check each time the SRU passes through the center of the search area. While there are many types of sector search patterns, a six-sector pattern is usually used. It consists of three equilateral triangles with one corner of each triangle at datum. See Figures H-44 and H-45. The search radius is also the length of every leg. This search pattern can be used in both single and multi- unit searches. An average coverage for sector patterns can be determined by using the mid-leg track spacing or, equivalently, twice the sweep width divided by the radius of the pattern. Sector searches have high Probability of Success (POS) near datum assuming the object is in the search area. Generally, aircraft sector search areas do not have a radius greater than 20 to 30 miles, while marine craft use a maximum radius of 5 miles. Because only a small area is covered, datum should be recomputed on every search to allow for drift. ***If the search is oriented over a marker, adjustment for total water current (TWC) will occur automatically, and only leeway must be considered. For standardization, all turns should be made to the right.***

(a) In *Sector Single-Unit (VS)* searches six-sector patterns are most commonly used. See Figure H-44.

(b) *Sector Single-Unit Radar (VSR)* is used when a radar-equipped marine craft takes station at the center of the pattern and provides radar navigation assistance to one aircraft completing a sector search pattern.

(c) *Sector Search Pattern: Single Unit -- Victor Sierra (VS)*, Figure H-44. When practical, the first leg of the search is normally in the direction of search object drift. All turns in this pattern are 120° to the right. All legs of the search pattern are equal to the chosen radius. Upon completion of the pattern, a second pattern is started with the heading of the new first leg 30° to the right of the final course of the first pattern.

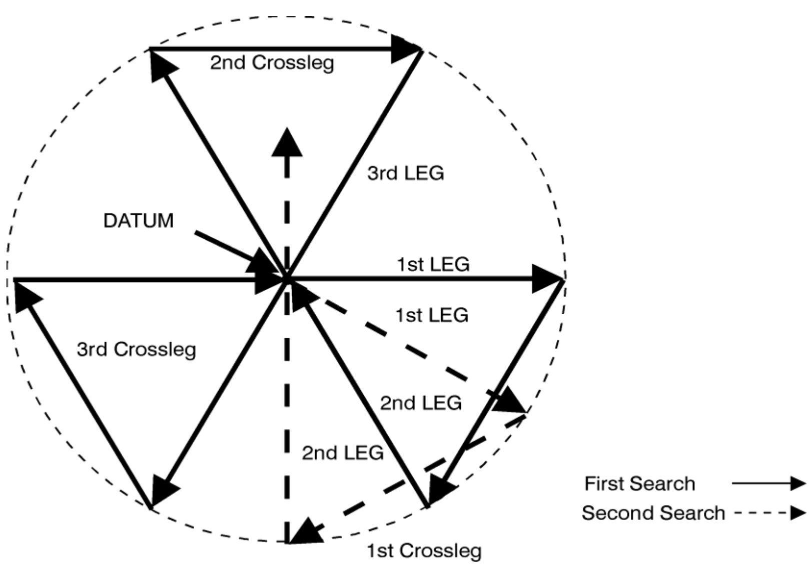


Figure H-44 Sector Pattern Single-Unit (VS)

(d) *Sector Search Pattern: Two-Units -- Victor Mike (VM)***.** The VM pattern is used when two surface SRUs are available, Figure H-45. This pattern is not used with aircraft SRUs. As the first SRU begins a Victor Sierra search, the second begins its pattern at datum in a direction 90° to the left of the first leg of the first SRU. If the SRUs arrive at datum to begin the search at the same time, the second starts at a lower speed than the first. When the first SRU is about one leg ahead of the second, the second accelerates to search speed. The slow start of the second SRU prevents the SRUs from arriving at datum at the same time. When both have completed one VM pattern, the coverage is the same as if a single SRU had completed two VS patterns.

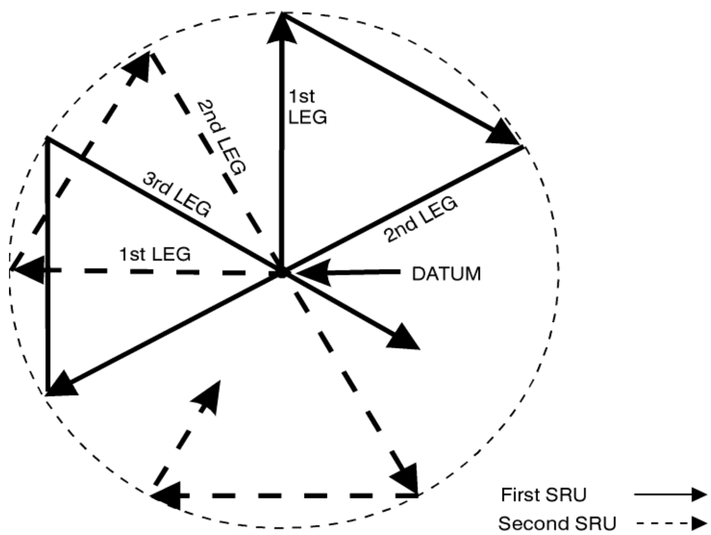


Figure H-45 Sector Pattern Two-Unit (VM)

(e) The sector search pattern becomes too complicated for more than two SRUs. When more than two SRUs are available, consider using a multi-unit parallel track (PM) search pattern, or dividing the search area into smaller areas and conducting single unit searches. Sector search distance and time calculations are as follows:

(1) To determine the distance traveled by each SRU completing a sector search, multiply the radius (R) by nine. (Trackline = 9 x R NM)

(2) To determine the Total Time (T) for a search, multiply the time (t) for one leg from Table H-43 by nine. (T = 9 x t)

(3) To determine Total Area (A) covered in a search, square the radius (multiply the radius (R) by itself), and then multiply the resultant by pi (3.14).

(A = R x R x 3.14)

Table H-43 Sector Pattern Search Computations

Radius	Speed (kts)								
	3	5	8	10	15	20	60	80	90
0.5	10:00	6:00	3:45	3:00	2:00	1:30	0:30	0.225	0:20
1.0	20:00	12:00	7:30	6:00	4:00	3:00	1:00	0:45	0:40
1.5	30:00	18:00	11:15	9:00	6:00	4:30	1:30	1:075	1:00
2.0	40:00	24:00	15:00	12:00	8:00	6:00	2:00	1:30	1:20
2.5	50:00	30:00	18:45	15:00	10:00	7:30	2:30	1:555	1:40
3.0	60:00	36:00	22:30	18:00	12:00	9:00	3:00	2:18	2:00
3.5		42:00	26:15	21:00	14:00	10:30	3:30	2:405	2:20
4.0		48:00	30:00	24:00	16:00	12:00	4:00	3:03	2:40
4.5		54:00	33:45	27:00	18:00	13:30	4:30	3:255	3:00
5.0		60:00	37:30	30:00	20:00	15:00	5:00	3:48	3:20
6.0			45:00	36:00	24:00	18:00	6:00	4:33	4:00
7.0			52:30	42:00	28:00	21:00	7:00	5:18	4:40
8.0			60:00	48:00	32:00	24:00	8:00	6:03	5:20

Note: Time to complete one leg (t) in minutes and seconds
Note: Interpolation may be used with this table

H.7.3.6 **Contour Patterns (O)** are used for search in mountainous and hilly terrain. They are adaptable to underwater SRUs for searching peaks on the ocean floor. Contour searches are covered in references (a) and (b).

H.7.3.7 **Flare Patterns (F)** are used only at night. Detection of survivors without visual aids is difficult at night. Parachute flares increase the chance of detection only slightly and are effective mostly for large objects in well-defined search areas on flat land or at sea. Parachute flares should be used for searches over land when the urgency is such that the risk of starting ground fires becomes acceptable. They are more useful in sea searches where searchers under parachute flare illumination are less likely to be confused by silhouettes or reflections from objects other than the target. The flares are normally dropped from a fixed- wing aircraft above and ahead of the SRU. The most effective SRUs for flare patterns are, in order, vessels, helicopters, and fixed-wing aircraft.

(a) *Flare Single-Unit (FS)* is conducted by a single vessel or helicopter with an aircraft dropping flares. See Figure H-50.

(1) For ships, the aircraft should drop the flares upwind of the vessel, off the starboard or port bow. Flare burnout should occur on the opposite quarter of the vessel. Illumination may be on one or both sides of the SRU.

(2) For helicopters, the search pattern should be flown into the wind or downwind at a minimum altitude of 500 feet. Favorable visual meteorological conditions should exist. The flares should be dropped at the 2 o'clock or 10 o'clock positions at a height, which permits flare burn out at or below helicopter altitude. Illumination should be continuous because alternating between light and darkness disorients helicopter pilots. With consideration for wind strength, the pattern should be planned so that the fixed-wing aircraft drops a new flare just before the old burns out. The helicopter pilot should be able to see the flare or flare-dropping aircraft when the flare is dropped.

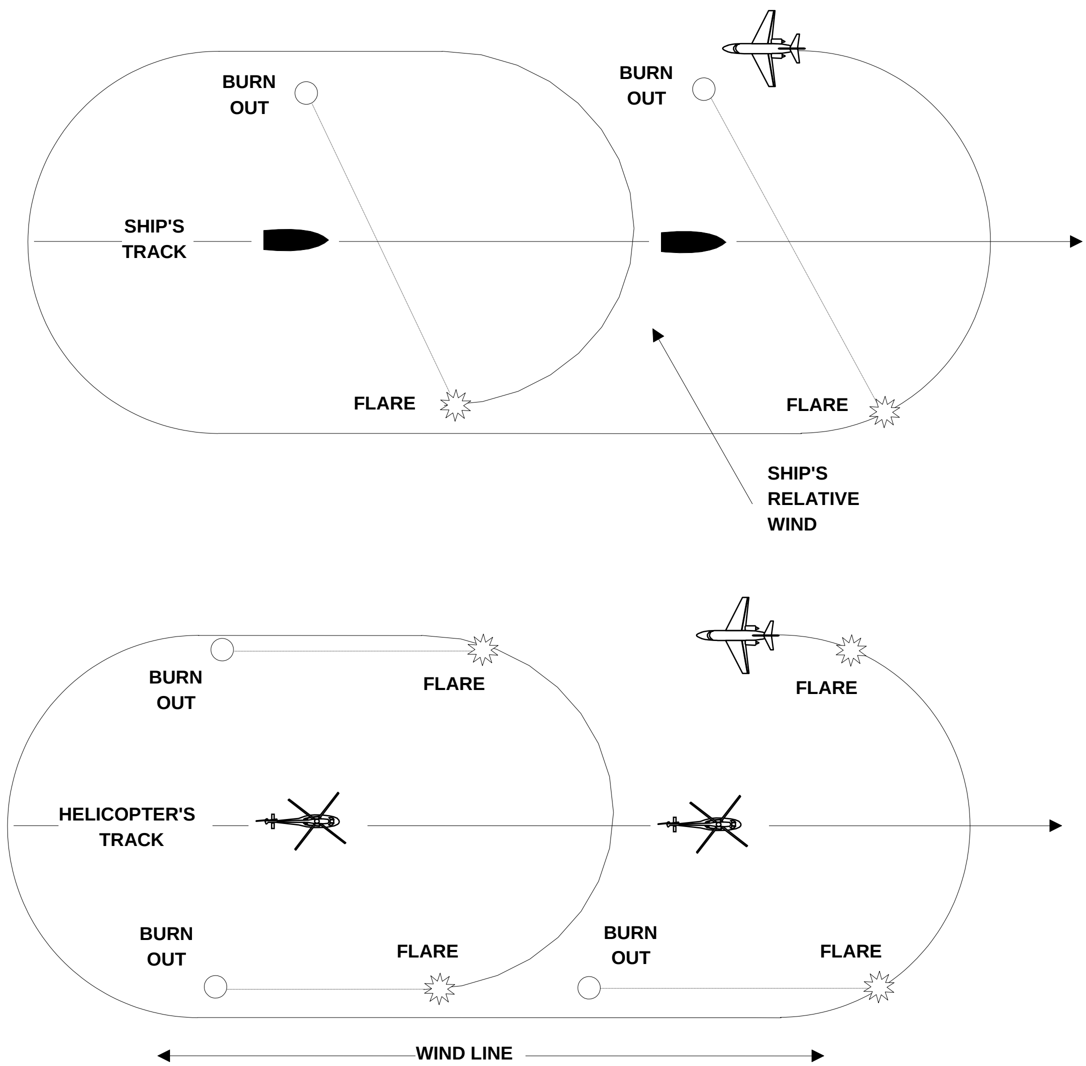


Figure H-46 Flare Single-Unit (FS)

(b) *Flare Multi-Unit (FM)* is similar to the Parallel Track Multiunit Non-Return pattern. The vessels form abeam with spacing between ships depending on size of target and local conditions. The search legs are oriented into the wind. The aircraft flies a racetrack pattern over the formation, and between vessels, dropping a set of flares upwind so that they are over the formation during the middle of the burning period. The aircraft drops a new set as the previous set burns out. See Figure H-47.

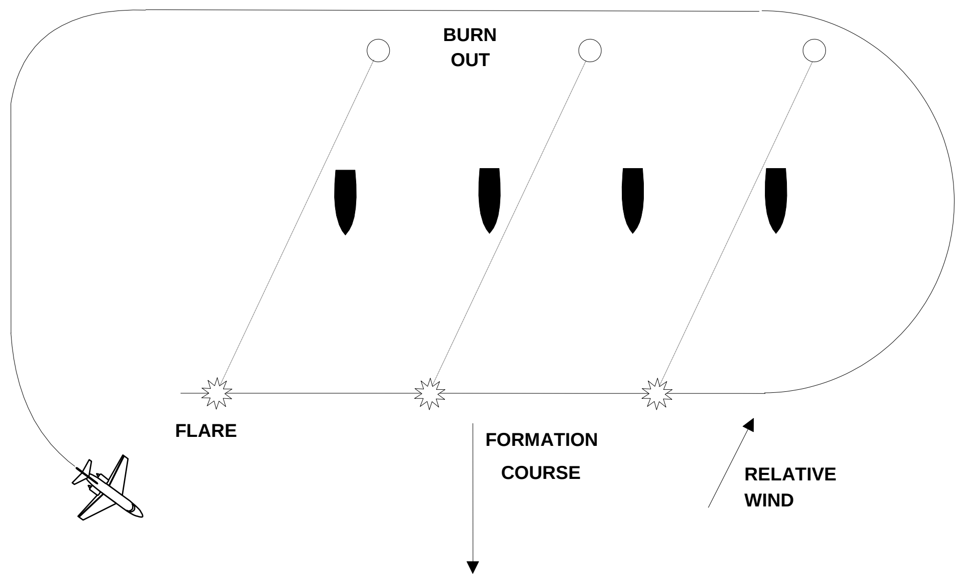


Figure H-47 Flare Multi-Unit (FM)

H.7.3.8 **Homing Patterns (H)** are used to locate emergency transmitters or other radio or electronic emissions from survivors or distressed craft when the detected signal is too weak for homing equipment to receive, or the SRU does not have homing equipment. Patterns for these searches are discussed in reference (b) (IAMSAR).

H.7.3.9 **Drift Compensation During a Search.** If the target and SRU are in motion, it may be necessary to consider the relative motion plot of the SRU with respect to the target, especially in high current areas. Failure to account for target motion may cause the target to drift out of the search area before the search is completed. Even if the target remains in the search area, the pattern relative to the target may be so distorted that POD is greatly reduced.

(a) While it is possible to compensate any search pattern for drift, in practice compensation is normally applied to parallel path (PS/CS) searches. To determine whether compensation is needed, planners ascertain expected velocity of target drift (v) during the next search, maximum dimensions (length (l) and width (w)) of the search area, and search speed (V) and track spacing (S) to be used.

(1) If the value of (v x l)/(V x S) is less than 0.1, compensation for drift is not necessary. Otherwise, orient the search area so that the major axis is parallel to target drift direction, and investigate the problem further.

(2) If the value of (v x w)/(V x S) is less than 0.1, no compensation is necessary. Otherwise, patterns for drift compensation should be considered.

(b) Patterns accounting for search target motion are:

(1) *Parallelogram Pattern (P_d).* In these patterns the search legs are parallel to target expected motion. The perimeter of the area relative to the earth can be found by moving the down creep side of the uncompensated area the distance the target is expected to

drift during the search of that area. For multi-SRU searches, the total area should be divided into adjacent areas that join only along sides parallel to the search legs (see Figure H-48). All SRUs should creep in the same direction, with altitude separation provided for aircraft SRUs. Each area should be compensated to account for differences expected in drift rate between subareas.

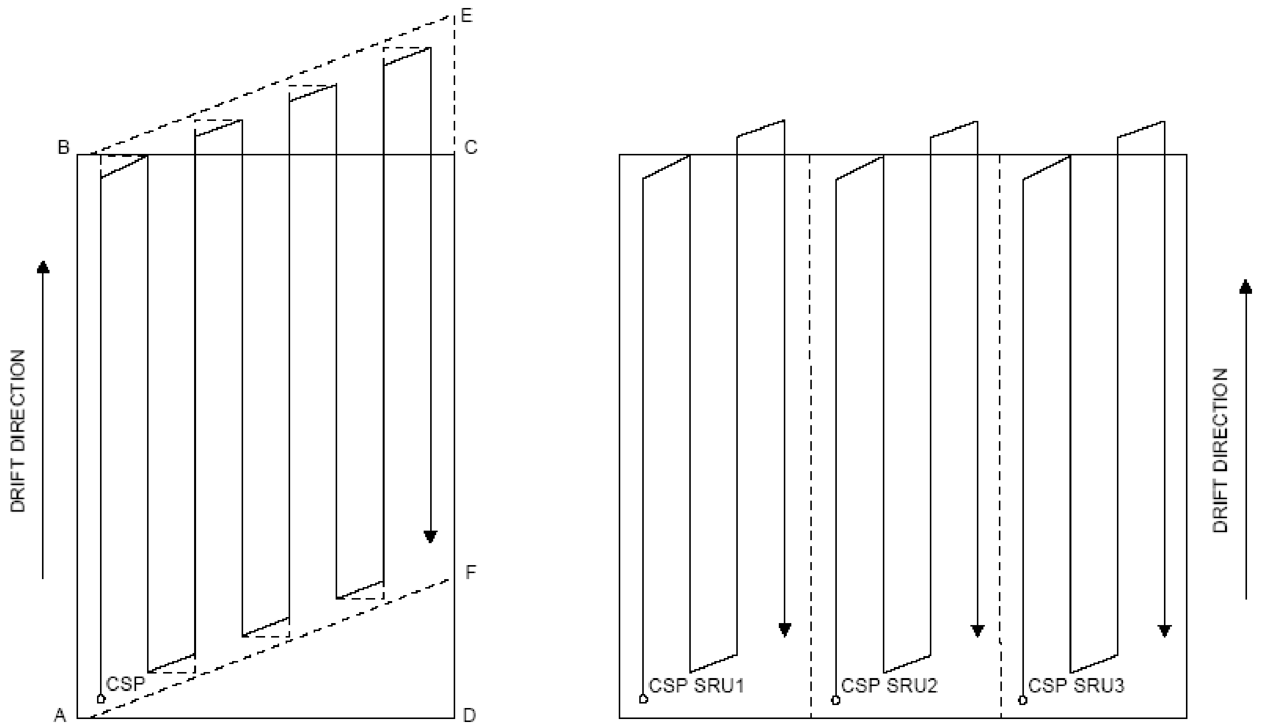


Figure H-48 Parallelogram Search Patterns

(2) *Cross-Over Barrier Pattern (B).* These patterns have search legs perpendicular to the expected relative movement of targets. The three types of barriers -- depending on relationships of search speed, search leg length, and target speed -- are advancing, stationary, and retreating barriers (see Figure H-49). Most barrier patterns executed by aircraft will be advancing. If multiple barrier patterns are used, search areas should be joined only along sides parallel to search legs. All SRUs should creep in the same direction, with aircraft given altitude separation. Barrier and parallelogram patterns should never be used in adjacent areas. A barrier pattern is more sensitive than a parallelogram pattern to differences between the computed rate of target drift and target rate of drift.

(3) *Expanded Area.* Circumstances may not permit use of parallelogram or barrier patterns for drift compensation. The search area size and number of SRUs may preclude establishing adjoining search areas. If so, the planner should expand the area and plan a search with non-compensated patterns. The amount and direction(s) of expansion should be consistent with expected target drift. Figure H-50 illustrates a case of drift direction reasonably well known, but a search area grouping requiring the expanded area technique. In this case, search areas are oriented in the direction of drift. Figure H-51 illustrates a similar case where the search area cannot be oriented with the drift direction. When the search is completed, the initial area, not the expanded area, is completely covered relative to the search target.

(c) When drift compensation is used, SRUs should arrive on scene at assigned times. Delays may occur, but target motion continues and its effect on area coverage relative to the target should be considered. In some cases the assigned area of a late arrival can be moved down drift without adversely affecting SRU separation. In other cases, the SMC will need to determine the uncovered area and search it later to ensure coverage. Search area prioritization also reduces the effects of delay or interruption. Areas can be ranked according to probability of containing the target. If this is done in advance, SRUs can be reassigned from areas of lower probability.

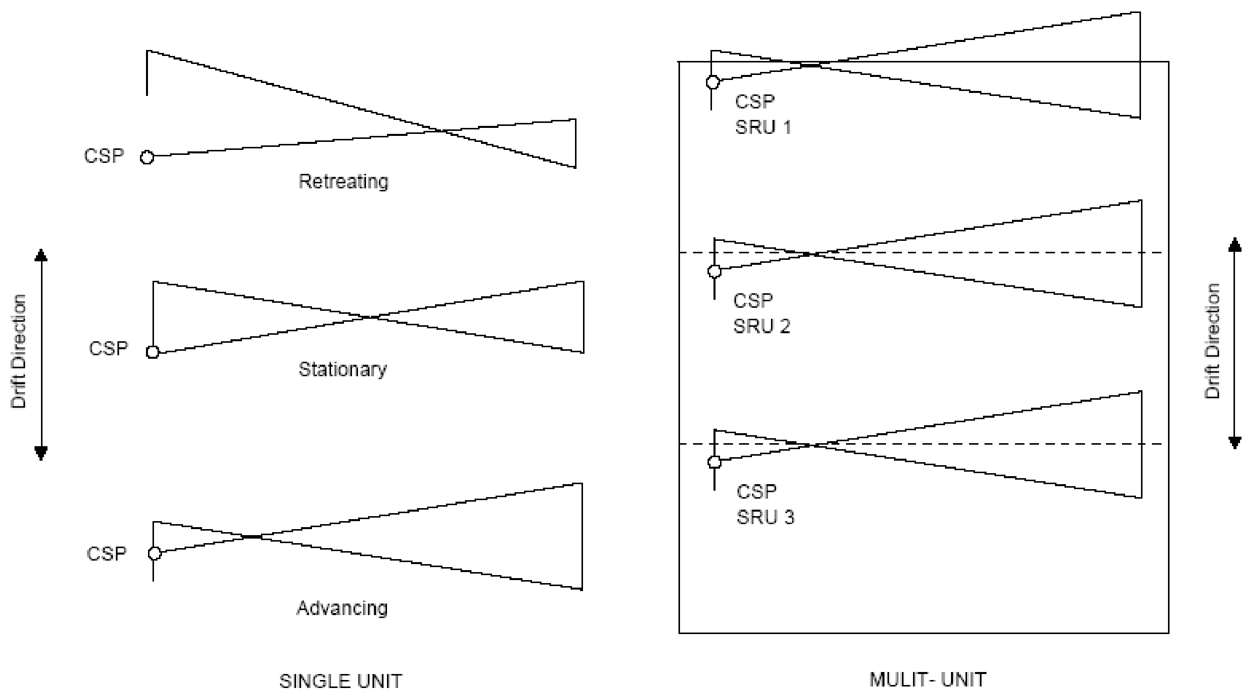


Figure H-49 Cross-Over Barrier Pattern (B)

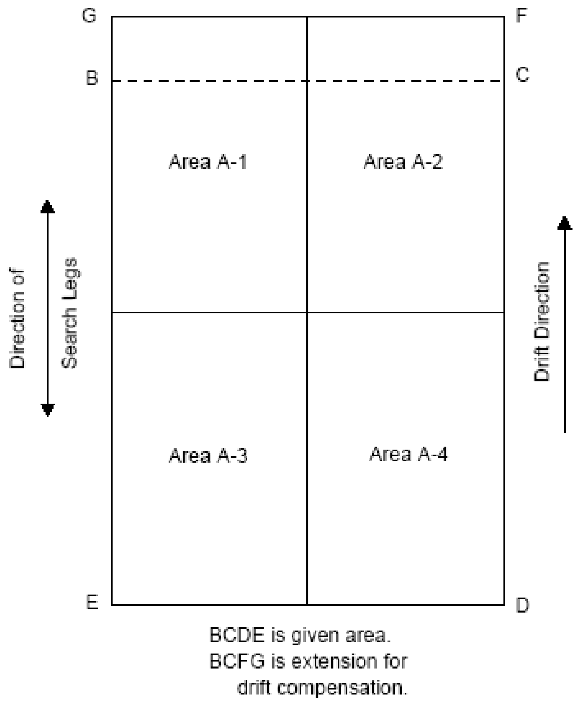


Figure H-50 Expanded Area, Drift Oriented

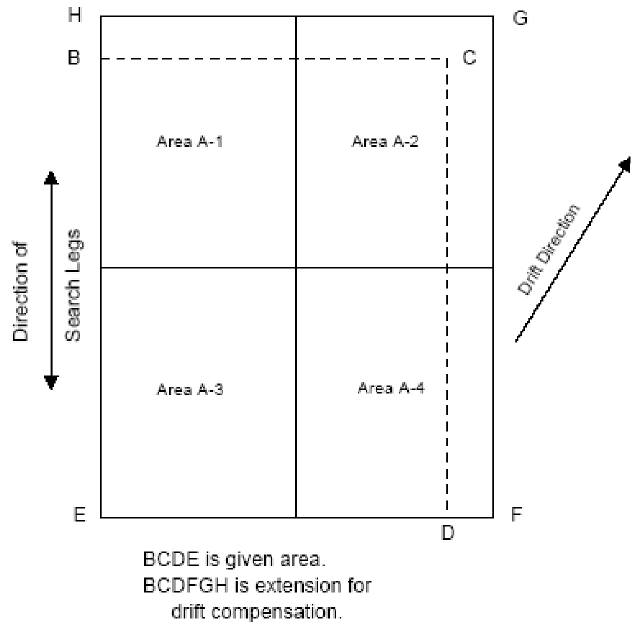


Figure H-51 Expanded Area

Table H-44 Search Pattern Summary

Pattern	*Name*	*SRU required*	*Remarks*
TSR	Trackline single-unit return	1	For search of a trackline or line of position when unit must break off search at same end of track as search originated.
TMR	Trackline multiunit return	2 or more	Same AS TSR except that 2 or more SRUs a are used cruising abeam of each other.
TSN	Trackline single-unit	1	Same as TSR except that search terminates at non-return at opposite end of track from commence search point.
TMN	Trackline multiunit	2 or more	Same as TMR except that search terminates at nonreturn opposite end of track from commence search point.
PS	Parallel track single-unit	1	Search of a large area when position of distress is unknown.
PM	Parallel track multiunit	2 or more	Same as PS except two or more SRUs search abeam of each other a distance S apart.
PMR	Parallel track multiunit	2 or more	Used for search of long rectangular area where return only one track out and back is possible.
PMN	Parallel track multiunit	2 or more	Only en route SRUs or transient craft available nonreturn for one track through search area.
PSL	Parallel track single-unit Loran	1	Same as PS except SRU uses Loran lines for Loran line greater navigational accuracy on tracks.
PMC	Parallel multiunit circle	2 or more	Underwater pattern only.
PSS	Parallel single-unit spiral	1	Underwater pattern only.
Pd	Parallel drift compensated	1 or more	Used when target motion requires drift Compensation
CS	Creeping line single-unit	1	Distress generally known to be between two points. Wider than trackline patterns.
CSC	Creeping line single-unit coordinated	1 acft + 1 ship	Same as PS except coordinated ship movement used to obtain greater navigational accuracy.
SS	Square single-unit	1	Distress Position known within close limits and search area not extensive.
SM	Square multiunit	2 acft	Same as SS except two SRUs fly at different altitudes on tracks which differ by 45°
VS	Sector single-unit	1	Distress position known within close limits and search area not extensive.
VSR	Sector single-unit radar	1 acft + 1 ship	Same as VS except ship controls aircraft by radar.
OS	Contour single-unit	1	Search of mountainous/hilly terrain.
OM	Contour multiunit	2 or more	Search of mountainous/hilly terrain by land search teams.
FS	Flare single-unit	1 acft + 1 ship or 2 acft.	Night visual search only.
FM	Flare multiunit	1 acft + ships	Night visual search only.
HSA	Homing single-unit aural	1	Electronic homing-in use.
HSM	Homing single-unit meter	1	Electronic homing-in use.
HMN	Homing multiunit nonreturn	2 or more	Electronic positioning use.
B	Cross-over Barrier	1 or more	Used when target motion requires drift compensation

Section H.8
Search Action Plan (SAP)

H.8.1 Purpose

The purpose of a Search Action Plan (SAP) is to communicate vital information to all participating SRUs and other appropriate parties so that the search may be performed safely, efficiently, and effectively in an organized, coordinated fashion. If the SMC does not promulgate a complete SAP to all concerned parties in a timely fashion, serious consequences may result. Each SRU needs to be aware of all other SRU assignments, not just its own. The most important reason for having each SRU aware of the overall plan is safety. Another reason is to allow re-assignment of the available SRUs in case an SRU is delayed or unable to participate in the search. SAPs include a brief description of the current situation, search objects, anticipated weather, and other pertinent information. They contain action items for parent commands and specific search patterns and assignments for the SRUs. SAPs also include coordination instructions where the SAR Mission Coordinator (SMC) is identified, the On Scene Coordinator (OSC) is designated and other coordination issues are addressed. Finally, SAPs specify radio frequency assignments (communications plan), and reporting requirements. SAPs are essential. In fact, they are the search planner's most important product.

H.8.2 SAROPS SAP

SAROPS produces a SAP in the standard format that is nearly complete by drawing all of the pertinent data from the Case Properties, the Simulator Run Properties, and the final Planner results, as modified by the search planner. The SAROPS SAP report is formatted so that it may be copied and pasted into a message form as the body of the message. It may also be delivered by other means including e-mail and fax. Delivery by voice communications is possible, but this mode is cumbersome and error prone. It should be avoided whenever practicable.

H.8.3 Standard SAP

A standard SAP allows the reader to quickly find critical information by knowing that it will always be in a certain place and to identify vital information that is missing. Equally as important, the DRAFTER of the SAP only needs to learn the format once, since it is now standardized throughout the Coast Guard.

H.8.3.1 Benefits of this standardized format include:

(a) Time saved in preparing the SAP.

(b) Fewer calls looking for missing information.

(c) Time saved finding information critical to executing the mission.

H.8.3.2 Policy regarding SAPs is provided in Chapter 3, the standard SAP format is provided in Appendix C.

Section H.9
Manual Solution Worksheets

The following worksheets are for the modified inputs to the manual solution contained in the IAMSAR Manual. A job aid follows each worksheet. The worksheets included are:

- Reversing Tides & Other Currents Worksheet
- Wind Current Worksheet

REVERSING TIDES & OTHER CURRENTS WORKSHEET

Case Title: ______________________________ Planner's Name: _________________ Date: ____________

A. Incident Summary

	MINIMUM	MAXIMUM
1. Latitude	_____________N/S	_____________ N/S
2. Longitude	____________ W/E	____________ W/E
3. Surface Position DTG	_______ Z _______	______ Z ________
4. Datum DTG	________ Z _______	
5. Drift Interval	____________ HRS	____________ HRS

B. Time Conversions: GMT + Zone Description (Rev) = Zone Time

1. Surface Position DTG (Zone Time) ________________ ________________
2. Datum DTG (Zone Time) ________________

C. Reversing Tidal Currents (Minimum / Maximum / First Search) (circle one)

1. REFERENCE STATION: ___________________________ PAGE: _______ DATE: ______________
   SUBSTATION: ___________________________________ REFERENCE NUMBER: _______________

2. TIME DIFFERENCES

   MINIMUM
   BEFORE

   Flood _____ HRS _____ MIN

   Max
   Flood _____ HRS _____ MIN

   MINIMUM
   BEFORE

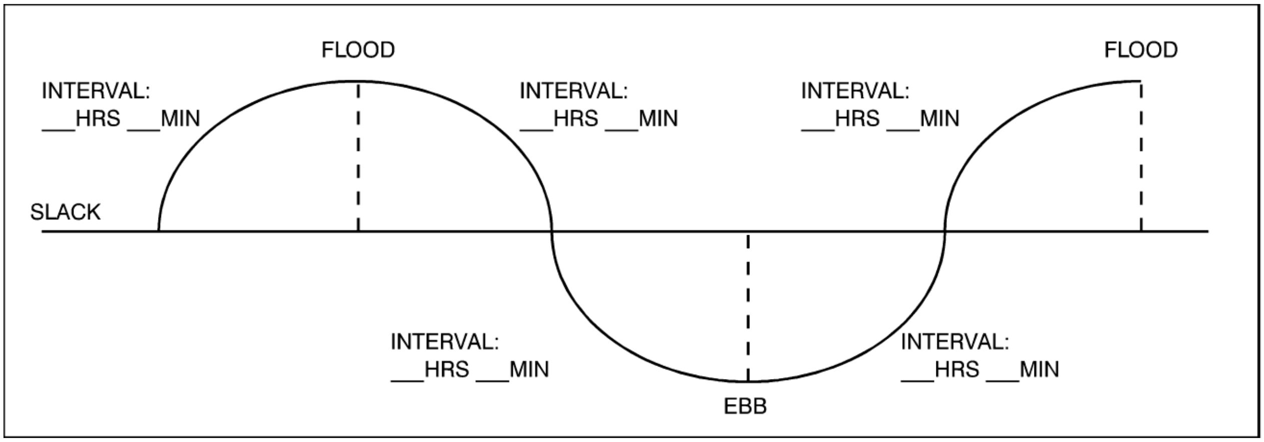
   Ebb _____ HRS _____ MIN

   Max
   Ebb _____ HRS _____ MIN

3. VELOCITY INFORMATION
   FLOOD: SPEED RATIO _____ AVERAGE DIRECTION _____ °T
   EBB: SPEED RATIO _____ AVERAGE DIRECTION _____ °T

4. a) REFERENCE STATION / b) SUBSTATION

TIME	SPEED	TIME	SPEED	(E/F?)	TIME	SPEED	TIME	SPEED	(E/F?)
______	SLACK	______	______		______	SLACK	______	______	
______	SLACK	______	______		______	SLACK	______	______	
______	SLACK	______	______		______	SLACK	______	______	
______	SLACK	______	______		______	SLACK	______	______	
______	SLACK	______	______		______	SLACK	______	______	



5. TIDAL CURRENT CHART
   INCIDENT TIME: ____________ DATUM TIME: ____________

6. COMPUTING AVERAGE FACTOR OF CYCLE:
   a) Time interval from slack water to incident: ______ HRS ______ MIN (Same Half-Cycle)
   Time interval from slack water to DATUM: ______ HRS ______ MIN (Same Half-Cycle)

b) FACTORS FOR THE FLOOD/EBB CYCLE (1)	b) FACTORS FOR THE FLOOD/EBB CYCLE (2)
_____ _____ _____ _____ _____	_____ _____ _____ _____ _____
_____ _____ _____ _____ _____	_____ _____ _____ _____ _____
_____ _____ _____ _____ _____	_____ _____ _____ _____ _____
_____ _____ _____ _____ _____	_____ _____ _____ _____ _____
_____ _____ _____ _____ _____	_____ _____ _____ _____ _____
c) TOTAL VALUE OF FACTORS IN THIS CYCLE: _____	c) TOTAL VALUE OF FACTORS IN THIS CYCLE: _____
Divided by: Total Number of factors in Cycle: _____	Divided by: Total Number of factors in Cycle: _____
Equals: Average Factor for Cycle: _____	Equals: Average Factor for Cycle: _____

7. COMPUTING THE AVERAGE CURRENT SPEED FOR THE CYCLE:

Maximum Current Speed for the Cycle: ______ KTS	Maximum Current Speed for the Cycle: ____ KTS
Multiplied by the Average Factor EQUALS	Multiplied by the Average Factor EQUALS
The Average Speed for the Cycle: ______ KTS	The Average Speed for the Cycle: _____ KTS

8. COMPUTING TIDAL CURRENT VECTOR FOR THE CYCLE: (1) F / E (2) F / E

	(1) F / E	(2) F / E
Time Duration of Drift through the Flood/Ebb Cycle:	______ HRS	______ HRS
Multiplied by the Average Current Speed:	______ KTS	______ KTS
EQUALS: Magnitude of Current vector for the Cycle:	_______ NM	_______ NM

9. CALCULATING THE TOTAL TIDAL CURRENT VECTOR:
   1st Current Vector: ______ °T ______ NM + 2nd Current Vector: ______°T ______ NM

   EQUALS: Total Reversing Tidal Current Vector: __________ °T __________ NM

OTHER CURRENTS WORKSHEET

1. There are many other currents that may affect a search object. Some of these are: Lake, Longshore, River, Surf, Rotary, etc. The form is self-explanatory..

2. Type of Current: _______________________________

3. Source of information: _________________________

	MINIMUM	**MAXIMUM**	
4. Set	____________ °T	____________ °T	
5. Drift	__________ KTS	__________ KTS	
6. Vector Direction from above and Drift x Drift Interval		____________ °T ___________ NM	____________ °T ___________ NM

REVERSING TIDAL CURRENT WORKSHEET
Job Aid

Introduction

This Job Aid provides step-by-step instructions to compute Reversing Tidal Current vectors as well as other currents. Tab 1 provides amplifying information on filling out Section C.6.b)(Factors of each cycle).

A. Incident Summary

This section of the worksheet is a review of the incident data.

NOTE: Use two columns only if calculations are from previous D_{min} and D_{max}

1. Latitude — Enter data from Datum Worksheet line B.3.
2. Longitude — Enter data from Datum Worksheet line B.4.
3. Surface Position DTG — Enter data from Datum Worksheet line B.2.
4. Datum DTG — Enter data from Datum Worksheet line C.1.
5. Drift Interval — Enter data from Datum Worksheet line C.2.

B. Time Conversion

Tidal Current Tables use Standard Meridian Time (Zone Time) for predictions. To properly use these tables, SAR Planners must know the Zone Description based upon the Standard Time Meridian. By using the following methodology, the SAR Planner avoids confusion among Local Time, Daylight Saving Time, and Legislated Time. The formula is:

GMT + ZD (reversed) = ZT

Greenwich Mean Time (GMT) is equal to Zulu time. Zone Descriptions (ZD) can be found in various manuals, such as Bowditch. Article 1814 of Bowditch explains this conversion.

1. Surface Position DTG — Enter the result of A.3. + ZD (rev.)
2. Datum DTG — Enter the result of A.4. + ZD (rev.)

C. Reversing Tidal Currents

1. Reference Station — Record date of incident. In the Index of the appropriate Tidal Current Tables, locate and record Substation Name and Reference Number, Reference Station Name and Page Number.
2. Time Differences — In Table 2 of Tidal Current Tables, locate Substation and record Time Differences, if applicable.
3. Velocity Information — In Table 2 of Tidal Current Tables, locate Substation and record Speed Ratio and Average Direction for Maximum Flood and Maximum Ebb, if applicable.
4. Time of Each Cycle
   a) Reference Station — In Table 1 of Tidal Current Tables, locate Reference Station. Record the applicable Predicted Times of Slack Water, Max Flood/Ebb and Speed of Max Current. Annotate speed with F for Flood or E for Ebb.
   b) Substation — Add or subtract Time Differences (2. above) to Reference Station Predicted Times [4.a)] and record results. Multiply Speed Ratio (3. above) times Reference Station Predicted Speed and record results to **hundredths** (0.XX). Annotate resultant Speed with **F** or **E**.

5. Tidal Current Chart — Record Incident Time and Datum Time [form A.3. and A.4.]. Plot Incident and Datum Times on Tidal Current Chart. Label all affected times of Slack Water, Max Flood, and Max Ebb for the incident. Calculate the Interval of the 1st Half and 2nd Half of each Affected Cycle. Record results.

6. Computing Average Factor of Cycle

   a. Time interval — Calculate the interval from Slack Water, within same half-cycle, to Incident and record results. Calculate the time interval from Slack Water within the same half-cycle to Datum and record results.

   b. Factors for the cycle — Using Table 3 of the Tidal Current Tables, determine which Table to use, A or B. Using Table 3, obtain necessary factors for each half of the Flood/Ebb Cycle. Record appropriately and circle F (Flood) or E (Ebb).

NOTE: If unsure of this instruction, refer to TAB 1 of this Appendix.

   c. Average Factor — Add the factors [6.b)] for each cycle and record results. Count the number of factors [6.b)] and divide the Total Value of Factors by the number of factors. Record results to **thousandths** (0.XXX).

7. Average Speed — Record the Max Current Speed [4.b)]. Multiply it by the Average Factor and record result to **hundredths** (0.XX).

8. Vectors For Each Cycle — Calculate the Duration of Drift through each Cycle and record result to **hundredths** (0.XX). Record the Average Current Speed and multiply it by the Duration of Drift. Record result to **hundredths** (0.XX).

9. Tidal Current Vectors — Record the Average Direction of Drift for each appropriate Cycle [3. above]. Record the Magnitude of Current Vector for each appropriate Cycle [8. above]. Use a Maneuvering Board or Scientific Calculator to calculate the Total Reversing Tidal Current Vector. Record result to **tenths** (0.X).

TAB 1

General

Tab 1 provides a detailed explanation and step-by-step directions for filling out Section 6.b, Factors of each cycle, of the Reversing Tidal Current Worksheet. You may find it helpful to use it in conjunction with the job aid located earlier in this appendix.

INSTRUCTION 6.b: REVERSING TIDAL CURRENT WORKSHEET

At the top of Section 6.b, circle the direction of the cycle (Flood/Ebb). Now go to Table 3. Use Table A for all other places except those listed for Table B. From your Tidal Current chart, locate the starting point of your cycle. There are two places you can start at: incident position or slack water. Starting at incident, there are three possible situations:

INCIDENT TO DATUM, SAME HALF CYCLE:

Use Instruction 6.b(1)

INCIDENT TO MAX CURRENT, 1st HALF OF CYCLE:

Use Instruction 6.b(2)

INCIDENT TO SLACK WATER, 2nd HALF OF CYCLE:

Use Instruction 6.b(3)

INSTRUCTION 6.b(1): INCIDENT TO DATUM, SAME HALF OF CYCLE

Locate the interval from the Tidal Current chart (Section 5) for that half of the cycle and locate the column in Table 3 for that interval. Do not interpolate on this Table. If you are halfway between the columns, go to the next higher column. Now on the left side of the Table enter the incident interval (time interval between slack water to datum). This is the factor for the incident; circle it. The next event is datum. On the left side of the Table enter the datum interval (time interval between slack water to datum). This is the factor for the datum; circle it. Now record the factors you circled and all in between. Check the number of factors for the cycle. For every 20 minutes of drift you should have one factor. (If you have one too many factors or are short one factor - ok. This is probably due to rounding off on Table 3.) You have all the factors for your cycle; go to the instructions for Section 6.c.

INSTRUCTION 6.b(2): INCIDENT TO MAX CURRENT, 1st HALF CYCLE

Locate the interval from the Tidal Current chart (Section 5) for that half of the cycle and locate the column in Table 3 for that interval. Do not interpolate on this Table. If you are halfway between the columns, go to the next higher column. Now on the left side of the Table enter the incident interval (time interval between slack water to incident). This is the factor for the incident; circle it. The next event is Max Current. The max current is represented by the last 1.0 listed in the column (bottom of column); circle it. Now record the factors you circled and all in between. These factors are only for the 1st half of your cycle; you are not finished yet. Move on to the next half cycle, there are two possible situations.

MAXIMUM CURRENT TO SLACK WATER, 2nd HALF OF CYCLE:

Use instruction 6.b(4)

MAXIMUM CURRENT TO DATUM, 2nd HALF OF CYCLE:

Use instruction 6.b(5)

INSTRUCTION 6.b(3): INCIDENT TO SLACK WATER, 2ND HALF OF CYCLE

Locate the interval from the Tidal Current chart (Section 5) for that half of the cycle and locate the column in Table 3 for that interval. Do not interpolate on this Table. If you are halfway between the columns, go to the next higher column. Now on the left side of the Table enter the incident interval (time interval between slack water to incident). This is the factor for the incident; circle it. The next event is slack water. The slack water is represented by the last factor listed at the top of the column; circle it. Now record the factors you circled and all in between.

Remember, you have not reached datum yet, you only calculated the factors for the first cycle. After you are finished with the 1st current vector you must continue with the next cycle starting at the slack water. There are two possible situations:

SLACK WATER TO MAX CURRENT, 1st HALF OF CYCLE:

Use instruction 6.b(6)

SLACK WATER TO DATUM, 1st HALF OF CYCLE:

Use instruction 6.b(7)

INSTRUCTION 6.b(4): MAX CURRENT TO SLACK WATER, 2ND HALF OF CYCLE

Locate the interval from the Tidal Current chart (Section 5) for that half of the cycle and locate the column in Table 3 for that interval. Do not interpolate on this Table. If you are halfway between the columns, go to the next higher column. The first event in this half of the cycle is maximum current. Since we already have a factor for maximum current in this cycle (last factor in the 1st half of the cycle), we will circle the next factor after max current. The max current is represented by the last 1.0 listed in that column (bottom of column), cross it out. Circle the next factor just above it. This factor represents 20 minutes after maximum current. The next event is slack water. Slack water is represented by the last factor listed at the top of the column; circle it. Now record the factors you circled and all in between. You now have all the factors for your cycle, go to the instructions for Section 6.c.

Remember, you have not reached datum yet, you only calculated the factors for the first cycle. After you are finished with the 1st current vector you must continue with the next cycle starting at the slack water. There are two possible situations:

SLACK WATER TO MAX CURRENT, 1st HALF OF CYCLE:

Use instruction 6.b(6)

SLACK WATER TO DATUM, 1st HALF CYCLE:

Use instruction 6.b(7)

INSTRUCTION 6.b(5): MAX CURRENT TO DATUM, 2ND HALF OF CYCLE

Locate the interval from the Tidal Current chart (Section 5) for that half of the cycle and locate the column in Table 3 for that interval. Do not interpolate on this Table. If you are halfway between the columns, go to the next higher column. The first event in this half of the cycle is maximum current. Since we already have a factor for maximum current in this cycle (last factor in the 1st half of the cycle), we will circle the next factor after max current. The max current is represented by the last 1.0 listed in that column (bottom of column), cross it out. Circle the next factor just above it. This factor represents 20 minutes after maximum current. The next event is datum. On the left side of the Table enter the datum interval (time interval between slack water to datum). This is the factor for datum; circle it. Now record the factors you circled and all in between. Check the number of factors for the cycle. For every 20 minutes of drift you should have one factor. (If you have one too many factors or are short one factor - ok. This is probably due to rounding off on Table 3.) You have all the factors for your cycle; go to the instructions for Section 6.c.

INSTRUCTION 6.b(6): SLACK WATER TO MAX CURRENT, 1st HALF OF CYCLE

Locate the interval from the Tidal Current chart (Section 5) for that half of the cycle and locate the column in Table 3 for that interval. Do not interpolate on this Table. If you are halfway between the columns, go to the next higher column. The first event in this half of the cycle is slack water. Slack water is represented by the last factor listed at the top of the column; circle it. The next event is max current. The max current is represented by the last 1.0 listed in the column (bottom of column); circle it. Now record the factors you circled and all in between. These factors are only for the 1st half of your cycle; you are not finished yet. Move on to the next half cycle, there are two possible situations:

MAXIMUM CURRENT TO SLACK WATER, 2nd HALF OF CYCLE:

Use instruction 6.b(4)

MAXIMUM CURRENT TO DATUM, 2nd HALF OF CYCLE:

Use instruction 6.b(5)

INSTRUCTION 6.b(7): SLACK WATER TO DATUM, 1st HALF OF CYCLE

Locate the interval from the Tidal Current chart (Section 5) for that half of the cycle and locate the column in Table 3 for that interval. Do not interpolate on this Table. If you are halfway between the columns, go to the next higher column. The first event in this half of the cycle is slack water. Slack water is represented by the last factor listed at the top of the column; circle it. The next event is datum. On the left side of the Table enter the datum interval (time interval between slack water to datum). This is the factor for the datum; circle it. Now record the factors you circled and all in between. Check the number of factors for the cycle. For every 20 minutes of drift you should have one factor. (If you have one too many factors or are short one factor - ok. This is probably due to rounding off on Table 3.) When you have all the factors for the cycle, go to the instructions for Section 6.c).

WIND CURRENT WORKSHEET

Case Title: ______________________________ Planner's Name: _______________________ Date: _____________

A. Incident Summary

	MINIMUM	MAXIMUM
1. Latitude	____________ N/S	____________ N/S
2. Longitude	____________ W/E	____________ W/E
3. Surface Position DTG	________ Z ______	________ Z ______
4. Datum DTG	_________ Z ______	
5. Drift Interval	____________ HRS	____________ HRS

B. Wind Current Vector Computations Required

WC (#)	Reported Wind DTG	Wind Valid Period	Number of Hours
( )	0000Z	2100 - 0300	____________
( )	0600Z	0300 - 0900	____________
( )	1200Z	0900 - 1500	____________
( )	1800Z	1500 - 2100	____________
( )	0000Z	2100 - 0300	____________
( )	0600Z	0300 - 0900	____________
( )	1200Z	0900 - 1500	____________
( )	1800Z	1500 - 2100	____________
	Total hours (sum number of hours column)		____________

C. Wind Current Vector Computations

Interval	Reported Wind DTG	Wind (A)/(B)	Coefficients (C)/(D)	Contribution (A+C)/(BxD)
1		/	/	/
2		/	/	/
3		/	/	/
4		/	/	/
5		/	/	/
6		/	/	/
7		/	/	/
8		/	/	/

Resultant LWC (______°T/ _____ KTS) times number of hours this period ( )
Equals WC ( ): ______ °T/ _____ NM

WIND CURRENT WORKSHEET

Interval	Reported Wind DTG	Wind (A)/(B)	Coefficients (C)/(D)	Contribution (A+C)/(BxD)
1		/	/	/
2		/	/	/
3		/	/	/
4		/	/	/
5		/	/	/
6		/	/	/
7		/	/	/
8		/	/	/

Resultant LWC (_______°T/ _____ KTS) times number of hours this period (   )
Equals WC (   ): ______ °T/ _____ NM

Interval	Reported Wind DTG	Wind (A)/(B)	Coefficients (C)/(D)	Contribution (A+C)/(BxD)
1		/	/	/
2		/	/	/
3		/	/	/
4		/	/	/
5		/	/	/
6		/	/	/
7		/	/	/
8		/	/	/

Resultant LWC (_______°T/ ______ KTS) times number of hours this period (   )
Equals WC (   ): ______ °T/ _____ NM

D. Total Resultant Wind Current Vector {WC} = WC(1) + WC(2) + WC(3) +. . .

[WC(   ): ____ / ____, WC(   ): ____ / ____, WC(   ): ____ / ____]

Total Resultant Wind Current Vector (WC) = ______ °T / _____ NM

WIND CURRENT WORKSHEET
Job Aid

Introduction

The WIND CURRENT WORKSHEET is used to calculate current caused by the effect of persistent winds on the surface of the water. Wind current is calculated when the surface position is more than 20 NM from shore and the water depth is greater than 100 FT.

A. Incident Summary

This section of the worksheet is a review of the incident data.

> **NOTE:** Use two columns only if calculations are from previous D_{min} and D_{max}.

1. Latitude — Enter data from Datum Worksheet line B.3.
2. Longitude — Enter data from Datum Worksheet line B.4.
3. Surface Position DTG — Enter data from Datum Worksheet line B.2.
4. Datum DTG — Enter data from Datum Worksheet line C.1.
5. Drift Interval — Enter data from Datum Worksheet line C.2.

B. Wind Current Vector Computations Required

Wind Current is calculated in 48-hour periods made up of sub periods of 6 hours or less. The first period begins at the time of datum and moves backward for eight 6-hour periods.

1. Wind Valid Period Column – Left Side — Scan the left hand column; insert the surface position time (A.3.) into the appropriate time slot.
2. Wind Valid Period Column – Right Side — Scan the right hand column; insert the datum time (A.4.) into the appropriate time slot.
3. WC(#) column — Consecutively, number the spaces in this column from surface position time to datum time.
4. Reported Wind DTG column — Starting with WC(1), append the appropriate date. Stop at the last numbered WC(#). 0000Z begins a new day.

EXAMPLE

WC (#)	Reported Wind DTG	Wind Value Period		Number of Hours
( )	0000Z	2100 - 0300		
(1)	040600Z	040730 ~~0300~~ - 0900		1.50
(2)	041200Z	0900 - 1500		6.00
(3)	041800Z	1500 - 2100		6.00
(4)	050000Z	2100 - ~~0300~~	050100	4.00
( )	0600Z	0300 - 0900		
( )	1200Z	0900 - 1500		
( )	1800Z	1500 - 2100		

5. Number of Hours column — Calculate the number of hours of drift for each WC period and enter result rounded off to **hundredths** (0.XX).

6. Total Hours — Sum the Number of Hours Column and enter the result. This figure should match the drift interval figure (A.5.).

C. Wind Current Vector Computations — This section calculates the local wind current (LWC) for each WC period. This method takes into account the effects of past or changing winds as well as Coriolis effect.

1. Reported Wind DTG column — On line 1, enter the Reported Wind DTG of the WC(#) from Section B above, corresponding with the wind current that this list will compute. The remaining lines will be the "Reported Wind DTG" for the wind history over the past 48 hours.

2. Wind (A)/(B) column — Obtain wind information from National Weather Service, Fleet Weather Service, or any other reliable source for the appropriate DTGs and enter wind direction (A) and speed (B).

3. Coefficients (C)/(D) columns — Obtain and enter the wind coefficients for the closest latitude from the wind current tables (Tables H-4a and H-4b). DO NOT INTERPOLATE between latitudes. If surface position is exactly between two columns (i.e., 07° 30' N), predict the direction of total drift, which should push the drifting object toward different latitude.

4. Contribution (A+C)/(BxD) column — Calculate Contribution:

   a. For each line, add the directions from columns A and C. If A+C is greater than 360 then subtract 360.

   b. For each line, multiply column B (wind speed) by column D (coefficient). Enter result rounded off to **thousandths** (0.XXX).

5. Resultant LWC times number of hours this period — Using a maneuvering board, or scientific calculator, vectorially add the vectors in the Contributions column. Enter result rounded off to **tenths** (0.X) of degrees and **hundredths** (0.XX) of KTS. Enter number of hours for this WC from Section B.

6. Equals WC(_): ____° T/___NM — Enter appropriate WC(#). Enter direction from Resultant LWC. Multiply LWC speed by the number of hours for this period and enter result (NM) rounded off to **hundredths** (0.XX).

7. Complete steps 1 thru 6 for additional WC(#).

D. Total Resultant Wind Current Vector =

1. Enter all WC(#) vectors.

2. (WC) = — Using a maneuvering board, or scientific calculator, vectorially add the WC(#) vectors. Enter resultant direction and distance in **tenths** (0.X) of degrees and NM here and on Datum Worksheet, Section E., line 1.

Appendix I
Flare Incidents

Recommended procedures and guidance for flare case planning are provided in this Appendix. Flare Sighting Check Sheets start on I-24. (These sheets may also be found in Appendix G.)

Section I.1
Flare Incidents

I.1.1 Response to Flares

Red and orange flares are recognized as marine and aviation emergency signals. ***Reported sightings of red/orange flares must be treated as distress situations unless sufficient other available information indicates no distress exists***. Examples of other information that might lead to such a conclusion include, but are not limited to, positive indications the sighted object was not a flare, notifications that an exercise involving flares or objects that could be mistaken for flares is underway in the same area, the effectiveness of completed search efforts, etc. Unresolved (insufficient information to either close or suspend) red or orange flare reports require first-light searches. Continued searches and searches in response to other than red or orange flares will depend on the specifics of the case.

If a flare is reported that is other than red or orange and there is reason to believe it could have originated from a distress situation, it should be treated the same as a red/orange flare sighting. Reasons for believing a flare that is not red or orange may indicate a distress situation include, but are not limited to, unresolved MADAY calls, ELT/EPIRB/PLB transmission in the vicinity, proximity to a known hazard to navigation, poor weather, and a craft being reported overdue in the general area of the flare sighting. Otherwise, there is no requirement to send assets to the scene. However, further investigation short of launching assets should be considered. ***In any case, the sighting information shall be recorded in an appropriate log where it will be available in the event that additional information becomes available that a distress incident may have occurred in the area near the time of the sighting.***

I.1.2 Importance of Accurate Information

The nature of flare distress signaling makes search planning and execution very difficult due to wide variations in flare types, possible altitudes, skill and position of the reporting source, weather, and many other factors. For that reason, the accuracy of the initial information received from a reporting source is most critical. For example, a hand-held flare in a recreational boat seen on the horizon by a reporting source standing on the beach, assuming the observer's eye and the flare are both six feet above the water, will be approximately 5.75 NM away, while a parachute flare rising to 1200 feet and seen on the horizon by the same reporting source could be more than 40 NM away.

I.1.3 Importance of a Prompt Response

As with all SAR cases, a prompt, thorough, and proper response yields the greatest chance of a rescue. Otherwise, the search planner may have no choice but to expand and/or extend the search, dispatching additional SRUs to search larger areas.

I.1.4 Skills Needed for Taking a Flare Sighting Report

Individuals taking a flare report should have a good understanding of the applicable principles and procedures. The inquiry process requires patience and good interpersonal skills since reporting sources are rarely familiar with the terminology or procedures for prosecuting flare sightings. ***A flare reporting checklist must be used to ensure that a proper report is taken to get all the facts.***

I.1.5 Sightings That Can Be Mistaken for Distress Flares

There are a number of situations that may be mistaken for distress flares, especially by untrained observers. Determining whether there is a high probability for the reporting source to have actually seen something other than a distress flare requires a combination of interviewing skill and comparison of the report with data from other sources.

I.1.5.1 Meteor Showers and Shooting Stars. Meteor showers occur when the earth passes through the debris field of a comet. This "space trash" burns up as it moves through the atmosphere, leaving behind several "wakes" of light. Most wakes last from one to ten seconds. Some brighter meteors can leave behind a "persistent train" that can last for up to 30 minutes. Meteor wakes are normally white, but may appear in nearly every color of the spectrum.

(a) While a sporadic meteor can appear anytime, most meteor showers occur on a regular basis every year. These showers are named after the nearest constellation from where they seem to originate. The origin is also referred to as the shower's radiant. Table I-1 provides information on major meteor shower activities and can be used to help correlate a suspected false flare sighting with a meteor.

Table I-1 Major Meteor Shower Activities

Name/Radiant	Annual Occurrence	Peak Occurrence	Average Per Hour
Quandranids	28 Dec –7 Jan	3-4 Jan	45 – 200 +
Lyrids	16-25 Apr	21-22 Apr	100 +
Eta Aquarids	21 Apr – 12 May	5 May	20 +
Southern Delta Aquarids	14 Jul – 18 Aug	15 – 20 May	10 +
Northern Delta Aquarids	16 Jul – 10 Sep	13 Aug	10 +
Perseids	23 Jul – 22 Aug	12-13 Aug	80 +
Southern Iota Aquarids	1 Jul – 18 Sep	6 Aug	8 +
Northern Iota Aquarids	11 Aug – 10 Sep	25 Aug	10 +
Alpha Capricornids	15 Jul – 11 Sep	1 Aug	14 +
Orionids	15 –29 Oct	21 Oct	20 +
Leonids	14 – 20 Nov	17 Nov	15 +
Geminids	6 – 19 Dec	13 – 14 Dec	100 +

(b) If it is suspected that a flare sighting report was actually a meteor shower, begin by correlating the bearing of the report with the meteor shower's radiant. The American Meteor Society's web site (found at http://www.amsmeteors.org/) provides a useful

Observer's Guide that describes where a meteor shower's radiant can be located. The radiant will be described in true degrees and declination above the horizon. Start by correlating the reported flare to a meteor by matching the direction and angle of elevation of the flare sighting with a meteor's radiant and declination

(c) Matching the report's bearing with a meteor shower's radiant is not enough to assume the sighting was a meteor. During the interview additional clues should be actively sought. Without putting words in the reporting source's mouth, ask the caller to describe what they saw.

(d) A meteor's wake normally "streaks" across a portion of the sky in an apparent straight line, as opposed to a meteor or parachute flare's vertical arch of trajectory. A meteor's wake can appear at any angle above the horizon. Only flares launched very close to the observer will appear to rise more than 8 degrees above the horizon. Unlike a meteor or parachute flare, there is no "burst" or flame associated with a meteor sighting. Because meteors travel across hundreds of miles of sky at high altitudes, they can be seen at greater distances by multiple observers. Flares on the other hand, can only be seen by observers within the flare's nominal range because of their limited height. Meteors require a relatively clear sky to be seen. If a sighting was observed in an overcast sky, it is not likely a meteor. During a meteor shower, the observer will normally witness several wakes track across the sky. Mariners have a limited number or flares available.If it is reasonably certain the reporting source mistook a meteor shower as a flare, conclude the interview by asking if it is possible that what was seen could have actually been a shooting star. Some callers might become embarrassed or even defensive at this point. It's important to reassure the caller that meteors are often confused with flares, and that the Coast Guard appreciates the caller's effort none the less

I.1.5.2 Military Operations. Military flight operations are often the source of flare sightings. Military aviators will sometimes deploy red or white flares during the course of a training mission. Military commands that may be operating assets in the vicinity of the flare sighting when it is reported should be queried regarding the nature of their operations.

The military sometimes uses various pyrotechnic devices in various colors and combinations corresponding to specific situations and meanings. Again, military commands that may be operating assets in the vicinity of the flare sighting when it is reported should be queried regarding the nature of their operations and any flare signals that may have been used at or near the time and place of the sighting report.

I.1.5.3 Distant Vessels. Commercial fishing vessels and merchant vessels illuminate their decks with powerful deck lights when performing work on deck or while at anchor. These lights may appear reddish-orange in color and may be confused with a handheld flare. When a report is received where the origin appears to be near known commercial vessel traffic, try to establish communications with those vessel(s) through the Urgent Marine Information Broadcast (UMIB). If a vessel in the area answers, request the operator to turn the deck lights off and on while the reporting source remains on the phone to correlate the sighting with the vessel.

I.1.5.4 Aids to Navigation. Under limited visibility, a distant aid to navigation's beacon may be reported as a distress signal. Ruling out a flare is as simple as asking the reporting source to describe exactly what is seen, including interval between sightings. If the sighting appears and disappears at regular timed intervals (without a rise and fall) that match the light characteristics of an aid on the line of bearing, it can be safely assumed that the origin is an aid to navigation.

I.1.5.5 Ascending and Descending Aircraft. Distant aircraft (beyond aural range) taking off or approaching a runway can often appear to be a flare. The airplane's landing gear lights can appear similar to a flare's trajectory as it flies near the airport. If the report plots near an airport's approach pattern, consider calling the Air Traffic Control Center to correlate the report with any aircraft in the vicinity. If an aircraft was present in the area, ask the reporting source if they might have confused the sighting with an aircraft.

I.1.5.6 Fireworks Displays. Fireworks, whether part of a professional display or those set off by private citizens, are easily mistaken for flares. Local authorities should be queried regarding the possibility of fireworks displays near the time and place of the reported flare sighting.

I.1.6 Assessing Reporting Source Reliability

The reliability of the reporting source should be confirmed whenever possible. Caller ID, if available, should be checked against the information given by the reporting source. An immediate call back to the reporting source should be considered to determine whether the person who answers is the same as the reporting source or can confirm that the reporting source was there and made the call. It may be appropriate to request local law enforcement authorities visit the reporting source, confirm their presence, interview them, and report their assessment of the reporting source's reliability. However, if in doubt, consider the reports reliable.

Section I.2
Definitions

I.2.1 Meteorological Visibility

The greatest distance, at which a black object of suitable dimensions can be seen and recognized by day against the horizon sky, or, in the case of night observations, could be seen and recognized if the general illumination were raised to the normal daylight level.

I.2.2 Nominal Range

The maximum distance at which a light can be seen in clear weather as defined by the International Visibility Code (meteorological visibility of 10 nautical miles).

I.2.3 Luminous Range

The maximum distance, at which a light can be seen *under existing visibility conditions*. Luminous Range does not take into account the elevation of the light, the observer's height of eye, the curvature of the earth, or interference from background lighting.

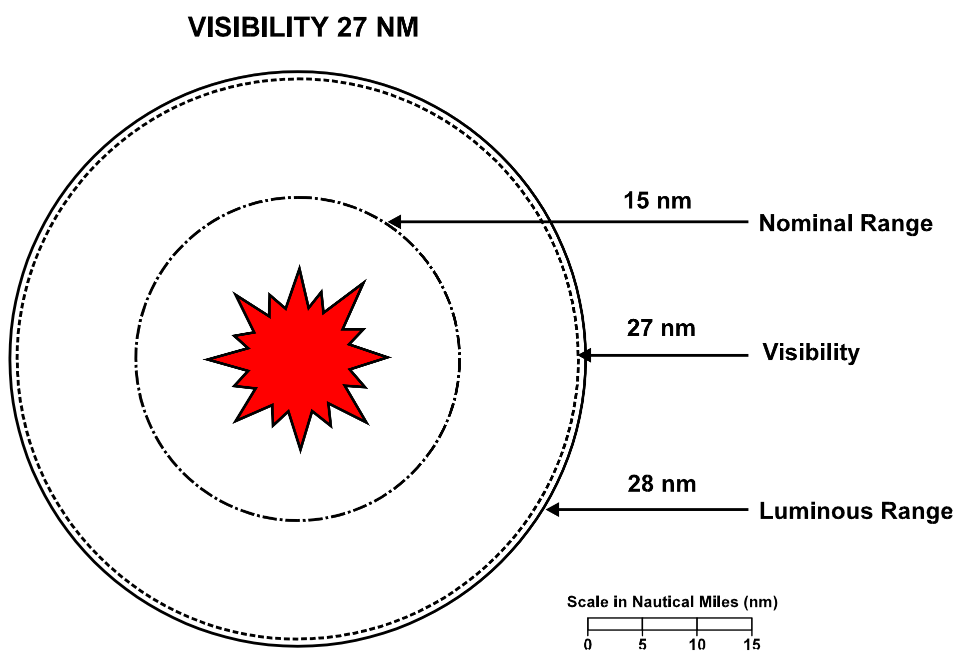


Figure I-1a Luminous Range and Visibility, example with visibility of 27nm

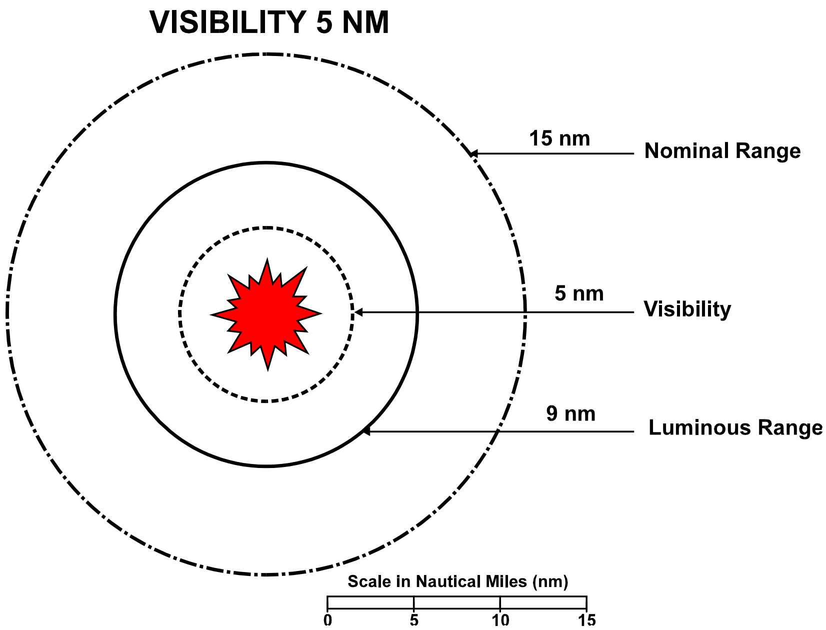


Figure I-1b Luminous Range and Visibility, example with visibility of 5 nm

I.2.4 Geographic Range

The maximum distance at which the curvature of the earth permits a light to be seen from a particular height of eye *without regard to the luminous intensity of the light*. Geographic range can be determined by adding the distance of the horizon from the observer and the distance of the horizon from the light.

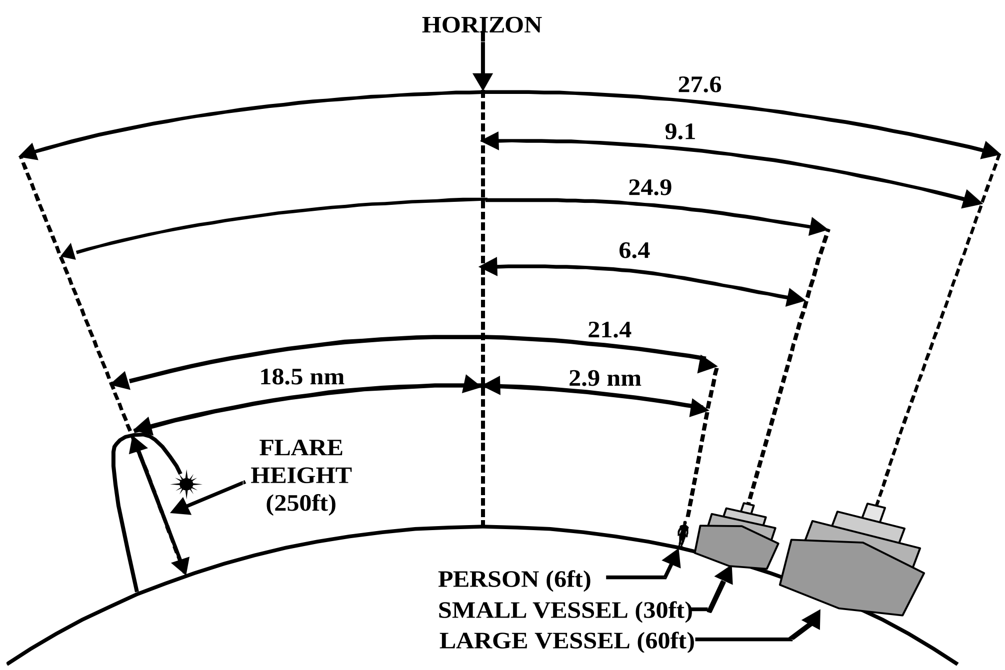


Figure I-2 Geographic Range of a flare by Height of Eye

Section I.3
Obtaining Sighting Data

I.3.1 Reporting Source

The following information about the reporting source should be obtained:

I.3.1.1 Position. Reporting source position is the point from which distance and direction are measured. Attempt to obtain: latitude/longitude; bearing and range from a prominent landmark; or street address.

Note: A latitude and longitude can often be derived from a reporting source's street address through the use of geo-location services provided on the Internet. In the event that no street address is available, consider dispatching an Auxiliarist or a police officer with a hand held GPS to the reporting source location to obtain a GPS position. These practices will reduce the position error of the reporting source to virtually zero.

I.3.1.2 Height of eye. To most accurately estimate the range to the flare from the reporting source, the height of eye of the reporting source is important. If the reporting source is in a tall building, record the floor number and estimate 10 feet per floor above the height of eye at ground level.

I.3.1.3 Personal information of the source. Obtain the name of the reporting source and establish a means of further contact. Request that the reporting source remain on scene or return to the position of the sighting in order to assist in the search and rescue unit (SRU) placement. A reporting source who provides a way to be contacted or is willing to remain on the scene or return to the scene is more credible than one unwilling to do these things.

I.3.2 Flare Characteristics

Characteristics can aid in determining the distress location, and may correlate with other sightings, phenomena, or military exercises. Flares can be identified primarily by trajectory and duration of burn. As Table I-2 describes, meteor flares have a rapid rise and rapid fall. Parachute flares exhibit a rapid rise and slow descent. These characteristics can be observed by an astute reporting source. Judging the height of the flare is much more difficult, even for a trained eye. It is important to note that the height of a flare significantly affects the size of the search area. If the type of flare can be determined to be a meteor flare, rather than a parachute flare, the search area can be significantly reduced since meteor flares can achieve only about 1/3 the maximum height of parachute flares. Parachute flares are rare among recreational boaters. If a flare is determined to be a parachute flare, a major search effort may be needed to cover a large geographic area. Table I-2 lists characteristics by flare type, but additional information can also be helpful. As much of the following information as possible should be collected:

I.3.2.1 Color. It is critical in assessing urgency. ***Red and orange flares must be treated as distress cases until proven otherwise.***

I.3.2.2 Number of flares, time(s) of sighting(s), and intervals between flares.

I.3.2.3 Apparent origin of the flare. Did the reporting source see where the flare came from? If so, was it near the horizon or definitely between the reporting source and the horizon? Did the flare illuminate any objects? If so, what were they?

I.3.2.4 Trajectory. The nature of the flare's trajectory is an extremely important clue. Every effort should be made to obtain accurate answers to the following questions: Did the reporting source see the flare both rise and fall? Rising only? Falling only? What were the rates of rising and falling (rapid rise and fall; rapid rise, slow fall, etc.)? Was the trajectory steep (mostly vertical) or flat (mostly horizontal)? Answers to these questions will help establish the type of flare and therefore the possible heights it could reach as well as provide some additional clues about its location. Table I-2 shows the characteristics of some common types of flares.

I.3.2.5 Time interval and duration of burn. This also aids in determining the type of flare. However, a flare may burn longer than the minimum duration. A flare may also burn less than the required time if the flare was fired incorrectly or if it was beyond its expiration date.

Table I-2 Flare Characteristics

TYPE	TRAJECTORY	AVERAGE HEIGHT	CANDLEPOWER NOMINAL RANGE	MINIMUM PEAK BURN DURATION
METEOR*	RAPID RISE RAPID DESCENT	250 - 400 FT	10000 – 30000 15 - 17 NM	5.5 Seconds
PARACHUTE**	RAPID RISE SLOW DESCENT	1000 - 1200 FT	20000 – 40000 14 - 20 NM	30-40 Seconds
HAND-HELD***	STEADY	ASSUME 10 FT	500 – 15000 8 - 16 NM	50-120 Seconds
*Meteor flares have no minimum altitude requirements. **Parachute flare requirements by SOLAS: 300 meters (990') height, 30K candlepower. ***Hand-held candlepower requirements: USCG-500; SOLAS-15000.				

I.3.2.6 Angle of observation. Often the reporting source will not be able to accurately estimate the angle of elevation without some assistance. The angle of elevation is the angle measured from the horizon to the top of the trajectory.

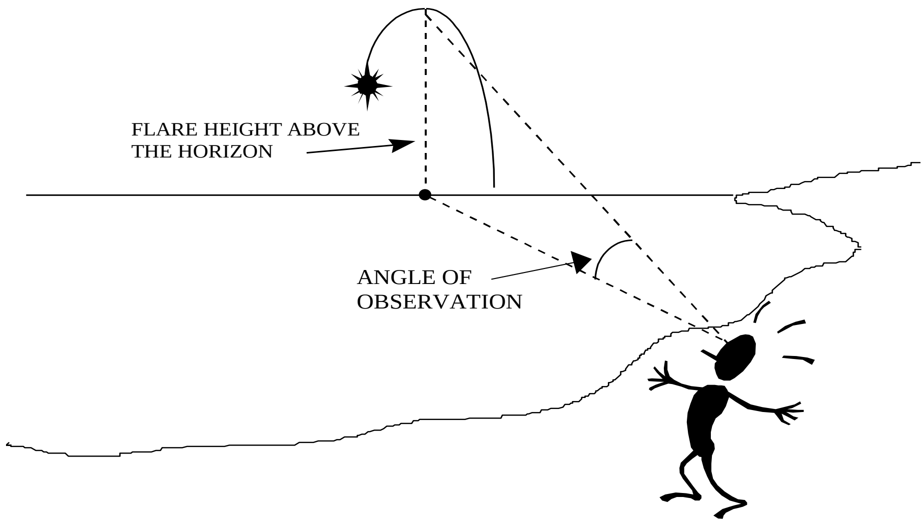


Figure I-3a Example of angle when flare origin is beyond the horizon and unobserved

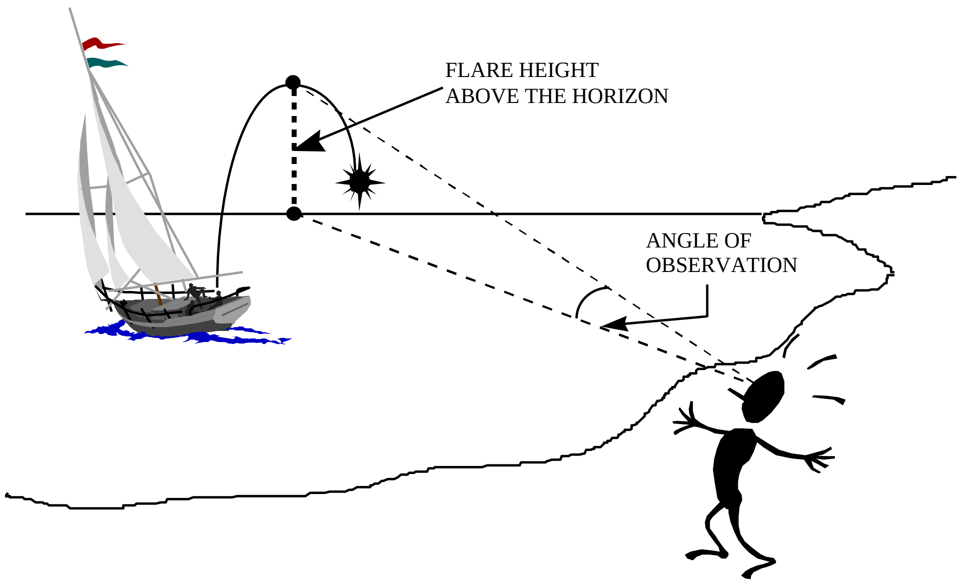


Figure I-3b Example of angle when flare origin is observed

If the origin of the flare is observed, the reporting source may measure the angle from the origin to the top of the trajectory. This method of determining the angle may be helpful when the horizon cannot be seen or used as a reference.

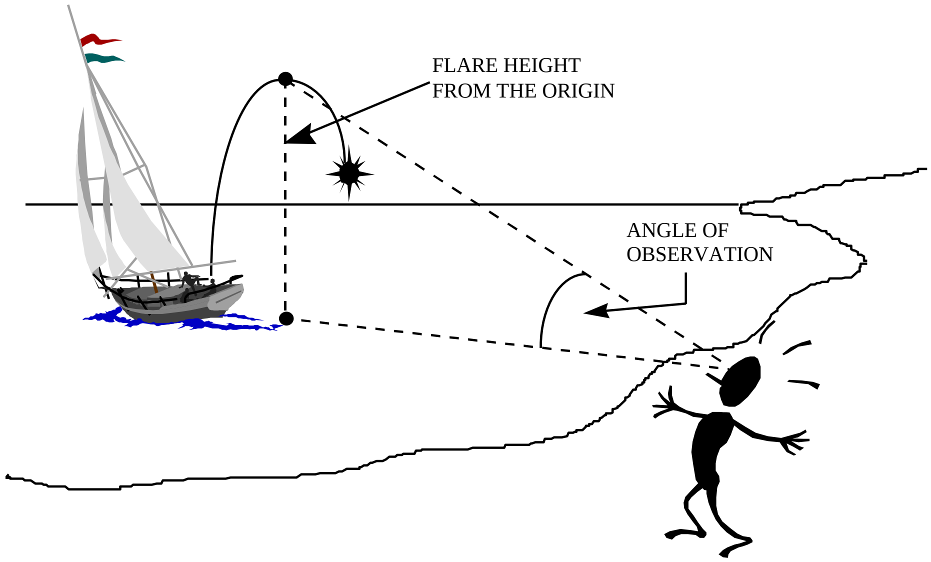


Figure I-3c Example of angle measured from flare origin to top of trajectory

The person taking the report should be sure to determine exactly what angle is measured. "Is the angle from the horizon to the top of the trajectory or from the point where you saw the flare take off to the top of the trajectory?" This distinction will become important in the planning stage.

(a) High Angle of Elevation. A major point to remember is that for any flare sighting with an angle of elevation of more than 8 degrees, the distance of the flare from the reporting source is less than 1.4 nm.

(b) Closed Fist Method. A closed fist held at arm's length with the thumb side up represents approximately 8 degrees of arc.

Unless the reporting source's height of eye is greater than the height of the flare at the top of its trajectory, the flare will normally appear to rise above the horizon. In this situation, when the bottom of the fist is aligned on the horizon relatively accurate estimates of small vertical angles can be made. Brief the reporting source on this reference system. "If you hold your fist at arm's length, with your thumb on top and the bottom of your fist on the horizon, was the top of the trajectory above or below the top of your fist?" If the flare was sighted below the top of the fist, have the reporting source attempt to more accurately estimate the angle with the horizon.

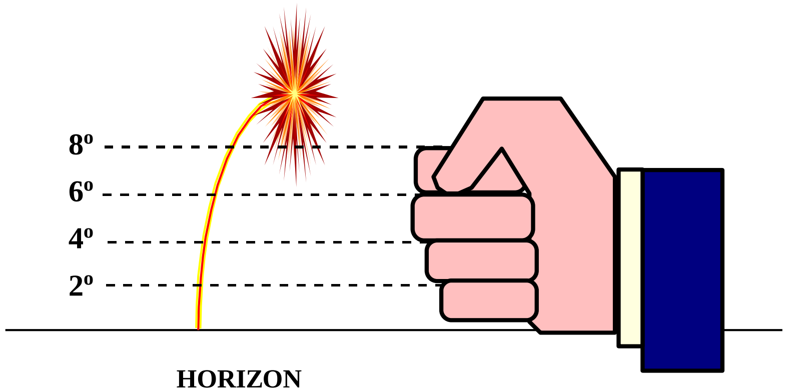


Figure I-4a Fist Method for measuring flare angles above horizon

An estimate of three fingers or half a hand can be extremely useful. Obtain the final estimate in terms such as “not less than ½ hand and not more than 1 ½ hands.” Convert number of fingers or fractions of hands to degrees based on Figure I-4a above.

Estimates collected from untrained reporting sources are necessarily fraught with uncertainty. ***Search planners must carefully question reporting sources of flares to remove as much of the uncertainty as possible without encouraging the reporting source to report unjustifiably precise estimates***. ***Search planners must then develop search plans that reflect the actual uncertainties***. Failure to do so can result in searching either too small or too large an area and missing the target. An estimate of “definitely less than a fist, but definitely more than a quarter of a fist,” translated to degrees as definitely less than 8 degrees but more than 2 degrees, can tremendously limit the datum area as compared with, “I can only say less than a fist.” The objective is to “bracket” or estimate the bounds of the area containing the sighted flare without covering substantially too much or too little area.

With hand-held flares, and even meteor flares if the reporting source is high enough, the flare may not rise above the visible horizon if it originates between the reporting source and the horizon. In this case, the reporting source should be asked to align the top of the index finger with the horizon and estimate the apparent distance *below* the horizon using the fist method described above. See Figure I-4b.

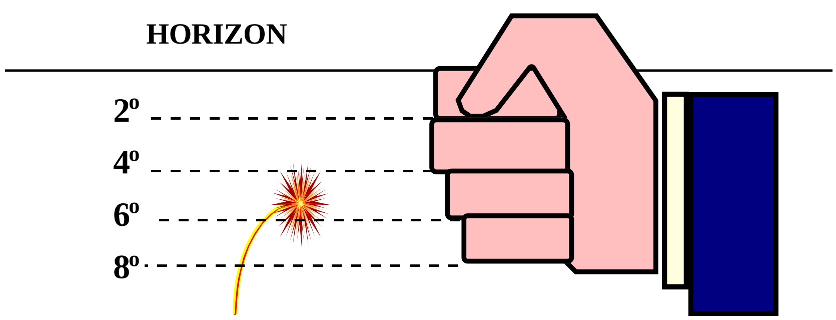


Figure I-4b Fist Method for measuring flare angles below the horizon

I.3.2.7 Bearing from the reporting source. There are several means by which a bearing may be estimated:

(a) clock method, (Figure I-5 shows how to determine the line of bearing by referring to the direction as points on a clock, with twelve o'clock being perpendicular to the reporting source in relation to the shore line or building where the reporting source is located. Most buildings along the shoreline will be aligned with the shore. If the "clock" is being referenced to a building's walls that are not aligned with the shoreline, then the search planner will need to determine the orientation of the building.)

(b) gyro/magnetic compass,

(c) reference object,

(d) seaman's eye, or

(e) a guess.

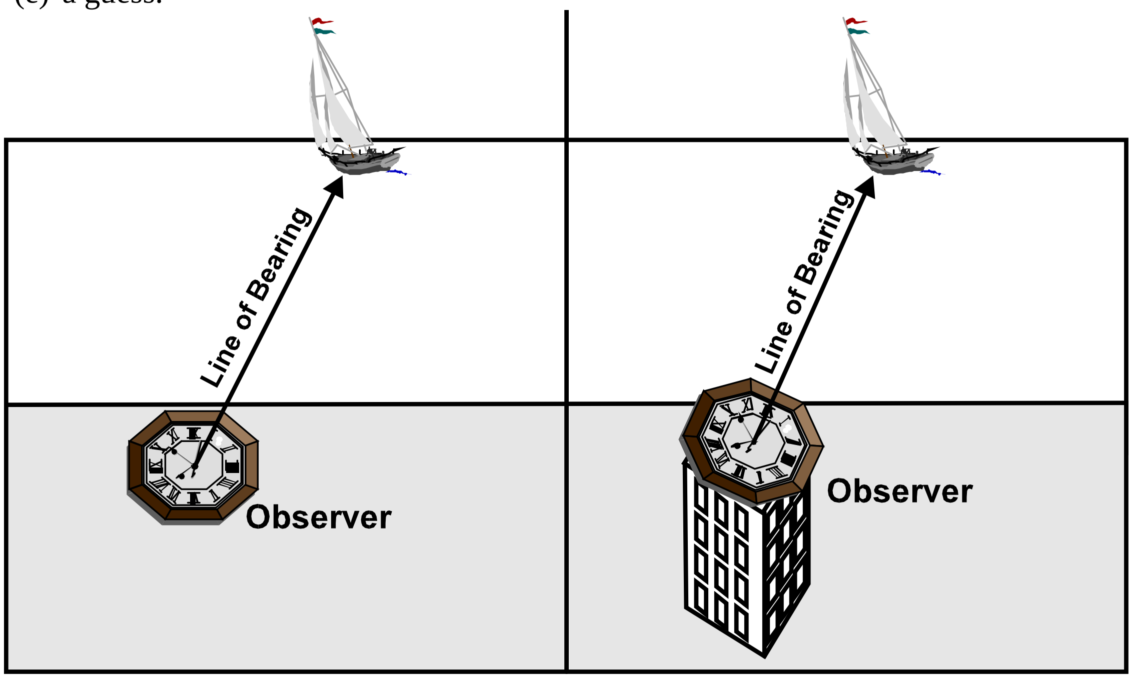


Figure I-5 Clock Method for determining bearing. Reporting source aligned with shore (left), bearing 1 o'clock; reporting source not aligned with shore (right), bearing 12 o'clock.

If the reporting source has difficulty in confidently estimating direction, amplifying information, such as the following, should be obtained:

(a) direction relative to the street direction,

(b) direction relative to a line passing through reporting source's position and another prominent landmark or reference point,

(c) identity of prominent landmarks on either side of the line of bearing from the reporting source to the flare,

(d) direction relative to the trend of the shoreline in that area, or

(e) direction relative to the line between the reporting source and the moon or a star or constellation the reporting source can confidently identify.

The search planner should estimate the degree of uncertainty in the form of bearing errors to the right and left of the reported bearing. These will establish rightmost and leftmost bearings from the reporting source. ***Datum estimates must reflect real doubts***. Failure to reflect realistic uncertainties can lead to false confidence in a search's chances for success.

I.3.2.8 Distance. Estimating distance directly from an observation, without recourse to vertical angles and tables, is difficult for even an accomplished seaman. Data developed in research conducted by the Coast Guard Research and Development Center (Robe, R.Q., et al., 1985) has shown that in most cases reporting sources tend to underestimate distance. Most estimates of distance should not be given significant consideration unless the reporting source is basing the estimate on the distance to a known object on or near the flare's line of bearing.

I.3.3 Helpful Information to Obtain

I.3.3.1 Aircraft/vessels seen in vicinity. If the reporting source can see the vessel being illuminated by the flare then the flare is inside the horizon. If an aircraft was seen, it may be possible to correlate this report with reports, if any, from the aircraft. It may also be possible to correlate the report with aircraft positions (from radar or radar playback) at the time of the sighting.

I.3.3.2 Obstructions. Information about obstructions can be of value in several ways.

(a) **Gauging distance.** For example, a flare seen to rise/descend in front of an island clearly indicates the maximum distance to the flare is the distance to the island. If seen behind an obstruction it clearly indicates the minimum distance is the obstruction distance.

(b) **Determining direction.** Flares seen over or between identifiable obstructions give the reporting source a reference for determining direction.

(c) **Estimating angle of elevation.** For example, a flare seen over the top of a nearby stand of 60 ft trees by a reporting source standing on the ground (assuming level terrain) means the flare could not have been fired from a distance very far beyond the tree line.

I.3.3.3 On scene weather and visibility. This can be useful in limiting the area to be searched. Ascertain how visibility was determined, such as from objects that are just visible at a known range. Keep in mind that horizontal visibility factors, such as ground fog, may not limit the visibility for a meteor or parachute flare as much as for a hand-held flare.

Section I.4
Estimating Distances

Estimating the distance of the flare from the reporting source is one of the more difficult problems in search planning. Flare sightings are generally made by untrained, inexperienced reporting sources. While any information they can provide is helpful, it also has a large associated uncertainty. However, the reporting source is not the only source of uncertainty. The actual height of the observed flare at the top of its trajectory is also subject to a large uncertainty. For reports of less than 4 degrees (1/2 fist), the range of distances increases very rapidly. ***Planners must use all means to obtain accurate information to establish a manageable search plan***.

Before presenting the actual step-by-step procedures for using the distance tables for estimating minimum and maximum distances from the reporting source, an explanation of the rationale behind these procedures and tables is in order.

I.4.1 Angle Above the Horizon

If the flare is observed above the horizon at the apex of its trajectory, then its distance from the reporting source will depend on the reporting source's height of eye, the observed angle above the horizon and the height of the flare above the surface. Assuming that information about the first two factors can be obtained from the reporting source, this leaves the height of the flare as the only "unknown." For flares that are fired into the air, the maximum height is assumed to be 1200 feet for parachute flares and 500 feet for meteor flares. The minimum height for both types of flare is assumed to be 250 feet or 10 feet above that of the reporting source for heights of eye greater than 240 feet. A flare that rises only 250 feet must be much closer to a given observer (e.g. height of eye 20 feet) in order to produce a given observed angle above the horizon (e.g. 1 degree) than a flare rising to 1200 feet which produces the same angle from the same point of observation. The distance in the first case is 2.31 nm while the distance in the second case is 10.98 nm. Therefore, the minimum distance table (Table I-3a) is based on the assumed minimum flare heights and the maximum distance tables (Tables I-3b and I-5) are based on the assumed maximum flare heights. The procedures presented later in this appendix also show how to account for realistic limitations in the ability of reporting sources to estimate vertical angles and to identify different types of flares.

Example: If a reporting source with a sextant whose height of eye is 20 feet observes a flare rise to one degree above the horizon, it would be about 11 nm away if it rose to 1200 feet but only 2.3 nm away if it rose to only 250 feet. However, if the reporting source could only estimate the angle as between 0.5 and 2 degrees, then the minimum and maximum ranges would become 1.2 nm and 19.2 nm.

I.4.2 Angle Below the Horizon

If the reporting source is high enough, and the flare is low enough at the top of its trajectory, then it will not appear to rise above the horizon. If this happens, then the flare must be between the reporting source and the horizon. However, for large heights of eye, the distance to the horizon can be quite substantial. The datum area can be reduced significantly if angles *below* the horizon can be measured or estimated. In this case, for a given height of eye and angle below the horizon, the higher the flare rises above the surface, the closer it must be. This is exactly opposite to the situation described in the preceding paragraph. Since a flare that does any rising at all and fails to cross the horizon line must be quite close, the minimum distance was computed by assuming the maximum flare height was 10 feet below that of the reporting source for heights of eye up to 240 feet and 250 feet for greater heights of eye. A minimum flare height of zero was used to determine the maximum distance from the reporting source.

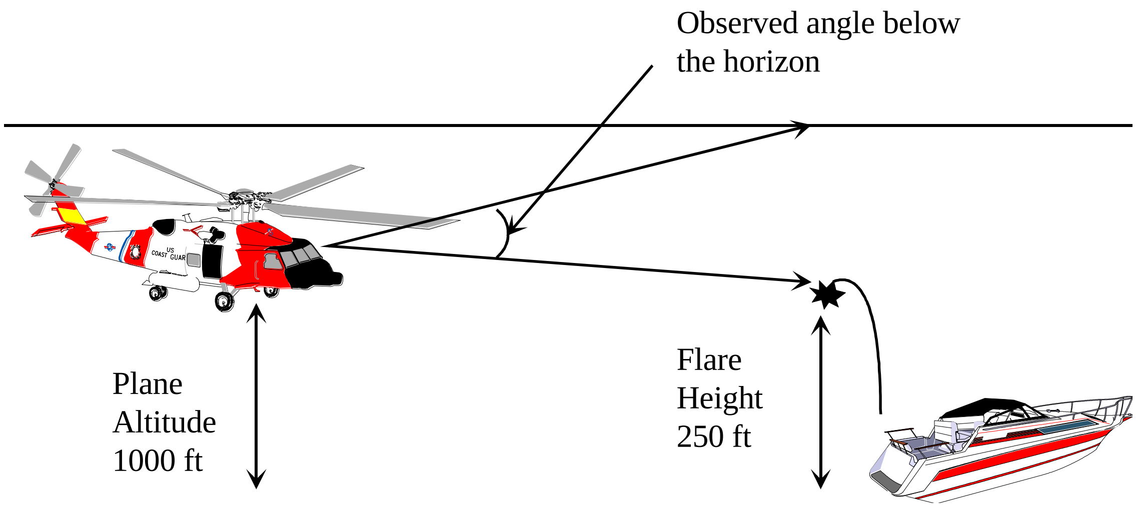


Figure I-6 Observed angle below the horizon

Example: A reporting source with a sextant and a height of eye of 300 feet observes a flare rise to within one degree of the horizon. If the flare's maximum height was 250 feet, it would be only 0.36 nm from the reporting source. If the maximum height was zero and it never actually left the surface, it would be about 2.2 nm away. However, if the reporting source could only estimate the angle as between 0.5 and 2 degrees below the horizon, then the minimum and maximum distances become 0.2 nm and 3.6 nm.

I.4.3 Angle Measured from Origin to Apex

The reporting source may not have a visible horizon to use as a reference for measuring angles, but may be able to estimate the angle between the origin and maximum height of the flare. Because the origin can be seen, the flare must be closer than the distance of the horizon, if the horizon could be seen. However, as stated before, for larger heights of eye the distance of horizon can be many miles away. To determine the maximum distance, and limit the datum area, a flare height of 1200 feet is assumed; and to determine the minimum distance, a flare height of 250 feet is assumed. The reporting source's height is not a factor in these calculations for several reasons. First, it is assumed that the earth is flat between the reporting source and the flare. Thus the horizon, which was used as a reference in the previous methods and whose distance from the reporting source varied with the reporting source's height of eye, is not a factor. Second, even though there are slight differences in the geometry and computed distances for different heights of eye, for the flat earth model and the heights and distances involved, these differences are insignificant. The solution found by using zero for the assumed height of eye and the simple trigonometry of right triangles produces sufficiently accurate results.

Example: If a reporting source with a sextant observes a flare rise to an observed angle of one degree from the flare origin to the apex, it would be about 11.3 nm away if it rose to 1200 feet but only 2.4 nm away if it rose to only 250 feet. However, if the reporting source could only estimate the angle as between 0.5 and 2 degrees, then the minimum and maximum distances become 1.2 nm and 22.6 nm. Figure I-7 illustrates this concept for several vertical angle observations.

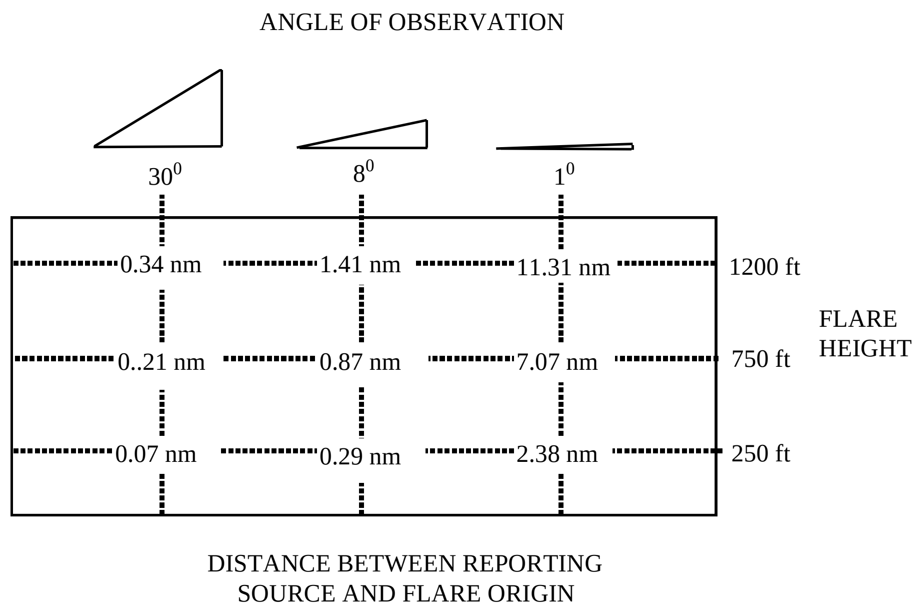


Figure I-7 Relationship of Vertical Angles to Distances (Flat Earth)

I.4.4 Limiting Factors

I.4.4.1 Geographic range. The geographic range is the absolute limiting factor for the maximum distance of all flares from the reporting source. Only rarely will flares be sighted at such an extreme range.

I.4.4.2 Luminous Range. The maximum distance may be limited by the luminous range of the flare at the time and place of the sighting. There is a complex relationship between luminous range and meteorological visibility. Because a flare is a bright source of light, it can be seen at distances greater than the meteorological visibility. As meteorological visibility decreases, so does a flare's luminous range. However, the relationship between the two changes dramatically. As shown in Figure I-8, a flare with a nominal luminous range of 20 nm may have actual luminous ranges from less than two to nearly five times the meteorological visibility. If on scene visibility is known to be such than even the brightest flare could not be seen at a distance equal to the maximum distance estimated by other means, some portion of the far end of the datum line or area may be eliminated. For a flare having a nominal luminous range of 20 nm, the sample table below shows the actual luminous range under various visibility conditions. Figure I-14, discussed later, may be used to estimate luminous ranges in virtually all situations of practical interest.

On scene Meteorological Visibility	Luminous Range
0.25 nm (500 yards)	1.2 nm
1 nm	3.5 nm
2 nm	6 nm
5 nm	12 nm
10 nm	20 nm
27 nm	40 nm

Figure I-8 Example of relationships between meteorological visibility and luminous range (for a flare with 20 nm nominal luminous range)

Visibility can be a significant limiting factor, but to be valid, it must be accurately determined for the immediate area of the reporting source at the time of the sighting. The average reporting source may misjudge distances to a visible object, and hence misjudge visibility, especially at night. Horizontal visibility may not have the same diminishing effect on meteor or parachute flares, as these flares may be seen above a ground fog or ground haze.

I.4.4.3 Obstructions. If a flare was definitely seen to rise/fall in front of an obstruction, its distance from the reporting source can be no greater than the distance to the obstruction. Similarly, if the flare is seen behind an obstruction, it can be no closer than the obstruction.

I.4.4.4 Position of origin or point last seen relative to horizon. If the reporting source saw the flare rise and fall between his position and the horizon, and can confidently estimate whether the flare rose from the surface or fell to the surface ¼, ½, ¾, of the distance to the horizon, or near or at the horizon, this information can reinforce other datum indicators or limit the maximum distance. Table H-41 (Table 12 of The American Practical Navigator (Bowditch, ed. 1995)) provides distance of the horizon for various heights of eye. When using this method, caution should be exercised when limiting maximum distance to a value significantly less than the distance of the horizon.

Section I.5
Determining a Datum Area and Search Plan Manually

I.5.1 Single Reporting Source

I.5.1.1 Plot the reporting source's position on a chart and draw a circle of radius equal to the reporting source's probable position error around that point.

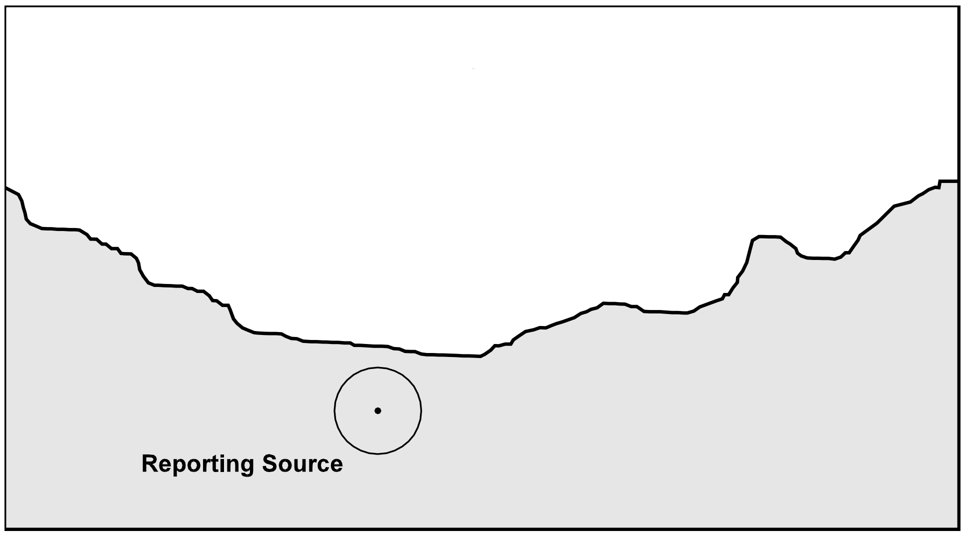


Figure I-9 Step 1: Plotting reporting source position and position error

I.5.1.2 Draw the line of bearing (LOB) along which the reporting source sighted the flare, with lines on either side showing the probable bearing error. The LOB should extend at least 20 nm toward the flare, and far enough behind the reporting source to intersect the position error circle on the side opposite the flare.

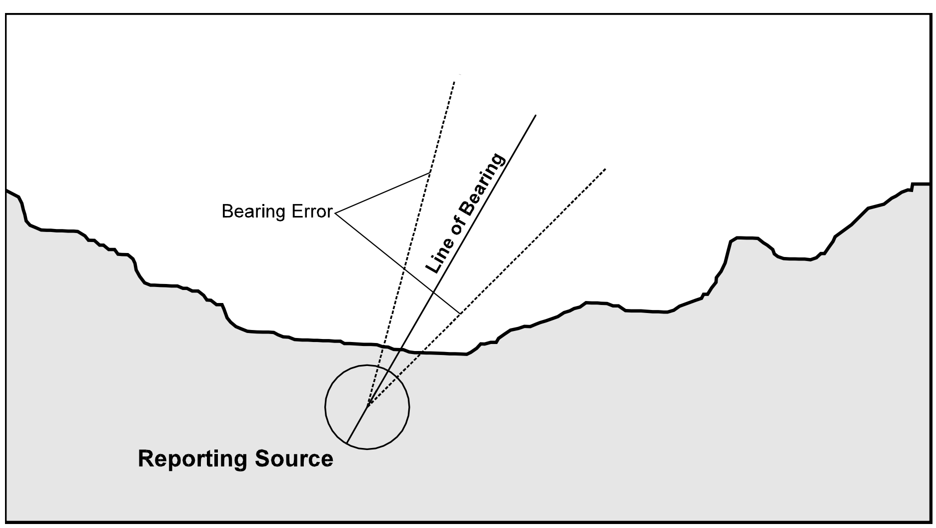


Figure I-10 Step 2: Plotting line of bearing and bearing error

I.5.1.3 Draw a line through the reporting source's position perpendicular to the flare's LOB. At each point where this line crosses the probable position error circle, draw a line parallel to the corresponding bearing error line.

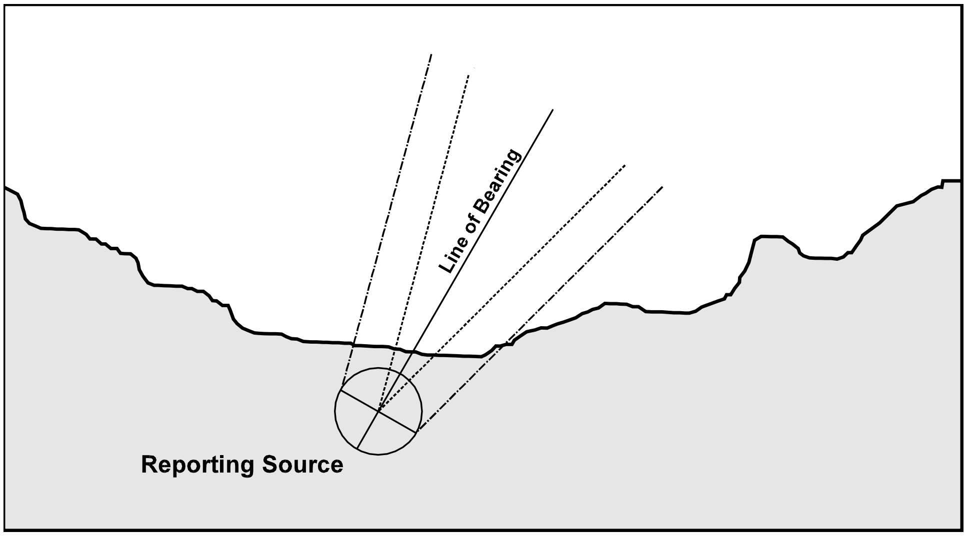


Figure I-11 Step 3: Bearing error including position error

I.5.1.4 Compute minimum and maximum distances by identifying which type of angle has been reported, convert fractions of a fist or numbers of fingers to degrees, and use these angles along with the reporting source's height to reference the appropriate set of minimum and maximum distance tables as described in (a) through (e) below. Determine if on scene visibility can limit the maximum distance, as described in (f) below.

It is important to note that if a range has been given for the observed angle, the *maximum* angle should be used with the minimum distance table and the *minimum* angle should be used with the maximum distance table. For example, suppose the reporting source states that the flare was "definitely less than a fist, but definitely more than a quarter of a fist." This would be translated to a maximum angle of 8 degrees and a minimum angle of 2 degrees. Use 8 degrees to determine minimum distance, and 2 degrees to determine maximum distance.

(a) If the angle is reported to be **above the horizon**, use Tables I-2a and I-2b as follows:

(1) Table I-3a, *Minimum Distance to Flare, Angle of Observation Above the Horizon*, determines the closest distance to the flare from the reporting source. Determine the minimum distance by using the maximum observed angle above the horizon. Angles can be determined by converting fractions of a fist to degrees.

Example: A flare seen ½ of a fist above the horizon, or at an angle of observation of 4 degrees, could be as close as 0.57 nm for a reporting source at 10ft.

(b) Table I-3b, *Maximum Distance to Flare, Angle of Observation Above the Horizon,* determines the maximum distance to the flare from the reporting source. Determine the maximum distance by using the minimum observed angle above the horizon, converted from fraction of a fist to degrees.

Example: A flare seen ¼ of a fist above the horizon, or at an angle of observation of 2 degrees would have a maximum distance of 5.63 nm for a reporting source at 10ft.

Given this range of observed angles, the flare must be roughly between 0.6 nm and 5.6 nm from the reporting source - a separation of only 5 nm. A more conservative estimate, obtained by "rounding" the minimum distance down and the maximum distance up the next 0.5 nm increment, would be 0.5 to 6.0 nm from the reporting source.

(b) If the angle is reported to be **below the horizon**, use Tables I-3a and I-3b as follows:

(1) Table I-4a, *Minimum Distance to Flare, Angle of Observation Below the Horizon*, determines the closest distance to the flare from the reporting source. Determine the minimum distance by using the maximum observed angle below the horizon. Angles can be determined by converting fractions of a fist to degrees.

Example: A flare seen ½ of a fist below the horizon, or at an angle of observation of 4 degrees, could be as close as 0.11nm for a reporting source at 300 ft.

(2) Table I-4b, *Maximum Distance to Flare, Angle of Observation Below the Horizon*, determines the maximum distance to the flare from the reporting source. Determine the maximum distance by using the minimum observed angle below the horizon, converted from fraction of a fist to degrees.

Example: A flare seen ¼ of a fist below the horizon, or at an angle of observation of 2 degrees would have a maximum distance of 1.23 nm for a reporting source at 300 ft.

Given this range of observed angles, the flare must be roughly between 0.1 nm and 1.2 nm from the reporting source - a separation of only 1.1 nm. A more conservative estimate, obtained by "rounding" the minimum distance down and the maximum distance up the next 0.5-mile increment, would be 0.0 to 1.5 nm from the reporting source.

Caution: As angles below the horizon become small, distances increase very rapidly. For example, a flare at zero height above the water observed as 0.5 degrees below the horizon from a height of eye of 260 feet is only 3.23 nm away but such a flare on the horizon could be as far as 18.9 nm away. Only if the flare is observed to be a definite, measurable angle below the horizon should maximum distances based on Table I-4b be used. Otherwise, the distance of the horizon should be used.

(c) If the angle is reported to be **from the origin up to the flare apex**:

The methods used in the two situations above cannot be used if the angle of observation is determined to be from the flare origin to the flare apex. This angle requires a different set of computations. Table I-5, *Distance Range for Angle of Observation from Flare Origin to Apex*, should be used to calculate the distance range using the minimum and maximum angles converted from fractions of a fist.

Example: A flare seen to rise from its origin as much as one fist, or at an angle of observation of 8 degrees, could be as close as 0.29 nm for the reporting source. If the minimum angle observed was ½ of a fist, or an angle of 4 degrees, then the flare could be as much as 2.82 nm from the same reporting source. A more conservative estimate would be between 0.0 and 3.0 nm from the observer.

(d) If the flare is **determined to be a meteor flare**:

(1) To determine the minimum distance to the flare, Table I-3a, *Minimum Distance to Flare, Angle of Observation Above the Horizon* should be used as in a) above because the minimum height is still assumed to be 250 feet or 10 feet above that of the reporting source for heights of eye greater than 240 feet. It is only the maximum height that has changed.

Example: A flare seen ½ of a fist above the horizon, or at an angle of observation of 4 degrees, could be as close as 0.57 nm for a reporting source at 10ft.

(2) If it can be determined from the description of the flare's trajectory that it is a meteor flare, Table I-6 *Maximum Distance for Meteor Flares, Angle of Observation Above the Horizon* should be used to determine the maximum distance. Using this table will significantly reduce the search area and should only be used in those cases where the flare's type is not in question. Determine the maximum distance by using the minimum observed angle above the horizon, converted from fraction of a fist to degrees.

Example: A flare seen ¼ of a fist above the horizon, or at an angle of observation of 2 degrees would have a maximum distance of 2.35 nm for a reporting source at 10ft.

Given this range of observed angles, the flare must be roughly between 0.6 nm and 2.4 nm from the reporting source - a separation of only 1.8 nm. A more conservative estimate, obtained by "rounding" the minimum distance down and the maximum distance up the next 0.5 nm increment, would be 0.5 to 2.5 nm from the reporting source.

Note: Tables I-3a and I-3b, *Minimum and Maximum Distance to Flare,* (respectively) *Angle of Observation Below the Horizon,* should still be used if the reporting source can identify the type of flare as a meteor because these tables are not affected by flare maximum height. Maximum distances in Table I-4b were calculated using a minimum height of zero. For more information see Section I.5.1.4(b) above.

(e) If the flare is **determined to be a hand-held flare**:

If it can be determined from the description of the flare's trajectory (or lack of one) that it is a hand-held flare, Table I-7 *Distances for Hand-held Flares* should be used to determine the distance using the angle below the horizon. A flare height of 10 feet is assumed.

Example: A flare seen as much as ¾ of a fist below the horizon, or at an angle of observation of 6 degrees, could be as close as 0.14 nm for a reporting source at 100 ft. If the minimum angle observed was ¼ of a fist below the horizon, or an angle of 2 degrees, then the flare could be as much as 0.39 nm from the same reporting source. A more conservative estimate would be between 0.0 and 0.5 nm from the observer, but even this is a very small separation.

Caution: As angles below the horizon become small, distances increase very rapidly. For example, a hand-held flare at a height of 10 feet above the water observed as 0.5 degrees below the horizon from a height of eye of 100 feet is only 1.27 nm away but such a flare on the horizon could be as far as 15.4 nm away (the geographic range found by adding the distances of the horizon from 100 feet and 10 feet). Only if the flare is observed to be a definite, measurable angle below the horizon should maximum distances based on Table I-6 be used. Otherwise, the geographic range should be used at this point.

f) Determine if on scene visibility can limit the maximum distance by using the largest appropriate nominal range from Figure I-2 and the on scene visibility with Figure I-14 to determine the luminous range of the flare. Enter the Luminous Range Diagram (Figure I-14) from the right or left vertical scale using the flare's nominal range. Follow the corresponding horizontal line across to the curve representing the meteorological visibility. Move vertically to read the luminous range from the top or bottom horizontal scale. For example, a flare with a nominal range of 15 nm has a luminous range of 28 nm when the meteorological visibility is 27 nm.

I.5.1.5 **Show the minimum and maximum distances as arcs extending to the bearing error lines on either side of the LOB.** The center point used to draw the maximum distance arc should be where the LOB intersects the position error circle on the side toward the flare. The center point used to draw the minimum distance arc should be where the LOB intersects the position error circle on the side away from the flare.

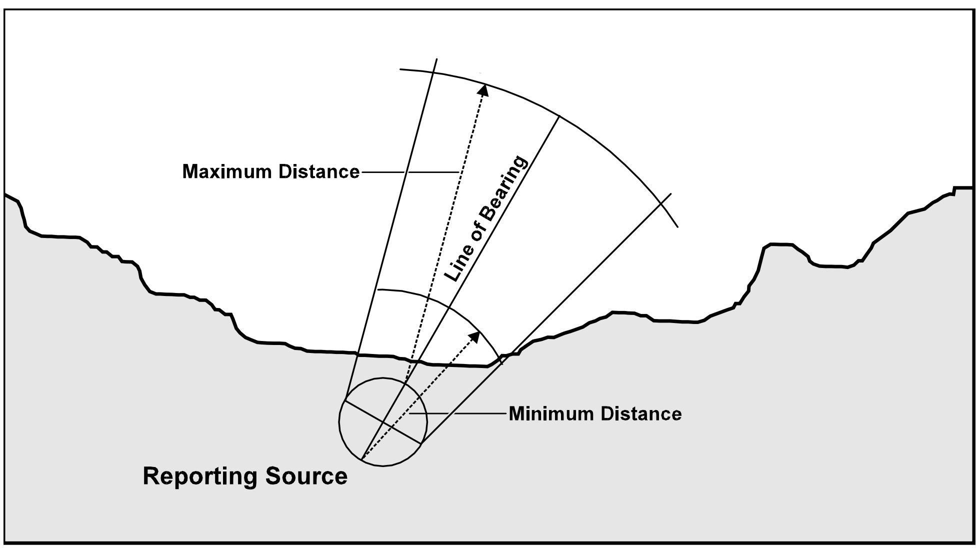


Figure I-12 Step 5: Plotting maximum and minimum arcs

I.5.1.6 **Enclose the resulting area in a rectangle** as shown in Figure I-13. Multiply the rectangle's length and width by the appropriate safety factor (1.1 for the first search) and draw a second, larger rectangle around the first. This will be the initial datum area and the initial search area.

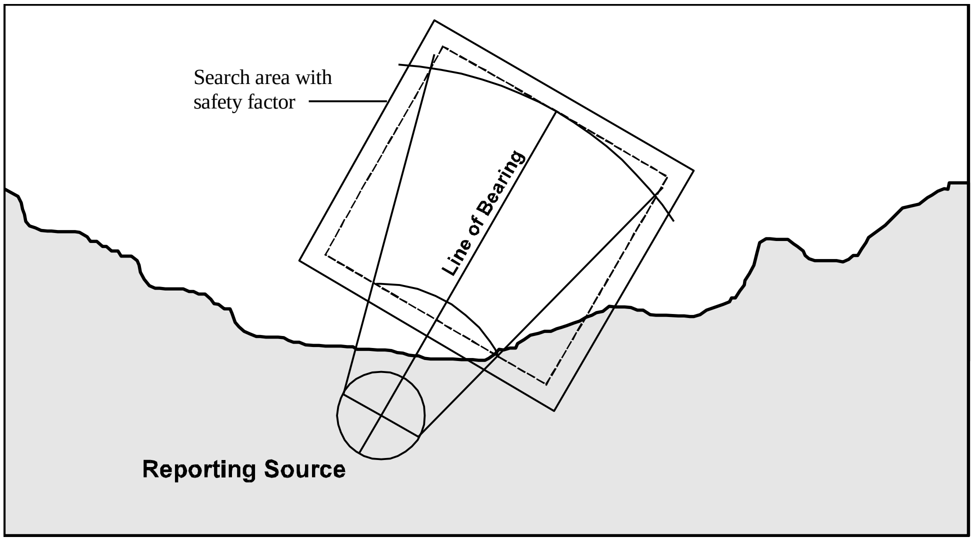


Figure I-13 Step 6: Enclosing the search area, including the safety factor

I.5.1.7 **Check with local military and civilian authorities for the presence of operations, including possible fireworks displays.** If the position of the sighting plots within a warning or restricted area, contact the controlling authority for possible correlation with activities in that area.

Caution: Although these procedures are designed to produce reasonably conservative results, search planners should not hesitate to expand the size of the search area if they feel it is too small or they have other reasons to believe the plotted area may have a less than 50% chance of containing the flare's origin.

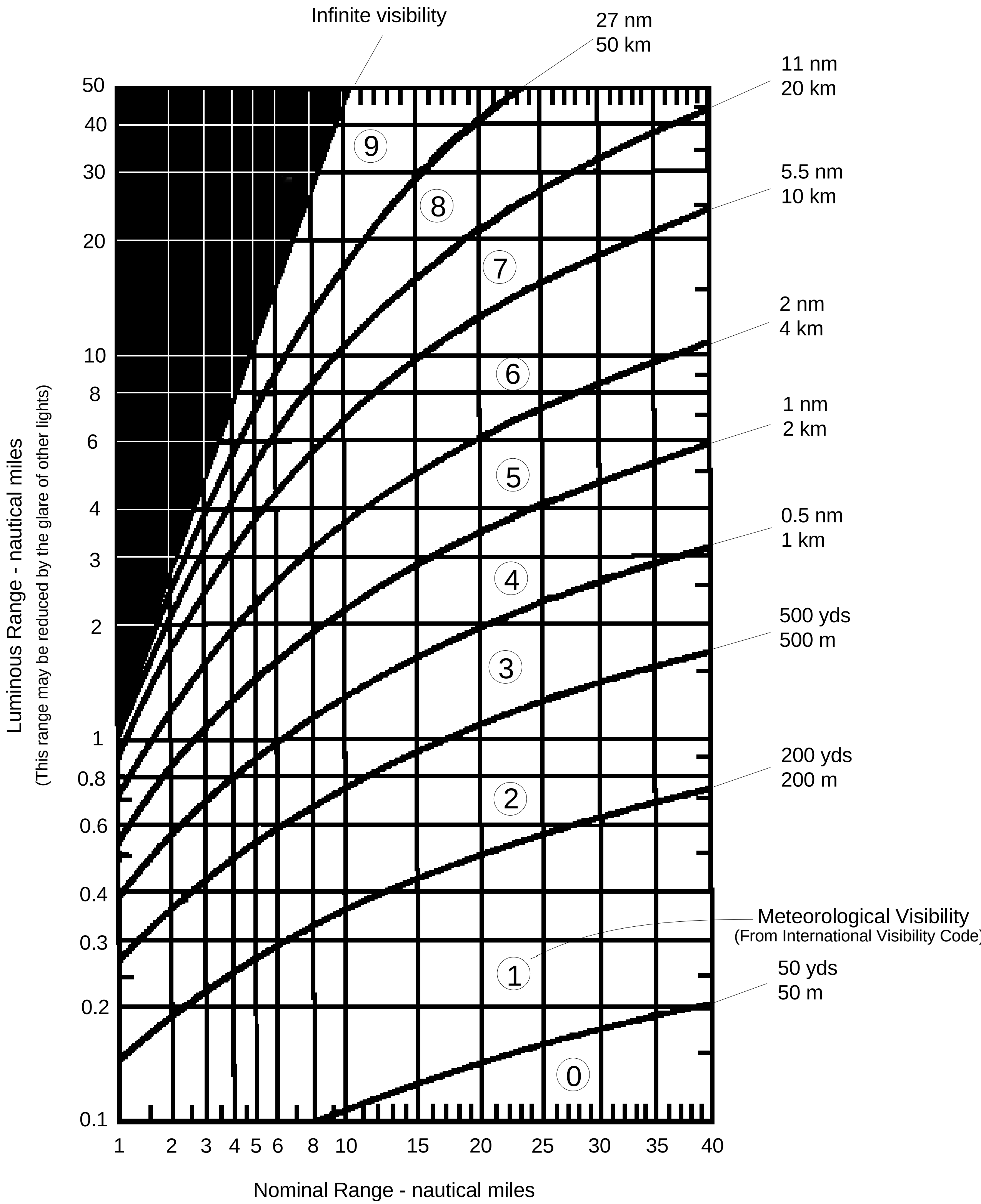


Figure I-14 Luminous Range Diagram (The American Practical Navigator, Bowditch, 1995)

I.5.2 Multiple Reporting Sources

When two or more reliable reporting sources provide good lines of bearing with good crossing angles, determining datum can be accomplished as in Figure I-15. For multiple report cases, determine which three reports are best and use these three reports to complete minimum and maximum calculations. ***Any time multiple reports are received, even from approximately the same location, the possibility of multiple flares must be considered***.

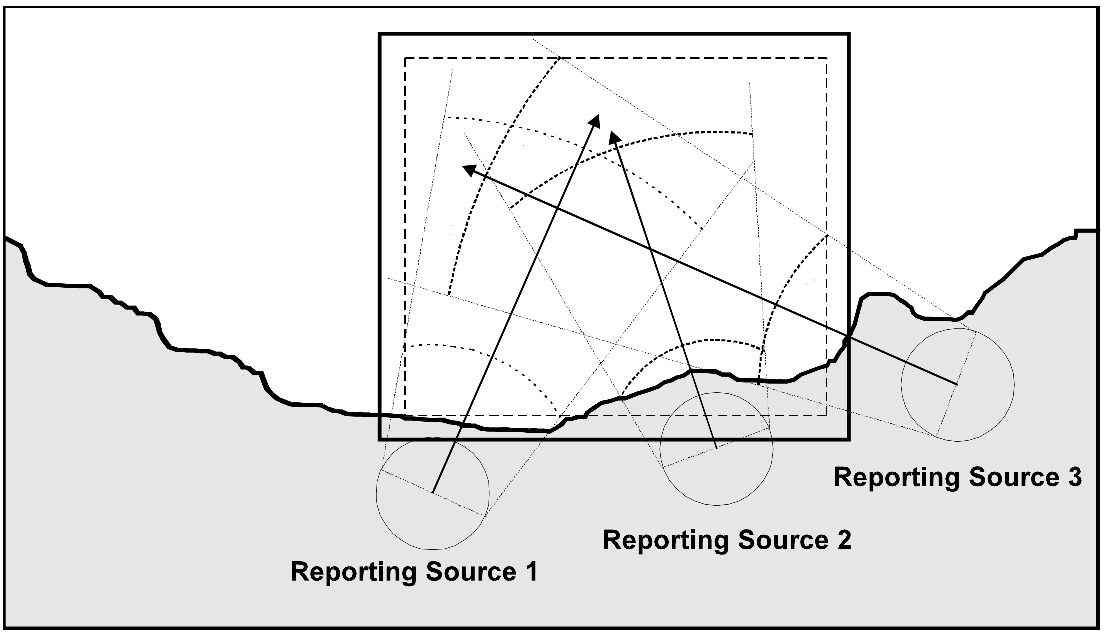


Figure I-15 Reporting sources with different positions

I.5.2.1 Reporting Sources have approximately the same position: Plot each individual reporting source's estimated range and bearing to the flare, properly accounting for the uncertainties in the reporting source's position, bearing estimate and vertical angle estimate. Once all reports are plotted, draw a rectangle that includes all of them, or at least all those that appear to be in reasonable agreement, and expand it by an appropriate safety factor to get the initial datum area and first search area.

I.5.2.2 Reporting Sources have significantly different positions: In this case if all reporting sources saw the same flare, there is a good chance of obtaining a reasonably accurate location for the flare by means of cross bearings. Again, plot each individual report as if it was a single report. Draw a rectangle that includes all of the points where bearing error lines cross and expand it by an appropriate safety factor to get the initial datum area and first search area. To be more conservative, include all the distance uncertainties as well, as shown in Figure I-15.

I.5.3 Search Planning

After establishing a datum area using the procedures outlined above, it will be necessary to plan a search based on this datum. Often it will be necessary to make assumptions about the type of search object based on the sighting report, local knowledge of typical craft and activities in the area, and correlation with other concurrent incidents, overdues, etc. If the difference between the time of the sighting and the SRU's time of arrival on scene is short, and the search object's drift is likely to be slow, then the rectangle enclosing the datum area may also be used as the initial response search area. The search planner may then proceed with the remainder of the search planning and execution process. However, in areas of high drift rates, when there will be a significant delay in the SRU's arrival on scene, or a second (e.g., first light) search is planned, the search planner may need to compute a new datum area for the SRU's projected arrival time that accounts for search object drift.

This may be accomplished manually by drifting each corner of the datum area as if it were an initial point datum. Assume the initial position error (X) for each corner point is zero. This will often result in twice as many datums (8) as corner points (4) due to leeway divergence. When using the manual search planning method, draw a probable error circle around each datum and enclose the entire set of circles in a rectangle to obtain the search area. In the event a corner point of the initial datum area falls on shore and it is virtually certain that the flare originated from a position on the water, choose initial datum points that are close to the corner points but in the water.

1.5.3.1 **Searching the Original Datum Area.** In situations where the original datum area is not included in the search area following drift, consideration should be given to searching the original area if the search object may have been anchored.

1.5.3.2 **SAROPS/SAR Tools Preferred.** Using SAROPS/SAR Tools' full capabilities is the preferred method for planning a search, including the initial response search. However, if a search pattern is established without using the SAROPS Simulator and planner, the pattern may be imported later for evaluation by the SAROPS Simulator. The next section describes planning searches using SAR Tools both without and with using SAROP Simulator and Planner.

Section I.6
Determining a Datum Area and Search Plan Using SAROPS/SAR Tools

The manual procedures given in the previous section have been largely automated with the flare sighting tool in the SAR Tools suite packaged with SAROPS. Use of this tool is both faster and more accurate than manual plotting and is therefore the preferred method for determining the initial datum area for flare sighting reports. In addition, if search planning is required, the flare sighting plots will form the basis for the initial datum area in SAROPS via an Area scenario.

I.6.1 Single Reporting Source

From the "Reporting Source" tab, enter the reporting source's name or other identifier in the "Observer" field, enter the time of the sighting in the "DTG" field, the reporting source's position in the "Position" field, the possible error in that position in the "Accuracy" field, and the reporting source's height of eye in the "Height Of Eye" field, as shown in Figure I-16 below.

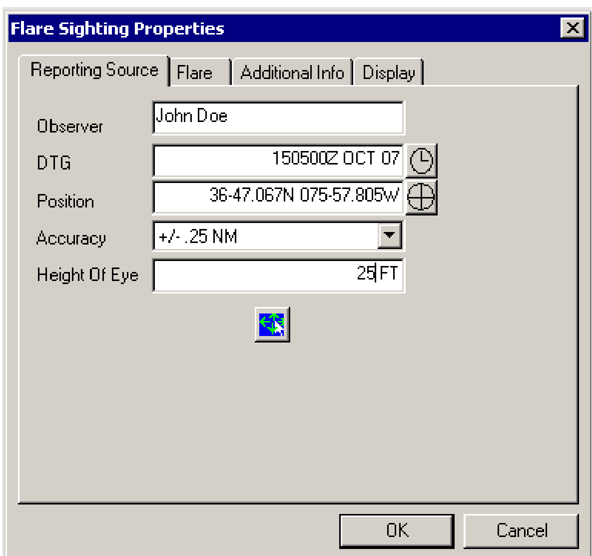


Figure I-16: Reporting Source Tab of Flare Sighting Properties in SAR Tools

Next, proceed to the "Flare" tab, enter the flare type (if known), color, and angle type. Usually the angle type will be "Above Horizon" but there can be situations where the observer's height of eye is high enough for angles to be below the horizon. Enter the bearing and bearing accuracy. Finally, enter the estimated minimum and maximum angles relative to the horizon or the origin of the flare, as appropriate. The "Flare" tab is shown in Figure I-17 below. Figure I-18 shows the resulting "flare cone" plot. The datum area for the flare's origin is the area bounded by the left and right bearing lines and the minimum and maximum distance arcs.

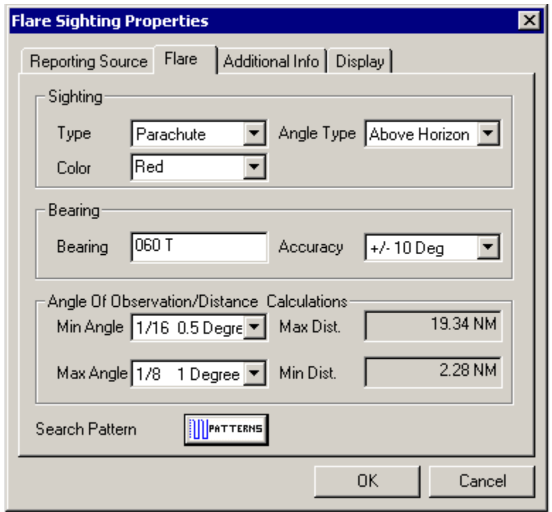


Figure I-17: Flare Tab of Flare Sighting Properties in SAR Tools

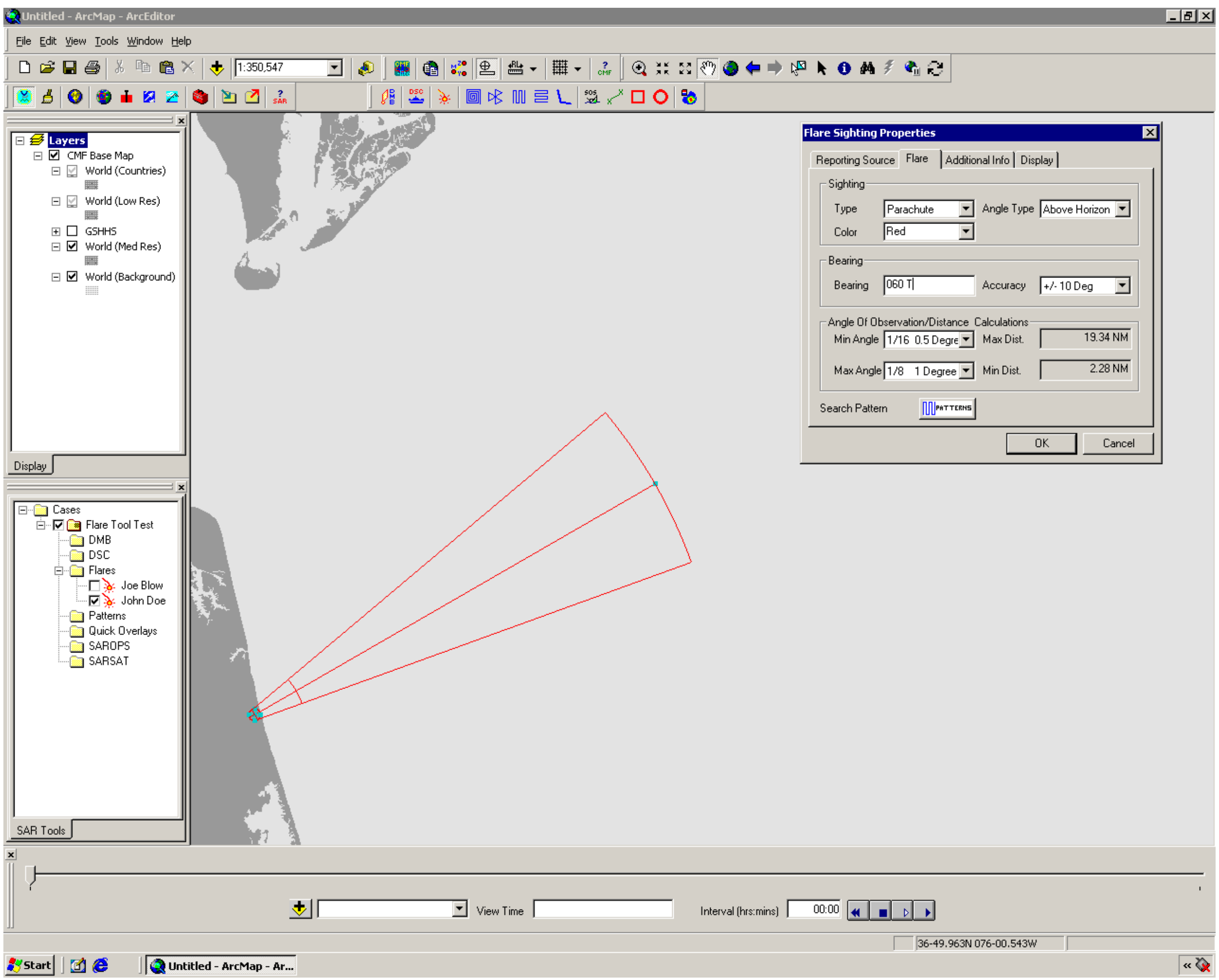


Figure I-18: Plot of Flare Sighting in SAR Tools

I.6.1.1 Determining an Initial Response Search Plan Directly from Flare Sighting Properties. If a search facility can get on scene quickly, a search may be planned using the patterns tool directly from the "Flare" tab of Flare Sighting Properties. Selecting the "Search Patterns" button will generate and plot a search area that covers the flare cone just computed. The search planner just needs to select a track space to generate a search pattern, as shown in Figure I-19 below.

While this is the quickest way to generate a search plan, it is more prudent to initiate a SAROPS "run" using an Area scenario as described in the next section. This is particularly true where the search object is likely to drift rapidly (high currents and/or high winds).

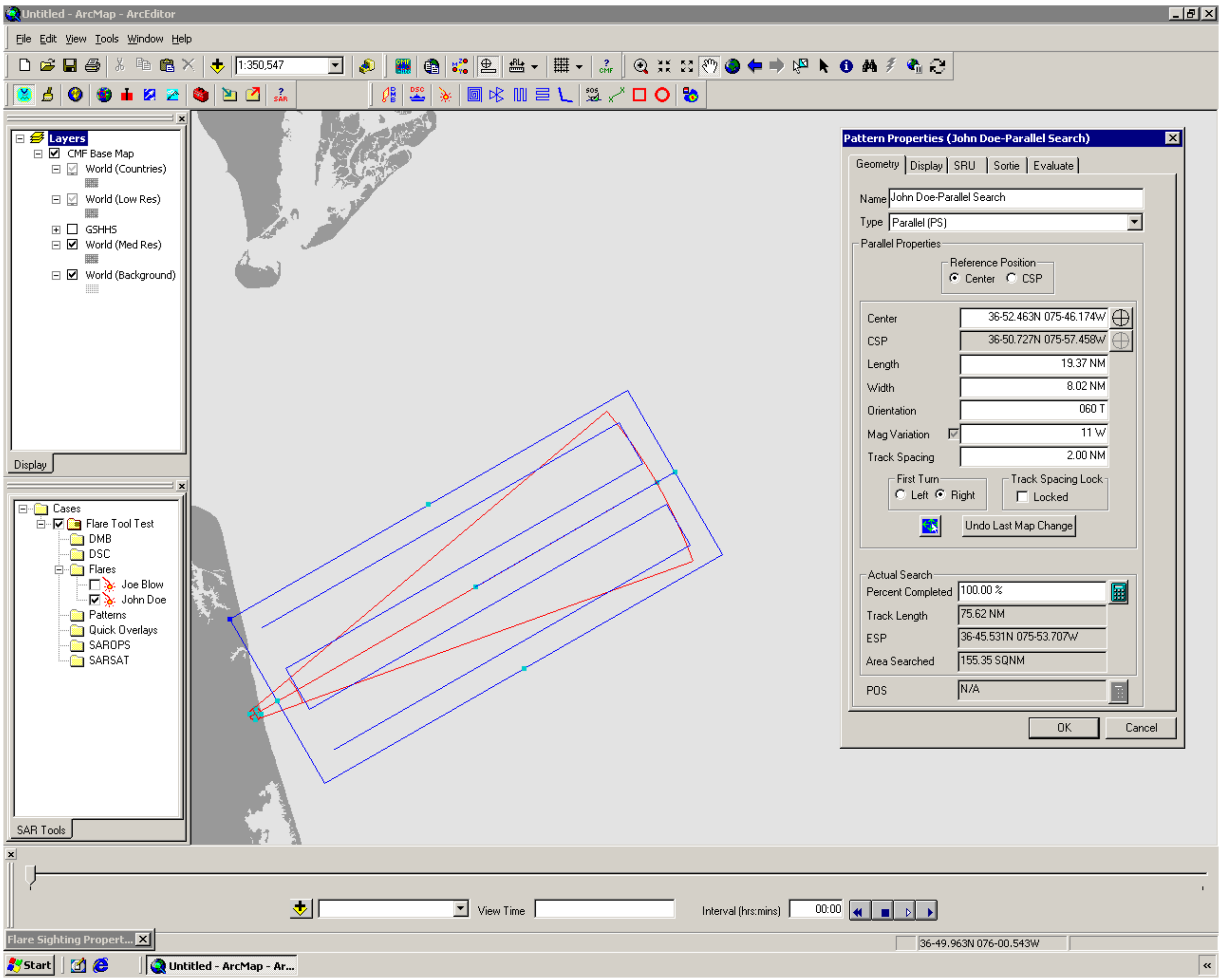


Figure I-19: Initial Response Search Pattern for Flare Sighting

I.6.1.2 Creating a SAROPS Area Scenario. A SAROPS run is initiated as described in Appendix H. To create an Area scenario from the plotted flare sighting data, simply add an Area scenario and construct a polygon that approximates the plotted flare cone as shown in Figure I-20 below. Five corner points are generally sufficient but the search planner is free to use more to more closely follow the minimum and maximum range arcs. However, the 5-point approximation shown in Figure I-20 is definitely adequate for search planning purposes in this example. Note that the corner points for the Area scenario can be established most quickly using the “Auto” feature of the Area scenario tool.

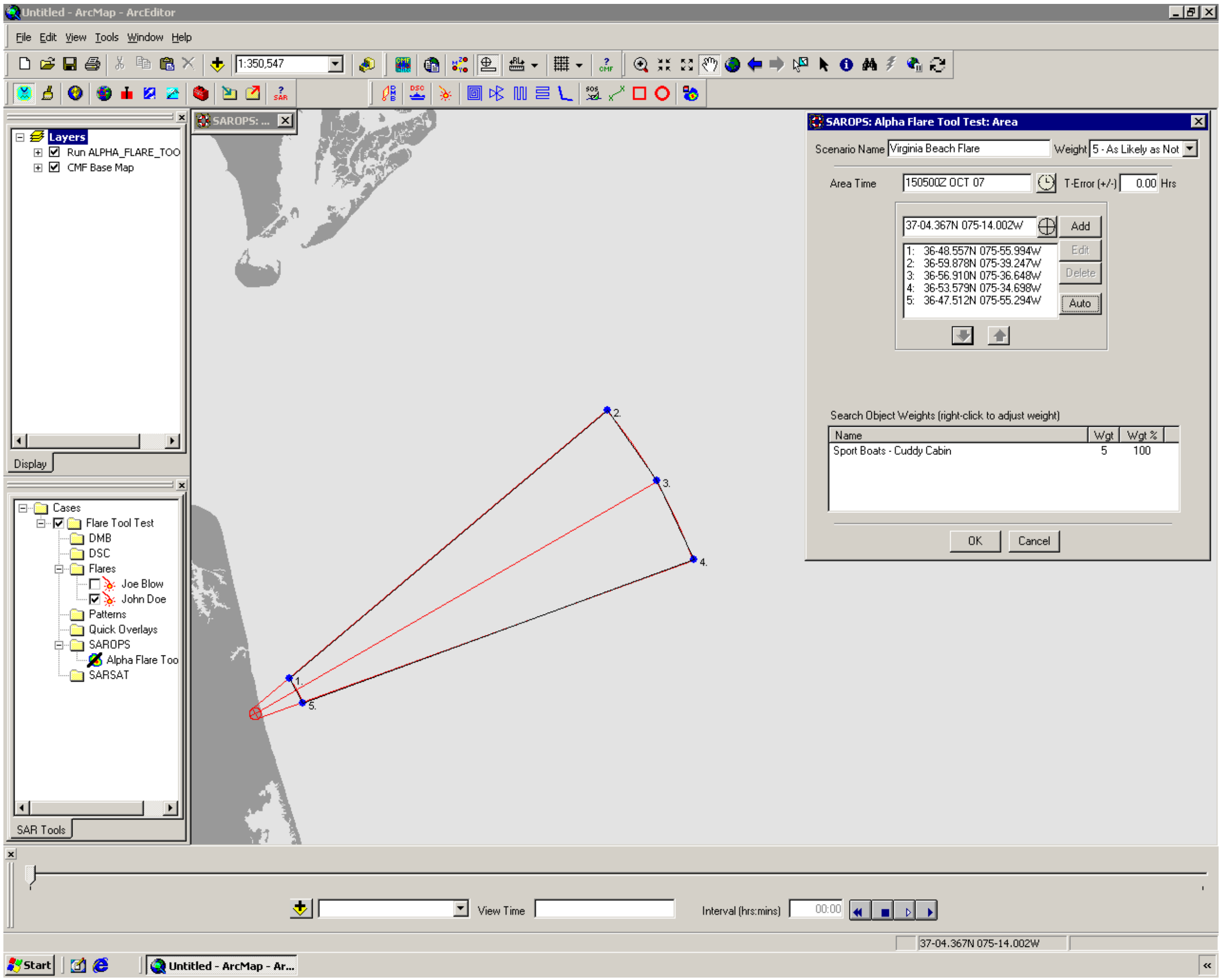


Figure I-20: Establishing SAROPS Area Scenario for a Flare Sighting

I.6.1.3 Developing a Search Plan. Once the Area scenario has been established, the search planner may proceed through the SAROPS search planning process to simulate drift with Simulator and obtain a near-optimal search plan with Planner. The search plan shown in Figure I-21 below is for a helicopter with a one-hour search endurance searching for a 20-foot sport boat with cuddy cabin using NVGs and illumination on a night with 10% clouds and a quarter moon. The commence search time is assumed to be two hours after the flare sighting. Although it takes a few more minutes to develop a search plan using SAROPS, it is time well spent. An initial probability grid is established, any drift between the time of the sighting and the commence search time (CST) can and should be accounted for, and a near-optimal search plan may be computed along with its expected POS value. Finally, the search will be automatically imported and the effects of the search will be taken into account when planning a subsequent search, if one is needed.

I.6.1.4 Searching the Original Datum Area. In situations where the original datum area is not included in the search area following drift, consideration should be given to searching the original area if the search object may have been anchored.

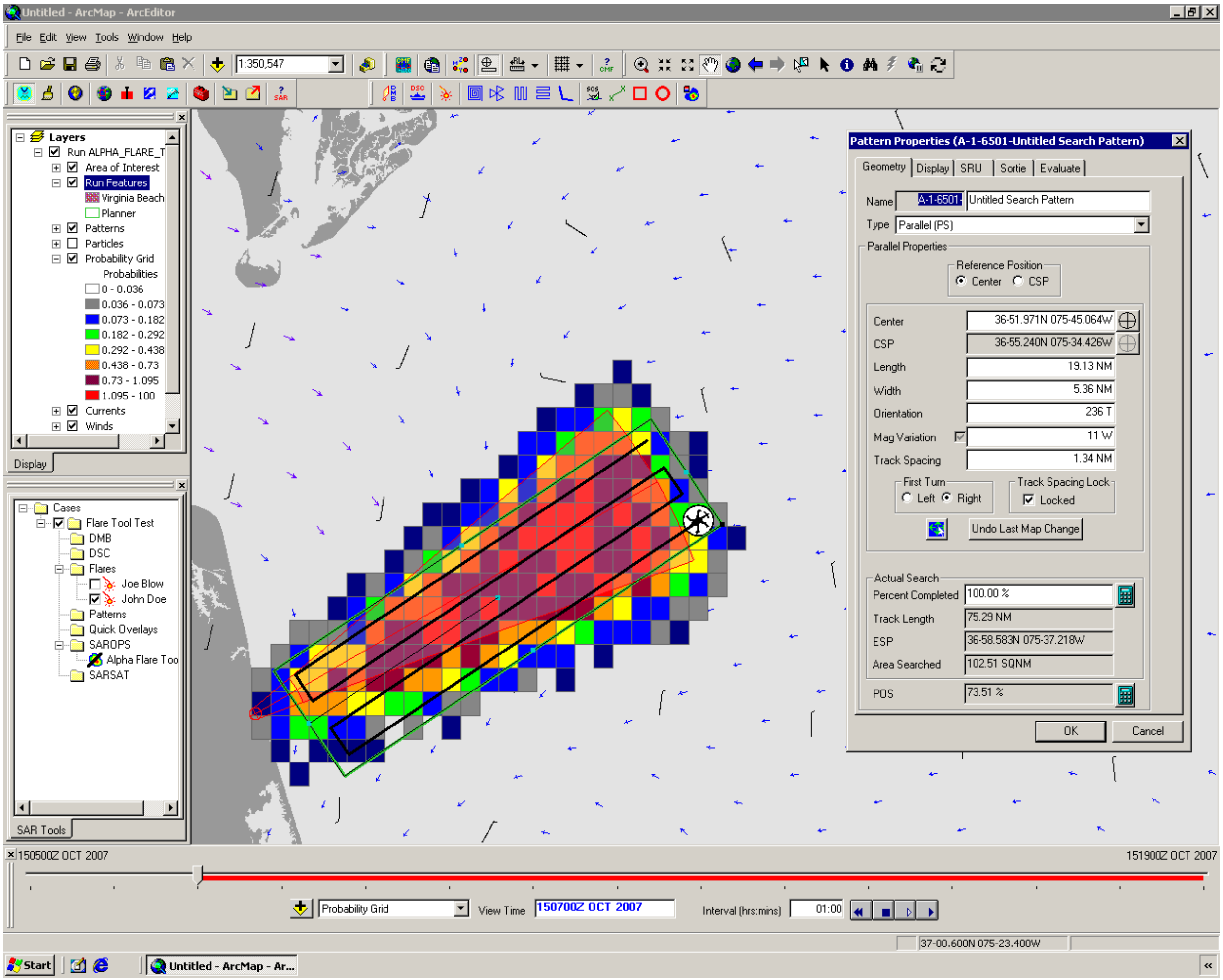


Figure I-21: SAROPS Search Plan (CST Two Hours After Flare Sighting)

I.6.2 Multiple Reporting Sources

The SAR Tools Flare Sighting module can be used multiple times to plot the results from multiple sightings.

I.6.2.1 Creating a SAROPS Area Scenario. Figure I-22 below shows the results from plotting the "flare cones" for two sightings that are presumed to be for the same flare. Note that having a second sighting has the potential to substantially reduce the size of the initial datum area, as shown in Figure I-22 below.

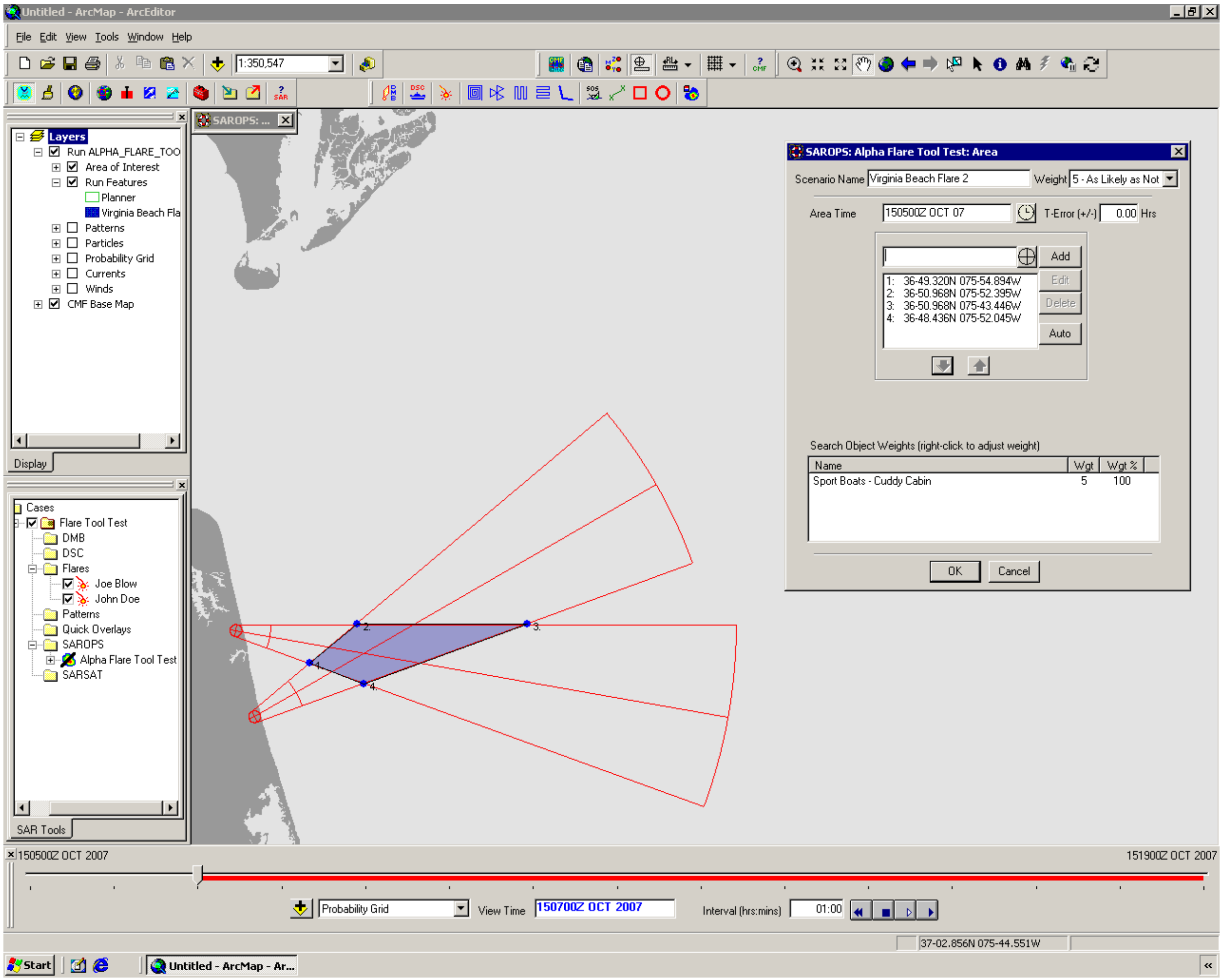


Figure I-22: Establishing SAROPS Area Scenario for Two Sightings of Same Flare

I.6.2.2 Developing a Search Plan. Figure I-23 below shows the resulting SAROPS search plan using the same environmental, SRU, and sensor parameters as before. Note the substantially reduced search area and track spacing, along with the increased POS. It should also be noted that search patterns generated from Flare Sightings Properties are based on single flare sighting reports only. There is no facility in that tool that can deal with search patterns appropriate for multiple sightings.

I.6.2.3 Searching the Original Datum Area. For multiple reporting sources as well, in situations where the original datum area is not included in the search area following drift, consideration should be given to searching the original area if the search object may have been anchored.

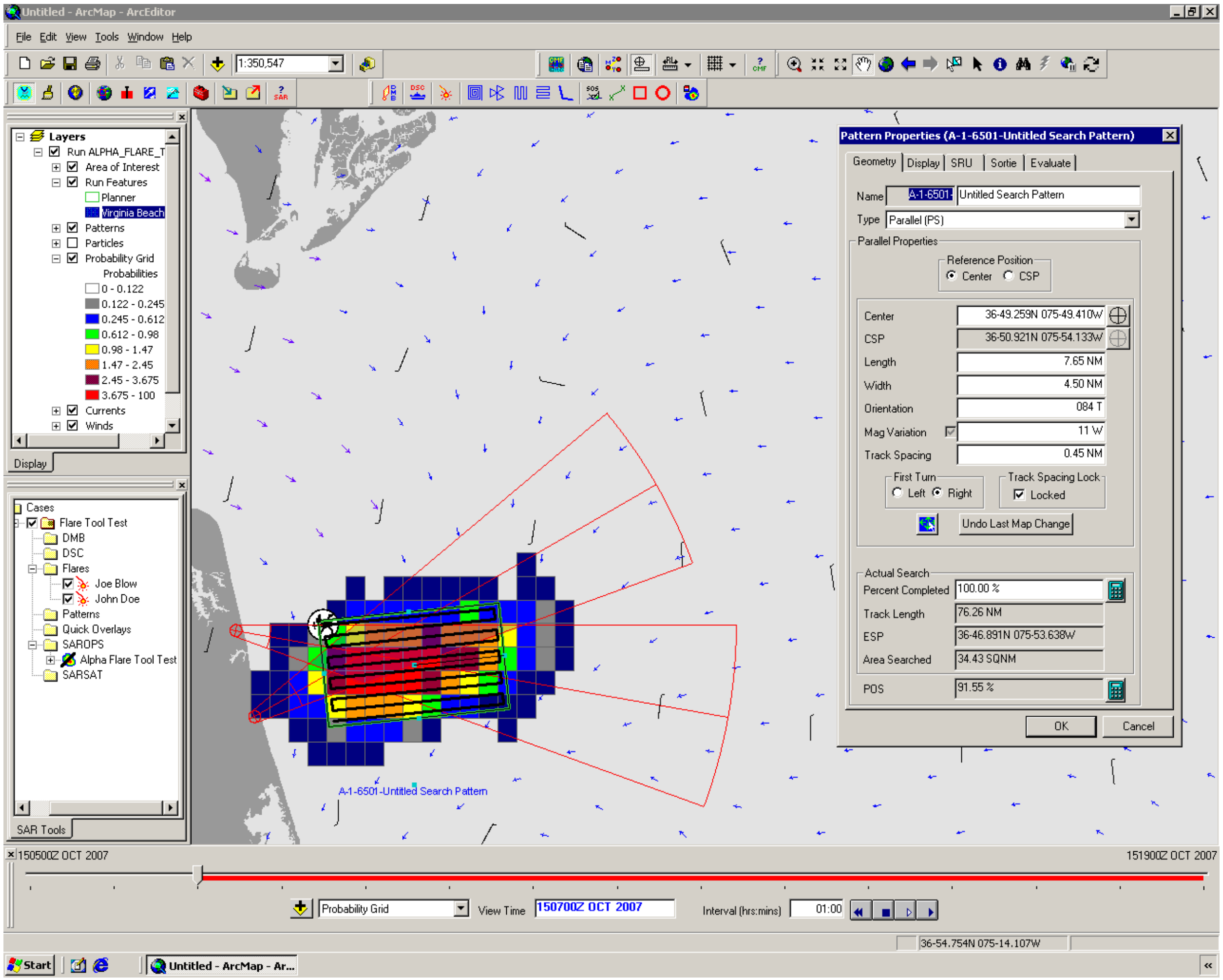


Figure I-23: SAROPS Search Plan (CST Two Hours After Flare Sightings)

Section I.7
Mission Conclusion

I.7.1 Considerations

Usually, the same challenges and uncertainties experienced throughout the case cumulate one last time as case resolution is sought. Concluding a flare incident also has a great deal in common with concluding other types of incidents.

I.7.2 Suspending Active Search Pending Further Developments

If the incident cannot be definitively resolved and closed, all of the data, information, assumptions, and search results must be carefully reviewed to ensure the search plans were prudent and reasonable in hindsight.

I.7.2.1 The review should ensure:

(a) All assigned areas were searched;

(b) PRE and EXCOM searches, if conducted, were completed;

(c) Cumulative Probability of Detection is as high as possible; and

(d) Compensations were made for weather conditions and any other difficulties encountered during the search.

I.7.2.2 Also review any other unresolved or pending cases, including:

(a) Uncorrelated mayday calls;

(b) Overdue or unreported cases;

(c) EPIRB or ELT alerts; and

(d) Any other flare sightings.

I.7.2.3 If any new clues or information develop, consider reopening the case.

I.7.3 Closing a Case

If the source of the flare is located and it can be confirmed with the person(s) involved that they did in fact launch the flare(s) that initiated the case, then the case may be closed. Even if a distressed vessel is located, confirming that the person(s) on board launched the flare(s) is required to ensure that the flares did not come from some other source. ***In the absence of such confirmation, the possibility of another incident must be considered.***

Table I-3a Angle of Observation Above the Horizon; Minimum Distance to the Flare (nm)

Reporting Source Height ft	0.50^{0}	1.00^{0}	1.50^{0}	2.00^{0}	2.50^{0}	3.00^{0}	3.50^{0}	4.00^{0}	5.00^{0}	6.00^{0}	7.00^{0}	8.00^{0}	10.00^{0}	12.00^{0}	14.00^{0}	16.00^{0}
10	4.68	2.35	1.55	1.16	0.92	0.77	0.65	0.57	0.46	0.38	0.32	0.28	0.23	0.19	0.16	0.14
20	4.71	2.31	1.51	1.12	0.89	0.74	0.63	0.55	0.44	0.36	0.31	0.27	0.22	0.18	0.15	0.13
30	4.69	2.25	1.46	1.08	0.86	0.71	0.61	0.53	0.42	0.35	0.30	0.26	0.21	0.17	0.15	0.13
40	4.64	2.18	1.41	1.04	0.83	0.68	0.58	0.51	0.40	0.33	0.29	0.25	0.20	0.16	0.14	0.12
50	4.57	2.11	1.36	1.00	0.79	0.65	0.56	0.49	0.39	0.32	0.27	0.24	0.19	0.16	0.13	0.12
60	4.47	2.03	1.30	0.96	0.76	0.62	0.53	0.46	0.37	0.30	0.26	0.23	0.18	0.15	0.13	0.11
70	4.37	1.95	1.24	0.91	0.72	0.59	0.50	0.44	0.35	0.29	0.25	0.21	0.17	0.14	0.12	0.10
80	4.25	1.87	1.19	0.87	0.68	0.56	0.48	0.42	0.33	0.27	0.23	0.20	0.16	0.13	0.11	0.10
90	4.12	1.78	1.12	0.82	0.64	0.53	0.45	0.39	0.31	0.26	0.22	0.19	0.15	0.13	0.11	0.09
100	3.97	1.69	1.06	0.77	0.61	0.50	0.42	0.37	0.29	0.24	0.21	0.18	0.14	0.12	0.10	0.09
110	3.81	1.59	1.00	0.72	0.57	0.47	0.40	0.35	0.27	0.23	0.19	0.17	0.13	0.11	0.09	0.08
120	3.64	1.50	0.93	0.68	0.53	0.44	0.37	0.32	0.25	0.21	0.18	0.16	0.12	0.10	0.09	0.08
130	3.46	1.40	0.87	0.63	0.49	0.40	0.34	0.30	0.24	0.19	0.17	0.14	0.11	0.09	0.08	0.07
140	3.26	1.29	0.80	0.58	0.45	0.37	0.31	0.27	0.22	0.18	0.15	0.13	0.10	0.09	0.07	0.06
150	3.05	1.19	0.73	0.53	0.41	0.34	0.29	0.25	0.20	0.16	0.14	0.12	0.10	0.08	0.07	0.06
160	2.83	1.08	0.66	0.48	0.37	0.30	0.26	0.22	0.18	0.15	0.12	0.11	0.09	0.07	0.06	0.05
170	2.59	0.97	0.59	0.43	0.33	0.27	0.23	0.20	0.16	0.13	0.11	0.10	0.08	0.06	0.05	0.05
180	2.34	0.86	0.52	0.37	0.29	0.24	0.20	0.18	0.14	0.11	0.10	0.08	0.07	0.06	0.05	0.04
190	2.07	0.74	0.45	0.32	0.25	0.20	0.17	0.15	0.12	0.10	0.08	0.07	0.06	0.05	0.04	0.03
200	1.78	0.62	0.38	0.27	0.21	0.17	0.14	0.13	0.10	0.08	0.07	0.06	0.05	0.04	0.03	0.03
220	1.15	0.38	0.23	0.16	0.13	0.10	0.09	0.08	0.06	0.05	0.04	0.04	0.03	0.02	0.02	0.02
240	0.41	0.13	0.08	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
260	0.43	0.13	0.08	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
280	0.45	0.13	0.08	0.06	0.04	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
300	0.48	0.14	0.08	0.06	0.04	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
320	0.50	0.14	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
340	0.53	0.14	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
360	0.56	0.14	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
380	0.59	0.14	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
400	0.62	0.15	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
420	0.66	0.15	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
440	0.70	0.15	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
460	0.75	0.15	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
480	0.80	0.15	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
500	0.85	0.16	0.09	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
520	0.91	0.16	0.09	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
540	0.98	0.16	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
560	1.05	0.16	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
580	1.14	0.16	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
600	1.24	0.17	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
620	1.35	0.17	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
640	1.47	0.17	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
660	1.62	0.17	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
680	1.78	0.17	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
700	1.98	0.18	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
720	2.20	0.18	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
740	2.45	0.18	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
760	2.74	0.18	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
780	3.07	0.19	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
800	3.44	0.19	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
820	3.84	0.19	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
840	4.27	0.19	0.10	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
860	4.74	0.20	0.10	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
880	5.24	0.20	0.10	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
900	5.76	0.20	0.10	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
920	6.29	0.20	0.10	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
940	6.85	0.21	0.10	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
960	7.41	0.21	0.10	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
980	7.98	0.21	0.10	0.07	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
1000	8.56	0.21	0.10	0.07	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01

Table I-3b Angle of Observation Above the Horizon; Maximum Distance to the Flare (nm)

Reporting Source Height ft	0.50°	1.00°	1.50°	2.00°	2.50°	3.00°	3.50°	4.00°	5.00°	6.00°	7.00°	8.00°	10.00°	12.00°	14.00°	16.00°
10	18.69	10.84	7.44	5.63	4.52	3.77	3.23	2.82	2.25	1.87	1.60	1.40	1.12	0.92	0.79	0.68
20	19.16	10.98	7.49	5.65	4.52	3.76	3.22	2.81	2.25	1.87	1.60	1.39	1.11	0.92	0.78	0.68
30	19.50	11.08	7.52	5.65	4.51	3.75	3.21	2.80	2.23	1.86	1.59	1.38	1.10	0.91	0.78	0.68
40	19.77	11.14	7.53	5.65	4.50	3.74	3.20	2.79	2.22	1.85	1.58	1.37	1.09	0.91	0.77	0.67
50	20.01	11.19	7.54	5.64	4.49	3.73	3.18	2.78	2.21	1.83	1.57	1.37	1.09	0.90	0.77	0.66
60	20.22	11.23	7.53	5.62	4.47	3.71	3.17	2.76	2.20	1.82	1.55	1.36	1.08	0.89	0.76	0.66
70	20.40	11.26	7.53	5.61	4.45	3.69	3.15	2.74	2.18	1.81	1.54	1.35	1.07	0.89	0.75	0.65
80	20.57	11.28	7.51	5.59	4.43	3.67	3.13	2.73	2.17	1.80	1.53	1.34	1.06	0.88	0.75	0.65
90	20.73	11.29	7.50	5.57	4.41	3.65	3.11	2.71	2.15	1.78	1.52	1.33	1.05	0.87	0.74	0.64
100	20.87	11.30	7.48	5.54	4.39	3.63	3.09	2.69	2.14	1.77	1.51	1.31	1.04	0.86	0.73	0.64
110	21.00	11.31	7.46	5.52	4.37	3.61	3.07	2.67	2.12	1.76	1.50	1.30	1.04	0.86	0.73	0.63
120	21.12	11.30	7.44	5.49	4.34	3.59	3.05	2.65	2.10	1.74	1.49	1.29	1.03	0.85	0.72	0.63
130	21.23	11.30	7.41	5.47	4.32	3.56	3.03	2.64	2.09	1.73	1.47	1.28	1.02	0.84	0.72	0.62
140	21.33	11.29	7.39	5.44	4.29	3.54	3.01	2.62	2.07	1.71	1.46	1.27	1.01	0.83	0.71	0.62
150	21.43	11.28	7.36	5.41	4.27	3.52	2.99	2.60	2.06	1.70	1.45	1.26	1.00	0.83	0.70	0.61
160	21.52	11.27	7.33	5.38	4.24	3.49	2.97	2.58	2.04	1.69	1.44	1.25	0.99	0.82	0.70	0.61
170	21.61	11.25	7.30	5.35	4.21	3.47	2.94	2.56	2.02	1.67	1.42	1.24	0.98	0.81	0.69	0.60
180	21.69	11.23	7.26	5.32	4.18	3.44	2.92	2.54	2.01	1.66	1.41	1.23	0.97	0.81	0.68	0.59
190	21.77	11.21	7.23	5.29	4.15	3.42	2.90	2.52	1.99	1.64	1.40	1.22	0.97	0.80	0.68	0.59
200	21.84	11.18	7.20	5.25	4.12	3.39	2.88	2.50	1.97	1.63	1.39	1.21	0.96	0.79	0.67	0.58
220	21.97	11.13	7.12	5.19	4.06	3.34	2.83	2.45	1.94	1.60	1.36	1.18	0.94	0.78	0.66	0.57
240	22.09	11.06	7.04	5.11	4.00	3.28	2.78	2.41	1.90	1.57	1.34	1.16	0.92	0.76	0.65	0.56
260	22.19	10.99	6.96	5.04	3.94	3.23	2.73	2.37	1.87	1.54	1.31	1.14	0.90	0.75	0.63	0.55
280	22.28	10.91	6.87	4.97	3.88	3.17	2.68	2.33	1.83	1.51	1.29	1.12	0.88	0.73	0.62	0.54
300	22.35	10.83	6.79	4.89	3.81	3.12	2.64	2.28	1.80	1.48	1.26	1.09	0.87	0.71	0.61	0.53
320	22.42	10.73	6.69	4.81	3.74	3.06	2.58	2.24	1.76	1.45	1.23	1.07	0.85	0.70	0.59	0.52
340	22.47	10.64	6.60	4.73	3.68	3.00	2.53	2.19	1.72	1.42	1.21	1.05	0.83	0.68	0.58	0.50
360	22.52	10.53	6.50	4.65	3.61	2.94	2.48	2.15	1.69	1.39	1.18	1.03	0.81	0.67	0.57	0.49
380	22.56	10.42	6.40	4.56	3.54	2.88	2.43	2.10	1.65	1.36	1.15	1.00	0.79	0.65	0.55	0.48
400	22.58	10.30	6.29	4.48	3.47	2.82	2.38	2.06	1.61	1.33	1.13	0.98	0.77	0.64	0.54	0.47
420	22.60	10.18	6.18	4.39	3.39	2.76	2.33	2.01	1.58	1.30	1.10	0.96	0.75	0.62	0.53	0.46
440	22.61	10.06	6.07	4.30	3.32	2.70	2.27	1.96	1.54	1.27	1.07	0.93	0.74	0.61	0.52	0.45
460	22.61	9.92	5.96	4.21	3.25	2.64	2.22	1.92	1.50	1.23	1.05	0.91	0.72	0.59	0.50	0.44
480	22.60	9.78	5.85	4.12	3.17	2.57	2.17	1.87	1.46	1.20	1.02	0.89	0.70	0.58	0.49	0.42
500	22.59	9.64	5.73	4.03	3.10	2.51	2.11	1.82	1.43	1.17	0.99	0.86	0.68	0.56	0.48	0.41
520	22.56	9.49	5.61	3.93	3.02	2.45	2.06	1.77	1.39	1.14	0.97	0.84	0.66	0.54	0.46	0.40
540	22.53	9.34	5.48	3.84	2.94	2.38	2.00	1.72	1.35	1.11	0.94	0.81	0.64	0.53	0.45	0.39
560	22.49	9.18	5.36	3.74	2.86	2.32	1.95	1.68	1.31	1.08	0.91	0.79	0.62	0.51	0.44	0.38
580	22.44	9.01	5.23	3.64	2.79	2.25	1.89	1.63	1.27	1.04	0.88	0.77	0.60	0.50	0.42	0.37
600	22.39	8.84	5.10	3.54	2.71	2.19	1.83	1.58	1.23	1.01	0.86	0.74	0.59	0.48	0.41	0.35
620	22.32	8.66	4.97	3.44	2.63	2.12	1.78	1.53	1.19	0.98	0.83	0.72	0.57	0.47	0.40	0.34
640	22.25	8.48	4.83	3.34	2.54	2.05	1.72	1.48	1.15	0.95	0.80	0.69	0.55	0.45	0.38	0.33
660	22.17	8.29	4.69	3.24	2.46	1.99	1.66	1.43	1.11	0.91	0.77	0.67	0.53	0.43	0.37	0.32
680	22.08	8.09	4.55	3.13	2.38	1.92	1.60	1.38	1.08	0.88	0.75	0.65	0.51	0.42	0.36	0.31
700	21.98	7.89	4.41	3.03	2.30	1.85	1.55	1.33	1.04	0.85	0.72	0.62	0.49	0.40	0.34	0.30
720	21.87	7.68	4.27	2.92	2.21	1.78	1.49	1.28	1.00	0.82	0.69	0.60	0.47	0.39	0.33	0.28
740	21.75	7.47	4.12	2.81	2.13	1.71	1.43	1.23	0.96	0.78	0.66	0.57	0.45	0.37	0.31	0.27
760	21.63	7.25	3.97	2.70	2.04	1.64	1.37	1.18	0.92	0.75	0.63	0.55	0.43	0.36	0.30	0.26
780	21.49	7.02	3.82	2.59	1.96	1.57	1.31	1.12	0.88	0.72	0.61	0.52	0.41	0.34	0.29	0.25
800	21.34	6.79	3.66	2.48	1.87	1.50	1.25	1.07	0.83	0.68	0.58	0.50	0.39	0.32	0.27	0.24
820	21.18	6.54	3.50	2.37	1.78	1.43	1.19	1.02	0.79	0.65	0.55	0.47	0.37	0.31	0.26	0.23
840	21.01	6.29	3.34	2.25	1.69	1.36	1.13	0.97	0.75	0.62	0.52	0.45	0.35	0.29	0.25	0.21
860	20.82	6.04	3.18	2.14	1.61	1.29	1.07	0.92	0.71	0.58	0.49	0.43	0.33	0.28	0.23	0.20
880	20.62	5.77	3.02	2.02	1.52	1.21	1.01	0.87	0.67	0.55	0.46	0.40	0.32	0.26	0.22	0.19
900	20.41	5.50	2.85	1.90	1.43	1.14	0.95	0.81	0.63	0.51	0.43	0.38	0.30	0.24	0.21	0.18
920	20.18	5.21	2.68	1.79	1.34	1.07	0.89	0.76	0.59	0.48	0.41	0.35	0.28	0.23	0.19	0.17
940	19.94	4.92	2.51	1.67	1.24	0.99	0.83	0.71	0.55	0.45	0.38	0.33	0.26	0.21	0.18	0.15
960	19.68	4.62	2.33	1.54	1.15	0.92	0.76	0.65	0.51	0.41	0.35	0.30	0.24	0.19	0.17	0.14
980	19.39	4.31	2.15	1.42	1.06	0.84	0.70	0.60	0.46	0.38	0.32	0.28	0.22	0.18	0.15	0.13
1000	19.09	3.99	1.97	1.30	0.97	0.77	0.64	0.55	0.42	0.35	0.29	0.25	0.20	0.16	0.14	0.12

Table I-4a Angle of Observation Below the Horizon; Minimum Distance to the Flare (nm)

Reporting Source Height ft	0.50 ^{0}	1.00 ^{0}	1.50 ^{0}	2.00 ^{0}	2.50 ^{0}	3.00 ^{0}	3.50 ^{0}	4.00 ^{0}	5.00 ^{0}	6.00 ^{0}	7.00 ^{0}	8.00 ^{0}	10.00 ^{0}	12.00 ^{0}	14.00 ^{0}	16.00 ^{0}
10	0.17	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
20	0.16	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
30	0.16	0.09	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
40	0.15	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
50	0.15	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
60	0.15	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
70	0.15	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
80	0.14	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
90	0.14	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
100	0.14	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
110	0.14	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
120	0.14	0.08	0.06	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
130	0.13	0.08	0.06	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
140	0.13	0.08	0.06	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
150	0.13	0.08	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
160	0.13	0.08	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
170	0.13	0.08	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
180	0.13	0.08	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
190	0.13	0.08	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
200	0.13	0.08	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
220	0.12	0.07	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
240	0.12	0.07	0.05	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
260	0.12	0.07	0.05	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
280	0.36	0.22	0.16	0.12	0.10	0.09	0.07	0.07	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02
300	0.59	0.36	0.26	0.20	0.17	0.14	0.12	0.11	0.09	0.07	0.06	0.06	0.05	0.04	0.03	0.03
320	0.81	0.50	0.36	0.28	0.23	0.20	0.17	0.15	0.12	0.10	0.09	0.08	0.06	0.05	0.05	0.04
340	1.04	0.64	0.47	0.36	0.30	0.25	0.22	0.20	0.16	0.13	0.12	0.10	0.08	0.07	0.06	0.05
360	1.26	0.78	0.57	0.44	0.37	0.31	0.27	0.24	0.19	0.16	0.14	0.12	0.10	0.08	0.07	0.06
380	1.47	0.92	0.67	0.52	0.43	0.37	0.32	0.28	0.23	0.19	0.17	0.15	0.12	0.10	0.08	0.07
400	1.68	1.05	0.76	0.60	0.50	0.42	0.37	0.32	0.26	0.22	0.19	0.17	0.14	0.11	0.10	0.08
420	1.89	1.18	0.86	0.68	0.56	0.48	0.41	0.37	0.30	0.25	0.22	0.19	0.15	0.13	0.11	0.10
440	2.10	1.32	0.96	0.76	0.62	0.53	0.46	0.41	0.33	0.28	0.24	0.21	0.17	0.14	0.12	0.11
460	2.30	1.45	1.06	0.83	0.69	0.59	0.51	0.45	0.37	0.31	0.27	0.23	0.19	0.16	0.13	0.12
480	2.50	1.58	1.15	0.91	0.75	0.64	0.56	0.49	0.40	0.34	0.29	0.26	0.21	0.17	0.15	0.13
500	2.70	1.70	1.25	0.99	0.81	0.69	0.60	0.54	0.44	0.37	0.32	0.28	0.22	0.19	0.16	0.14
520	2.89	1.83	1.34	1.06	0.88	0.75	0.65	0.58	0.47	0.40	0.34	0.30	0.24	0.20	0.17	0.15
540	3.08	1.96	1.44	1.14	0.94	0.80	0.70	0.62	0.50	0.42	0.37	0.32	0.26	0.22	0.19	0.16
560	3.27	2.08	1.53	1.21	1.00	0.86	0.75	0.66	0.54	0.45	0.39	0.34	0.28	0.23	0.20	0.17
580	3.46	2.21	1.62	1.29	1.06	0.91	0.79	0.70	0.57	0.48	0.42	0.37	0.30	0.25	0.21	0.18
600	3.65	2.33	1.72	1.36	1.13	0.96	0.84	0.74	0.61	0.51	0.44	0.39	0.31	0.26	0.22	0.20
620	3.83	2.45	1.81	1.43	1.19	1.01	0.88	0.78	0.64	0.54	0.47	0.41	0.33	0.28	0.24	0.21
640	4.02	2.58	1.90	1.51	1.25	1.07	0.93	0.83	0.67	0.57	0.49	0.43	0.35	0.29	0.25	0.22
660	4.20	2.70	1.99	1.58	1.31	1.12	0.98	0.87	0.71	0.60	0.52	0.45	0.37	0.31	0.26	0.23
680	4.38	2.82	2.08	1.65	1.37	1.17	1.02	0.91	0.74	0.62	0.54	0.48	0.38	0.32	0.27	0.24
700	4.55	2.94	2.17	1.73	1.43	1.22	1.07	0.95	0.77	0.65	0.56	0.50	0.40	0.33	0.29	0.25
720	4.73	3.05	2.26	1.80	1.49	1.28	1.11	0.99	0.81	0.68	0.59	0.52	0.42	0.35	0.30	0.26
740	4.91	3.17	2.35	1.87	1.55	1.33	1.16	1.03	0.84	0.71	0.61	0.54	0.44	0.36	0.31	0.27
760	5.08	3.29	2.44	1.94	1.61	1.38	1.21	1.07	0.87	0.74	0.64	0.56	0.45	0.38	0.32	0.28
780	5.25	3.40	2.53	2.01	1.67	1.43	1.25	1.11	0.91	0.77	0.66	0.58	0.47	0.39	0.34	0.29
800	5.42	3.52	2.62	2.09	1.73	1.48	1.30	1.15	0.94	0.79	0.69	0.61	0.49	0.41	0.35	0.31
820	5.59	3.64	2.70	2.16	1.79	1.54	1.34	1.19	0.97	0.82	0.71	0.63	0.51	0.42	0.36	0.32
840	5.76	3.75	2.79	2.23	1.85	1.59	1.39	1.23	1.01	0.85	0.74	0.65	0.52	0.44	0.37	0.33
860	5.92	3.86	2.88	2.30	1.91	1.64	1.43	1.27	1.04	0.88	0.76	0.67	0.54	0.45	0.39	0.34
880	6.09	3.98	2.97	2.37	1.97	1.69	1.48	1.31	1.07	0.91	0.78	0.69	0.56	0.47	0.40	0.35
900	6.25	4.09	3.05	2.44	2.03	1.74	1.52	1.35	1.11	0.93	0.81	0.71	0.58	0.48	0.41	0.36
920	6.42	4.20	3.14	2.51	2.09	1.79	1.57	1.39	1.14	0.96	0.83	0.73	0.59	0.50	0.43	0.37
940	6.58	4.31	3.22	2.58	2.15	1.84	1.61	1.43	1.17	0.99	0.86	0.76	0.61	0.51	0.44	0.38
960	6.74	4.42	3.31	2.65	2.21	1.89	1.66	1.47	1.20	1.02	0.88	0.78	0.63	0.52	0.45	0.39
980	6.90	4.53	3.39	2.71	2.26	1.94	1.70	1.51	1.24	1.05	0.91	0.80	0.64	0.54	0.46	0.40
1000	7.06	4.64	3.48	2.78	2.32	1.99	1.74	1.55	1.27	1.07	0.93	0.82	0.66	0.55	0.48	0.41

Table I-4b Angle of Observation Below Horizon; Maximum Distance to the Flare (nm)

Reporting Source Height ft	0.50°	1.00°	1.50°	2.00°	2.50°	3.00°	3.50°	4.00°	5.00°	6.00°	7.00°	8.00°	10.00°	12.00°	14.00°	16.00°
10	0.17	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
20	0.33	0.17	0.12	0.09	0.07	0.06	0.05	0.05	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01
30	0.48	0.26	0.18	0.13	0.11	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.02
40	0.62	0.34	0.23	0.18	0.14	0.12	0.10	0.09	0.07	0.06	0.05	0.05	0.04	0.03	0.03	0.02
50	0.76	0.42	0.29	0.22	0.18	0.15	0.13	0.11	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.03
60	0.90	0.50	0.35	0.26	0.21	0.18	0.16	0.14	0.11	0.09	0.08	0.07	0.06	0.05	0.04	0.03
70	1.03	0.58	0.40	0.31	0.25	0.21	0.18	0.16	0.13	0.11	0.09	0.08	0.06	0.05	0.05	0.04
80	1.16	0.65	0.46	0.35	0.28	0.24	0.21	0.18	0.15	0.12	0.10	0.09	0.07	0.06	0.05	0.05
90	1.29	0.73	0.51	0.39	0.32	0.27	0.23	0.20	0.16	0.14	0.12	0.10	0.08	0.07	0.06	0.05
100	1.42	0.80	0.56	0.43	0.35	0.30	0.26	0.23	0.18	0.15	0.13	0.11	0.09	0.08	0.07	0.06
110	1.54	0.88	0.62	0.47	0.39	0.33	0.28	0.25	0.20	0.17	0.14	0.13	0.10	0.08	0.07	0.06
120	1.66	0.95	0.67	0.52	0.42	0.35	0.31	0.27	0.22	0.18	0.16	0.14	0.11	0.09	0.08	0.07
130	1.78	1.03	0.72	0.56	0.45	0.38	0.33	0.29	0.23	0.20	0.17	0.15	0.12	0.10	0.08	0.07
140	1.90	1.10	0.77	0.60	0.49	0.41	0.36	0.31	0.25	0.21	0.18	0.16	0.13	0.11	0.09	0.08
150	2.02	1.17	0.83	0.64	0.52	0.44	0.38	0.33	0.27	0.23	0.19	0.17	0.14	0.11	0.10	0.08
160	2.13	1.24	0.88	0.68	0.55	0.47	0.40	0.36	0.29	0.24	0.21	0.18	0.15	0.12	0.10	0.09
170	2.25	1.31	0.93	0.72	0.59	0.50	0.43	0.38	0.31	0.26	0.22	0.19	0.15	0.13	0.11	0.10
180	2.36	1.38	0.98	0.76	0.62	0.52	0.45	0.40	0.32	0.27	0.23	0.20	0.16	0.14	0.12	0.10
190	2.47	1.45	1.03	0.80	0.65	0.55	0.48	0.42	0.34	0.29	0.25	0.22	0.17	0.14	0.12	0.11
200	2.59	1.52	1.08	0.84	0.69	0.58	0.50	0.44	0.36	0.30	0.26	0.23	0.18	0.15	0.13	0.11
220	2.80	1.66	1.18	0.92	0.75	0.64	0.55	0.49	0.39	0.33	0.28	0.25	0.20	0.17	0.14	0.12
240	3.02	1.80	1.28	1.00	0.82	0.69	0.60	0.53	0.43	0.36	0.31	0.27	0.22	0.18	0.16	0.14
260	3.23	1.93	1.38	1.08	0.88	0.75	0.65	0.57	0.46	0.39	0.33	0.29	0.24	0.20	0.17	0.15
280	3.44	2.06	1.48	1.15	0.95	0.80	0.70	0.61	0.50	0.42	0.36	0.32	0.25	0.21	0.18	0.16
300	3.64	2.19	1.58	1.23	1.01	0.86	0.74	0.66	0.53	0.45	0.38	0.34	0.27	0.23	0.19	0.17
320	3.84	2.32	1.67	1.31	1.07	0.91	0.79	0.70	0.57	0.48	0.41	0.36	0.29	0.24	0.21	0.18
340	4.04	2.45	1.77	1.38	1.14	0.96	0.84	0.74	0.60	0.50	0.44	0.38	0.31	0.26	0.22	0.19
360	4.24	2.58	1.86	1.46	1.20	1.02	0.88	0.78	0.63	0.53	0.46	0.40	0.32	0.27	0.23	0.20
380	4.43	2.71	1.96	1.53	1.26	1.07	0.93	0.82	0.67	0.56	0.49	0.43	0.34	0.29	0.24	0.21
400	4.62	2.83	2.05	1.61	1.32	1.13	0.98	0.87	0.70	0.59	0.51	0.45	0.36	0.30	0.26	0.22
420	4.81	2.96	2.14	1.68	1.39	1.18	1.03	0.91	0.74	0.62	0.53	0.47	0.38	0.32	0.27	0.24
440	4.99	3.08	2.24	1.76	1.45	1.23	1.07	0.95	0.77	0.65	0.56	0.49	0.40	0.33	0.28	0.25
460	5.18	3.20	2.33	1.83	1.51	1.29	1.12	0.99	0.80	0.68	0.58	0.51	0.41	0.34	0.30	0.26
480	5.36	3.32	2.42	1.91	1.57	1.34	1.16	1.03	0.84	0.71	0.61	0.54	0.43	0.36	0.31	0.27
500	5.54	3.44	2.51	1.98	1.63	1.39	1.21	1.07	0.87	0.73	0.63	0.56	0.45	0.37	0.32	0.28
520	5.72	3.56	2.60	2.05	1.69	1.44	1.26	1.11	0.91	0.76	0.66	0.58	0.47	0.39	0.33	0.29
540	5.90	3.68	2.69	2.12	1.75	1.50	1.30	1.15	0.94	0.79	0.68	0.60	0.48	0.40	0.35	0.30
560	6.07	3.80	2.78	2.20	1.82	1.55	1.35	1.19	0.97	0.82	0.71	0.62	0.50	0.42	0.36	0.31
580	6.25	3.92	2.87	2.27	1.88	1.60	1.39	1.24	1.01	0.85	0.73	0.64	0.52	0.43	0.37	0.32
600	6.42	4.04	2.96	2.34	1.94	1.65	1.44	1.28	1.04	0.88	0.76	0.67	0.54	0.45	0.38	0.33
620	6.59	4.15	3.05	2.41	2.00	1.70	1.48	1.32	1.07	0.90	0.78	0.69	0.55	0.46	0.40	0.35
640	6.76	4.27	3.14	2.48	2.06	1.75	1.53	1.36	1.11	0.93	0.81	0.71	0.57	0.48	0.41	0.36
660	6.93	4.38	3.22	2.55	2.12	1.81	1.58	1.40	1.14	0.96	0.83	0.73	0.59	0.49	0.42	0.37
680	7.10	4.50	3.31	2.62	2.17	1.86	1.62	1.44	1.17	0.99	0.85	0.75	0.61	0.51	0.43	0.38
700	7.26	4.61	3.40	2.69	2.23	1.91	1.67	1.48	1.20	1.02	0.88	0.77	0.62	0.52	0.45	0.39
720	7.43	4.72	3.48	2.76	2.29	1.96	1.71	1.52	1.24	1.04	0.90	0.80	0.64	0.54	0.46	0.40
740	7.59	4.84	3.57	2.83	2.35	2.01	1.75	1.56	1.27	1.07	0.93	0.82	0.66	0.55	0.47	0.41
760	7.75	4.95	3.66	2.90	2.41	2.06	1.80	1.60	1.30	1.10	0.95	0.84	0.68	0.56	0.48	0.42
780	7.91	5.06	3.74	2.97	2.47	2.11	1.84	1.64	1.34	1.13	0.98	0.86	0.69	0.58	0.50	0.43
800	8.07	5.17	3.83	3.04	2.53	2.16	1.89	1.68	1.37	1.16	1.00	0.88	0.71	0.59	0.51	0.44
820	8.23	5.28	3.91	3.11	2.59	2.21	1.93	1.72	1.40	1.18	1.02	0.90	0.73	0.61	0.52	0.46
840	8.39	5.39	4.00	3.18	2.64	2.26	1.98	1.76	1.43	1.21	1.05	0.92	0.74	0.62	0.53	0.47
860	8.54	5.50	4.08	3.25	2.70	2.31	2.02	1.80	1.47	1.24	1.07	0.95	0.76	0.64	0.55	0.48
880	8.70	5.61	4.16	3.32	2.76	2.36	2.07	1.83	1.50	1.27	1.10	0.97	0.78	0.65	0.56	0.49
900	8.85	5.71	4.25	3.39	2.82	2.41	2.11	1.87	1.53	1.29	1.12	0.99	0.80	0.67	0.57	0.50
920	9.01	5.82	4.33	3.45	2.87	2.46	2.15	1.91	1.56	1.32	1.14	1.01	0.81	0.68	0.58	0.51
940	9.16	5.93	4.41	3.52	2.93	2.51	2.20	1.95	1.60	1.35	1.17	1.03	0.83	0.70	0.60	0.52
960	9.31	6.03	4.50	3.59	2.99	2.56	2.24	1.99	1.63	1.38	1.19	1.05	0.85	0.71	0.61	0.53
980	9.46	6.14	4.58	3.66	3.05	2.61	2.28	2.03	1.66	1.41	1.22	1.07	0.87	0.72	0.62	0.54
1000	9.61	6.25	4.66	3.72	3.10	2.66	2.33	2.07	1.69	1.43	1.24	1.09	0.88	0.74	0.63	0.55

Table I-5 Angle of Observation from Flare Origin to Apex; Minimum and Maximum Distance (nm)

Observed angle	Minimum Distance to flare	Maximum Distance to flare
0.50	4.71	22.63
1.00	2.36	11.31
1.50	1.57	7.54
2.00	1.18	5.66
2.50	0.94	4.52
3.00	0.79	3.77
3.50	0.67	3.23
4.00	0.59	2.82
5.00	0.47	2.26
6.00	0.39	1.88
7.00	0.34	1.61
8.00	0.29	1.41
10.00	0.23	1.12
12.00	0.19	0.93
14.00	0.17	0.79
16.00	0.14	0.69
20.00	0.11	0.54
24.00	0.09	0.44
28.00	0.08	0.37
32.00	0.07	0.32

Table I-6 Maximum Distance for Meteor Flares, Angle of Observation Above the Horizon (nm)

Reporting Source Height ft	0.50 ^{0}	1.00 ^{0}	1.50 ^{0}	2.00 ^{0}	2.50 ^{0}	3.00 ^{0}	3.50 ^{0}	4.00 ^{0}	5.00 ^{0}	6.00 ^{0}	8.00 ^{0}	10.00 ^{0}	12.00 ^{0}	14.00 ^{0}	16.00 ^{0}
10	8.91	4.70	3.14	2.35	1.88	1.56	1.33	1.17	0.93	0.77	0.58	0.46	0.38	0.32	0.28
20	9.11	4.71	3.13	2.33	1.86	1.54	1.32	1.15	0.92	0.76	0.57	0.45	0.37	0.32	0.28
30	9.23	4.70	3.10	2.30	1.83	1.52	1.30	1.13	0.90	0.75	0.56	0.44	0.37	0.31	0.27
40	9.31	4.68	3.07	2.27	1.80	1.49	1.27	1.11	0.88	0.73	0.55	0.43	0.36	0.31	0.27
50	9.36	4.64	3.03	2.24	1.77	1.47	1.25	1.09	0.87	0.72	0.53	0.43	0.35	0.30	0.26
60	9.40	4.60	2.99	2.20	1.74	1.44	1.23	1.07	0.85	0.70	0.52	0.42	0.34	0.29	0.25
70	9.42	4.55	2.94	2.17	1.71	1.41	1.20	1.05	0.83	0.69	0.51	0.41	0.34	0.29	0.25
80	9.42	4.50	2.90	2.13	1.68	1.39	1.18	1.03	0.81	0.67	0.50	0.40	0.33	0.28	0.24
90	9.41	4.45	2.85	2.09	1.65	1.36	1.15	1.00	0.80	0.66	0.49	0.39	0.32	0.27	0.24
100	9.40	4.39	2.80	2.05	1.61	1.33	1.13	0.98	0.78	0.64	0.48	0.38	0.31	0.27	0.23
110	9.37	4.32	2.75	2.01	1.58	1.30	1.10	0.96	0.76	0.63	0.47	0.37	0.31	0.26	0.23
120	9.33	4.26	2.70	1.96	1.54	1.27	1.08	0.94	0.74	0.61	0.46	0.36	0.30	0.25	0.22
130	9.29	4.19	2.64	1.92	1.51	1.24	1.05	0.91	0.72	0.60	0.44	0.35	0.29	0.25	0.22
140	9.23	4.11	2.59	1.88	1.47	1.21	1.03	0.89	0.71	0.58	0.43	0.34	0.28	0.24	0.21
150	9.17	4.04	2.53	1.83	1.44	1.18	1.00	0.87	0.69	0.57	0.42	0.33	0.28	0.23	0.20
160	9.11	3.96	2.47	1.79	1.40	1.15	0.97	0.85	0.67	0.55	0.41	0.32	0.27	0.23	0.20
170	9.03	3.88	2.41	1.74	1.36	1.12	0.95	0.82	0.65	0.54	0.40	0.32	0.26	0.22	0.19
180	8.95	3.80	2.35	1.70	1.33	1.09	0.92	0.80	0.63	0.52	0.39	0.31	0.25	0.21	0.19
190	8.86	3.71	2.29	1.65	1.29	1.06	0.89	0.78	0.61	0.51	0.37	0.30	0.24	0.21	0.18
200	8.77	3.63	2.23	1.60	1.25	1.02	0.87	0.75	0.59	0.49	0.36	0.29	0.24	0.20	0.17
220	8.55	3.44	2.10	1.51	1.17	0.96	0.81	0.70	0.56	0.46	0.34	0.27	0.22	0.19	0.16
240	8.31	3.26	1.97	1.41	1.10	0.90	0.76	0.66	0.52	0.43	0.32	0.25	0.21	0.18	0.15
260	8.04	3.06	1.84	1.31	1.02	0.83	0.70	0.61	0.48	0.39	0.29	0.23	0.19	0.16	0.14
280	7.74	2.85	1.70	1.21	0.94	0.76	0.65	0.56	0.44	0.36	0.27	0.21	0.17	0.15	0.13
300	7.40	2.64	1.56	1.11	0.86	0.70	0.59	0.51	0.40	0.33	0.24	0.19	0.16	0.13	0.12
320	7.02	2.41	1.42	1.00	0.77	0.63	0.53	0.46	0.36	0.30	0.22	0.17	0.14	0.12	0.11
340	6.60	2.18	1.27	0.90	0.69	0.56	0.47	0.41	0.32	0.26	0.20	0.15	0.13	0.11	0.09
360	6.14	1.94	1.12	0.79	0.61	0.49	0.42	0.36	0.28	0.23	0.17	0.14	0.11	0.09	0.08
380	5.61	1.69	0.97	0.68	0.52	0.43	0.36	0.31	0.24	0.20	0.15	0.12	0.10	0.08	0.07
400	5.03	1.43	0.82	0.57	0.44	0.36	0.30	0.26	0.20	0.17	0.12	0.10	0.08	0.07	0.06
420	4.35	1.17	0.66	0.46	0.35	0.29	0.24	0.21	0.16	0.13	0.10	0.08	0.06	0.05	0.05
440	3.58	0.89	0.50	0.35	0.27	0.21	0.18	0.16	0.12	0.10	0.07	0.06	0.05	0.04	0.04
460	2.65	0.60	0.34	0.23	0.18	0.14	0.12	0.10	0.08	0.07	0.05	0.04	0.03	0.03	0.02
480	1.51	0.31	0.17	0.12	0.09	0.07	0.06	0.05	0.04	0.03	0.02	0.02	0.02	0.01	0.01
500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table I-7 Distances for Hand-held Flares (nm)

Reporting Source Height ft	0.50 ^{0}	1.00 ^{0}	1.50 ^{0}	2.00 ^{0}	2.50 ^{0}	3.00 ^{0}	3.50 ^{0}	4.00 ^{0}	5.00 ^{0}	6.00 ^{0}	7.00 ^{0}	8.00 ^{0}	10.00 ^{0}	12.00 ^{0}	14.00 ^{0}	16.00 ^{0}
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.16	0.09	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
30	0.32	0.17	0.12	0.09	0.07	0.06	0.05	0.05	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01
40	0.46	0.25	0.18	0.13	0.11	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.02
50	0.61	0.34	0.23	0.18	0.14	0.12	0.10	0.09	0.07	0.06	0.05	0.05	0.04	0.03	0.03	0.02
60	0.75	0.42	0.29	0.22	0.18	0.15	0.13	0.11	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.03
70	0.88	0.49	0.34	0.26	0.21	0.18	0.15	0.14	0.11	0.09	0.08	0.07	0.06	0.05	0.04	0.03
80	1.01	0.57	0.40	0.31	0.25	0.21	0.18	0.16	0.13	0.11	0.09	0.08	0.06	0.05	0.05	0.04
90	1.14	0.65	0.45	0.35	0.28	0.24	0.21	0.18	0.15	0.12	0.10	0.09	0.07	0.06	0.05	0.05
100	1.27	0.72	0.51	0.39	0.32	0.27	0.23	0.20	0.16	0.14	0.12	0.10	0.08	0.07	0.06	0.05
110	1.40	0.80	0.56	0.43	0.35	0.30	0.26	0.22	0.18	0.15	0.13	0.11	0.09	0.08	0.07	0.06
120	1.52	0.87	0.61	0.47	0.38	0.32	0.28	0.25	0.20	0.17	0.14	0.13	0.10	0.08	0.07	0.06
130	1.64	0.95	0.67	0.51	0.42	0.35	0.31	0.27	0.22	0.18	0.16	0.14	0.11	0.09	0.08	0.07
140	1.76	1.02	0.72	0.56	0.45	0.38	0.33	0.29	0.23	0.20	0.17	0.15	0.12	0.10	0.08	0.07
150	1.88	1.09	0.77	0.60	0.49	0.41	0.35	0.31	0.25	0.21	0.18	0.16	0.13	0.11	0.09	0.08
160	2.00	1.16	0.82	0.64	0.52	0.44	0.38	0.33	0.27	0.23	0.19	0.17	0.14	0.11	0.10	0.08
170	2.11	1.23	0.87	0.68	0.55	0.47	0.40	0.36	0.29	0.24	0.21	0.18	0.15	0.12	0.10	0.09
180	2.23	1.31	0.93	0.72	0.59	0.49	0.43	0.38	0.31	0.26	0.22	0.19	0.15	0.13	0.11	0.10
190	2.34	1.38	0.98	0.76	0.62	0.52	0.45	0.40	0.32	0.27	0.23	0.20	0.16	0.14	0.12	0.10
200	2.45	1.45	1.03	0.80	0.65	0.55	0.48	0.42	0.34	0.29	0.25	0.22	0.17	0.14	0.12	0.11
220	2.67	1.58	1.13	0.88	0.72	0.61	0.53	0.46	0.38	0.31	0.27	0.24	0.19	0.16	0.14	0.12
240	2.89	1.72	1.23	0.96	0.78	0.66	0.57	0.51	0.41	0.34	0.30	0.26	0.21	0.17	0.15	0.13
260	3.10	1.85	1.33	1.03	0.85	0.72	0.62	0.55	0.44	0.37	0.32	0.28	0.23	0.19	0.16	0.14
280	3.31	1.99	1.43	1.11	0.91	0.77	0.67	0.59	0.48	0.40	0.35	0.30	0.24	0.20	0.17	0.15
300	3.51	2.12	1.52	1.19	0.98	0.83	0.72	0.63	0.51	0.43	0.37	0.33	0.26	0.22	0.19	0.16
320	3.72	2.25	1.62	1.27	1.04	0.88	0.77	0.68	0.55	0.46	0.40	0.35	0.28	0.23	0.20	0.17
340	3.92	2.38	1.72	1.34	1.10	0.94	0.81	0.72	0.58	0.49	0.42	0.37	0.30	0.25	0.21	0.19
360	4.11	2.51	1.81	1.42	1.17	0.99	0.86	0.76	0.62	0.52	0.45	0.39	0.32	0.26	0.23	0.20
380	4.31	2.63	1.91	1.49	1.23	1.04	0.91	0.80	0.65	0.55	0.47	0.41	0.33	0.28	0.24	0.21
400	4.50	2.76	2.00	1.57	1.29	1.10	0.95	0.84	0.69	0.58	0.50	0.44	0.35	0.29	0.25	0.22
420	4.69	2.88	2.09	1.64	1.35	1.15	1.00	0.89	0.72	0.61	0.52	0.46	0.37	0.31	0.26	0.23
440	4.88	3.01	2.19	1.72	1.42	1.20	1.05	0.93	0.75	0.63	0.55	0.48	0.39	0.32	0.28	0.24
460	5.06	3.13	2.28	1.79	1.48	1.26	1.09	0.97	0.79	0.66	0.57	0.50	0.40	0.34	0.29	0.25
480	5.24	3.25	2.37	1.87	1.54	1.31	1.14	1.01	0.82	0.69	0.60	0.52	0.42	0.35	0.30	0.26
500	5.43	3.37	2.46	1.94	1.60	1.36	1.19	1.05	0.85	0.72	0.62	0.55	0.44	0.37	0.31	0.27
520	5.60	3.49	2.55	2.01	1.66	1.42	1.23	1.09	0.89	0.75	0.65	0.57	0.46	0.38	0.33	0.28
540	5.78	3.61	2.64	2.08	1.72	1.47	1.28	1.13	0.92	0.78	0.67	0.59	0.47	0.40	0.34	0.30
560	5.96	3.73	2.73	2.16	1.78	1.52	1.32	1.17	0.95	0.80	0.70	0.61	0.49	0.41	0.35	0.31
580	6.13	3.85	2.82	2.23	1.84	1.57	1.37	1.21	0.99	0.83	0.72	0.63	0.51	0.43	0.36	0.32
600	6.31	3.97	2.91	2.30	1.90	1.62	1.42	1.25	1.02	0.86	0.74	0.65	0.53	0.44	0.38	0.33
620	6.48	4.08	3.00	2.37	1.96	1.68	1.46	1.29	1.05	0.89	0.77	0.68	0.54	0.45	0.39	0.34
640	6.65	4.20	3.09	2.44	2.02	1.73	1.51	1.34	1.09	0.92	0.79	0.70	0.56	0.47	0.40	0.35
660	6.82	4.31	3.17	2.51	2.08	1.78	1.55	1.38	1.12	0.95	0.82	0.72	0.58	0.48	0.41	0.36
680	6.98	4.43	3.26	2.59	2.14	1.83	1.60	1.42	1.15	0.97	0.84	0.74	0.60	0.50	0.43	0.37
700	7.15	4.54	3.35	2.66	2.20	1.88	1.64	1.46	1.19	1.00	0.87	0.76	0.61	0.51	0.44	0.38
720	7.32	4.66	3.44	2.73	2.26	1.93	1.69	1.50	1.22	1.03	0.89	0.78	0.63	0.53	0.45	0.39
740	7.48	4.77	3.52	2.80	2.32	1.98	1.73	1.54	1.25	1.06	0.92	0.81	0.65	0.54	0.46	0.41
760	7.64	4.88	3.61	2.87	2.38	2.03	1.78	1.58	1.29	1.09	0.94	0.83	0.67	0.56	0.48	0.42
780	7.80	4.99	3.69	2.94	2.44	2.08	1.82	1.62	1.32	1.11	0.96	0.85	0.68	0.57	0.49	0.43
800	7.96	5.10	3.78	3.00	2.50	2.13	1.86	1.66	1.35	1.14	0.99	0.87	0.70	0.59	0.50	0.44
820	8.12	5.21	3.86	3.07	2.55	2.18	1.91	1.70	1.38	1.17	1.01	0.89	0.72	0.60	0.51	0.45
840	8.28	5.32	3.95	3.14	2.61	2.24	1.95	1.73	1.42	1.20	1.04	0.91	0.74	0.62	0.53	0.46
860	8.44	5.43	4.03	3.21	2.67	2.29	2.00	1.77	1.45	1.23	1.06	0.93	0.75	0.63	0.54	0.47
880	8.59	5.54	4.12	3.28	2.73	2.34	2.04	1.81	1.48	1.25	1.08	0.96	0.77	0.64	0.55	0.48
900	8.75	5.65	4.20	3.35	2.79	2.39	2.09	1.85	1.51	1.28	1.11	0.98	0.79	0.66	0.56	0.49
920	8.90	5.76	4.28	3.42	2.84	2.43	2.13	1.89	1.55	1.31	1.13	1.00	0.81	0.67	0.58	0.50
940	9.05	5.86	4.36	3.48	2.90	2.48	2.17	1.93	1.58	1.34	1.16	1.02	0.82	0.69	0.59	0.52
960	9.21	5.97	4.45	3.55	2.96	2.53	2.22	1.97	1.61	1.36	1.18	1.04	0.84	0.70	0.60	0.53
980	9.36	6.08	4.53	3.62	3.01	2.58	2.26	2.01	1.64	1.39	1.20	1.06	0.86	0.72	0.61	0.54
1000	9.51	6.12	4.61	3.69	3.07	2.63	2.30	2.05	1.68	1.42	1.23	1.08	0.87	0.73	0.63	0.55

Appendix J
Emergency Position Indicating Radio Beacon (EPIRB) Registration Form

J.1 Beacon Registration Options

EPIRB/ELT/PLB owners may register their beacons using the following registration form. Beacon owners can also update their existing registration information including ownership information, emergency contacts and vessel information with the same form. Please note that online registration is now available from the NOAA website at www.beaconregistration.noaa.gov as an alternative method.

J.1.1 When speaking with beacon owners after a SAR case, SAR planners should inform beacon owners of the online registration web site as a means of keeping beacon information up to date.

Save Time! Register your beacon online at: www.beaconregistration.noaa.gov

Official 406 MHz EPIRB Registration Form

Mail or Fax to:
SARSAT Beacon Registration
NOAA
NSOF, E/SPO53
1315 East West Highway
Silver Spring, MD 20910
Fax No. 301-817-4565

EPIRB Information

Beacon ID (Unique Identification Number) ☐☐☐☐☐ ☐☐☐☐☐ ☐☐☐☐☐

(15-digit hexadecimal ID provided by the beacon manufacturer)

For manufacturer's use only.

Checksum ☐☐☐☐☐

☐ Category I (Automatic Deployment)
☐ Category II (Manual Deployment)

EPIRB Manufacturer ____________

Model No. ____________

Purpose of EPIRB Registration

☐ New Registration ☐ Change of Registration Information ☐ Replacement of Decal Only
☐ Renewal of Registration ☐ Replacement for a previously registered EPIRB
☐ Change of Ownership Please enter the old unique ID number ☐☐☐☐☐ ☐☐☐☐☐ ☐☐☐☐☐

Owner/Operator Information

Name ____________ (Last, First, Middle Initial)

Mailing Address ____________

____

City ____________ State/Province ____________

ZIP (Postal) Code ____________ Country ____________

E-mail ____________

Telephone

( ) ____________ ☐ Home ☐ Work ☐ Cellular ☐ Fax ☐ Other
Area Code

( ) ____________ ☐ Home ☐ Work ☐ Cellular ☐ Fax ☐ Other
Area Code

( ) ____________ ☐ Home ☐ Work ☐ Cellular ☐ Fax ☐ Other
Area Code

( ) ____________ ☐ Home ☐ Work ☐ Cellular ☐ Fax ☐ Other
Area Code

Vessel Information

Usage: ☐ Commercial ☐ Non-commercial ☐ Government Military ☐ Government Non-military

Type

Sail: Number of Masts ____________

Power: ☐ Fishing ☐ Tug ☐ Cargo ☐ Tanker ☐ Pleasure Craft ☐ Other ____________

Non-power: ☐ Life Boat ☐ Life Raft ☐ Other ____________

Vessel Name ____________

Vessel Color ____________

Survival Craft(s) on Vessel: Life Boat ____ (No. of) Life Raft ____ (No. of)

Is your EPIRB equipped with a Simplified Voyage Data Recorder (SVDR)? ☐ Yes ☐ No

Radio Equipment (Check all that apply)

☐ VHF ☐ MF ☐ HF ☐ SSB ☐ Other ____________

Vessel Telephone Numbers

Radio Call Sign ____________

Cellular ____________ MMSI Number ____________

INMARSAT ____________

Federal / State Registration Number ____________

Length Overall (ft) ____________ **Capacity** ____________ (Crew and Passengers)

Homeport ____________ (Marina/Dock)

____________ (City) ____________ (State)

Additional Data ____________

____

Emergency Contact Information *(Please indicate someone other than the owner)*

Name of **Primary** 24-Hour Emergency Contact:

____

Telephone

( ) ____________ ☐ Home ☐ Work ☐ Cellular ☐ Fax ☐ Other
Area Code

( ) ____________ ☐ Home ☐ Work ☐ Cellular ☐ Fax ☐ Other
Area Code

( ) ____________ ☐ Home ☐ Work ☐ Cellular ☐ Fax ☐ Other
Area Code

( ) ____________ ☐ Home ☐ Work ☐ Cellular ☐ Fax ☐ Other
Area Code

Name of **Alternate** 24-Hour Emergency Contact:

____

Telephone

( ) ____________ ☐ Home ☐ Work ☐ Cellular ☐ Fax ☐ Other
Area Code

( ) ____________ ☐ Home ☐ Work ☐ Cellular ☐ Fax ☐ Other
Area Code

( ) ____________ ☐ Home ☐ Work ☐ Cellular ☐ Fax ☐ Other
Area Code

( ) ____________ ☐ Home ☐ Work ☐ Cellular ☐ Fax ☐ Other
Area Code

Signature ____________ Date ____________

If you do not receive a hardcopy confirmation of your registration from NOAA within 2 weeks, please email beacon.registration@noaa.gov or call 1.888.212.SAVE (7283).

OMB Auth. (0648-0295) Expires: 29FEB2024
Rev. 12/2017

For information on the U.S. Search & Rescue Satellite-Aided Tracking (SARSAT) system, please visit www.sarsat.noaa.gov

Important Notice - Please Read Before Completing Your Registration

Registration is an important facet for all Cospas-Sarsat 406 MHz emergency beacons. Not only is it required by Federal Regulations but the information you furnish is used by Search and Rescue (SAR) agencies in the event of beacon activation. Registration information is an important tool to assist the United States Coast Guard, United States Air Force, and other SAR agencies in locating and quickly responding to you, your vessel, or your aircraft. Failure to register your beacon or update your registration information may delay a rescue response. Accurate, up-to-date registration information is used to conserve resources by helping to eliminate false alert deployments, as an inadvertent activation can be resolved with a phone call when the beacon is properly registered.

There is no charge for beacon registration. This is a service provided by the U.S. National Oceanic and Atmospheric Administration (NOAA).

All online registrations are entered into the National 406 MHz Beacon Registration Database on the same day of entry. Registration forms received via postal mail, email, or fax are entered into the database within 2 business days of receipt. A confirmation letter with your completed registration information is sent to you immediately via email. In addition, a hardcopy of the confirmation letter will be sent to you via postal mail and should arrive within 2 weeks (if you have not provided an email address, you will only receive this hardcopy). If your beacon is an EPIRB, PLB, or SSAS, a NOAA Registration Decal will be included on your hardcopy confirmation letter; please affix the decal to your beacon in such a way that it is clearly visible. (ELT owners do not receive decals.) Upon receipt of your registration confirmation, please review all information. If changes or updates are necessary, you can make them online or by sending them to us via email, fax, or postal mail. **If you have NOT RECEIVED your registration confirmation within 2 weeks, please email or call us (contact information below).**

Failure to register, re-register (as required every 2 years), or to notify NOAA of any changes to the status of your 406 MHz beacon could result in penalties and/or fines being issued under Federal Law. ***More importantly, failure to maintain accurate and complete information could result in a delayed response by rescue forces.***

The owner or user of a beacon is required to notify NOAA immediately of any changes to the registration information at any time. By submitting this registration the owner, operator, or legally authorized agent declares under penalty of law that all information in the registration information is true, accurate, and complete. Providing information that is knowingly false or inaccurate may be punishable under Federal Statutes. Solicitation of this information is authorized by Title 47, Part 87 of the U.S. Code of Federal Regulations (CFR) and the U.S. Office of Management & Budget (OMB) Control Number: 0648-0295. Additional registration forms can be found on the NOAA-SARSAT Beacon Registration website.

Please note that NOAA will complement or update your registration information if your registration is outdated and credible information is provided from other sources. NOAA will also seek information from other databases to update and/or complement the existing information for an expired beacon registration. Although the information provided will become a matter of public record, there is no intent to circulate beyond its intended purpose--to assist SAR agencies in carrying out their mission. False alerts remain a chief concern for SAR agencies. Please carefully refer to the beacon's user manual for instructions on properly operating, installing, testing, performing required maintenance, and/or stowage of your beacon. These are important factors in reducing the number of false alerts. ***Please use the utmost care at all times!***

The public reporting burden for the collection of this information is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, and completing and reviewing the collection of information. Comments regarding this burden or any other aspect of this collection of information, including suggestions for reducing this burden should be sent to:

SARSAT Beacon Registration
NOAA/SARSAT
NSOF, E/SPO53
1315 East West Highway
Silver Spring, MD 20910

Appendix K
Bibliography

K.1 Annotated Bibliography for Rescue Coordination Centers

The Annotated Bibliography for Rescue Coordination Centers was produced by the Improvements to Search and Rescue Capabilities (ISARC) project under project element 1012.6. Additional reference materials have since been added.

Senior Rescue Coordination Center (RCC) watchstanders expressed a need for a list or bibliography of references that each Command Center should have. Innumerable sources of oceanographic data exist including historical data and near real-time data as well as estimates from numerical models.

K.1.1 The Annotated Bibliography presents the results of a search of available resources that could aid the RCC watchstanders in their Search and Rescue operations.

K.1.1.1 Includes the following types of data:

(a) Sea surface temperature;

(b) Wind climatology and resulting wind current;

(c) Ocean wave prediction;

(d) Sea state climatology;

(e) Sea current (low frequency);

(f) Tides and tidal currents;

(g) General oceanography texts; and

(h) Other types of relevant information.

K.1.2 The references described herein consist of atlases, charts, computer software, tabulated data as well as texts and reports. The references selected present the data in formats that are best suited to providing answers understandable and suitable for non-oceanographers. The table below shows the different sources of information and what types of information each source contains. A list specific to the First District is included **at the end. A list specific to each district will be published as completed.**

K.1.3 The Command SAR Library requirements are contained in Appendix A.

Source	**Sea Surface Temperature**	**Wind Climatology and Wind Currents**	**Ocean Wave Prediction**	**Sea State**	**Sea Current**	**Tides and Tidal Current**	**General Oceanography**	**Other Types of Information**
Boating Almanac							T/D	T
Bowditch								T
Chapman Piloting								T
CG Addendum								T
CG Rescue & Survival Systems Manual								T
Coast Pilot	T/D							
Evaluation of Wind Current		T						
Glossary of Oceanography							T	T
Major Currents in the Atlantic					T			
Marine Climatic Atlas CD-ROM	C/D	C/D		C/D				
NDBC Observations		C/D		C/D				
NOAA Ocean Products Center	A							
National SAR Supplement		T				T		T
Pierson, Newman and James			T					
Satellite Imagery	A/D							
Summary Synoptic Met. Obs.	D	D		D				
Surface Currents					A			
Tidal Current Charts						A		
Tidal Current Diagrams						A		
Tidal Current Tables						D		
Tide. 1						C/D		
Tide Tables						D		
Tides ABC						C/D		
Navy Hindcast Ocean Wave Model		A	A	A/D				
Navy Marine Climatic Atlas	A/D	A/D		A/D				
Wave Forecasts & Navigation								T
Waterway Guide						T		T

A – Atlases, charts and graphical data
C – Computer software
D – Digital and tabular data
T – Texts and reports

Appendix L
SAR Legal Authorities

L.1 This appendix provides the most commonly queried laws regarding search and rescue.

L.1.1 Statutory Authority in U.S. Code.

The statutory authority for the U. S. Coast Guard to conduct SAR missions is contained in Title 14, Sections 102, 521, and 701 of the U.S. Code. This code is paraphrased in the Preface of this Addendum; below is the code in its entirety.

L.1.1.1 14 U.S.C. § 102 / Primary Duties. The Coast Guard shall:

(a) Enforce or assist in the enforcement of all applicable Federal laws on, under, and over the high seas and waters subject to the jurisdiction of the United States;

(b) Engage in maritime air surveillance or interdiction to enforce or assist in the enforcement of the laws of the United States;

(c) Administer laws and promulgate and enforce regulations for the promotion of safety of life and property on and under the high seas and waters subject to the jurisdiction of the United States, covering all matters not specifically delegated by law to some other executive department;

(d) Develop, establish, maintain, and operate, with due regard to the requirements of national defense, aids to maritime navigation, icebreaking facilities, and rescue facilities for the promotion of safety on, under, and over the high seas and waters subject to the jurisdiction of the United States;

(e) Pursuant to international agreements, develop, establish, maintain, and operate icebreaking facilities on, under, and over waters other than the high seas and waters subject to the jurisdiction of the United States;

(f) Engage in oceanographic research of the high seas and in waters subject to the jurisdiction of the United States; and

(g) Maintain a state of readiness to assist in the defense of the United States, including when functioning as a specialized service in the Navy pursuant to section 103.

L.1.1.2 14 U.S.C. § 521 / Saving life and Property

(a) In order to render aid to distressed persons, vessels, and aircraft on and under the high seas and on and under the waters over which the United States has jurisdiction and in order to render aid to persons and property imperiled by flood, the Coast Guard may:

(1) Perform any and all acts necessary to rescue and aid persons and protect and save property;

(2) Take charge of and protect all property saved from marine or aircraft disasters, or floods, at which the Coast Guard is present, until such property is claimed by persons legally authorized to receive it or until otherwise disposed of in accordance with law or applicable regulations and care for bodies of those who

may have perished in such catastrophes;

(3) Furnish clothing, food, lodging, medicines, and other necessary supplies and services to persons succored by the Coast Guard; and

(4) Destroy or tow into port sunken or floating dangers to navigation.

(b)

(1) Subject to paragraph (2), the Coast Guard may render aid to individuals and protect and save property at any time and at any place at which Coast Guard facilities and personnel are available and can be effectively utilized.

(2) The Commandant shall make full use of all available and qualified resources, including the Coast Guard Auxiliary and individuals licensed by the Secretary pursuant to section 8904(b) of title 46, United States Code, in rendering aid under this subsection in nonemergency cases.

(c) An individual who knowingly and willfully communicates a false distress message to the Coast Guard or causes the Coast Guard to attempt to save lives and property when no help is needed is:

(1) guilty of a class D felony;

(2) subject to a civil penalty of not more than $10,000; and

(3) liable for all costs the Coast Guard incurs as a result of the individual's action.

(d) The Secretary shall establish a helicopter rescue swimming program for the purpose of training selected Coast Guard personnel in rescue swimming skills, which may include rescue diver training.

(e) An individual who knowingly and willfully operates a device with the intention of interfering with the broadcast or reception of a radio, microwave, or other signal (including a signal from a global positioning system) transmitted, retransmitted, or augmented by the Coast Guard for the purpose of maritime safety is:

(1) guilty of a class E felony; and

(2) subject to a civil penalty of not more than $1,000 per day for each violation.

L.1.1.3 14 U.S.C. § 701 / Cooperation with other States, Agencies, Territories, and Political Subdivisions

(a) The Coast Guard may, when so requested by proper authority, utilize its personnel and facilities (including members of the Auxiliary and facilities governed under chapter 39) to assist any Federal agency, State, Territory, possession, or political subdivision thereof, or the District of Columbia, to perform any activity for which such personnel and facilities are especially qualified. The Commandant may prescribe conditions, including reimbursement, under which personnel and facilities may be provided under this subsection.

(b) The Coast Guard, with the consent of the head of the agency concerned, may avail itself of such officers and employees, advice, information, and facilities of any Federal agency, State, Territory, possession, or political subdivision thereof, or the

District of Columbia as may be helpful in the performance of its duties. In connection with the utilization of personal services of employees of state or local governments, the Coast Guard may make payments for necessary traveling and per diem expenses as prescribed for Federal employees by the standardized Government travel regulations.

L.1.2 The following is a table that lists SAR legal authorities.

Table L-1 Legal Authorities – Search and Rescue (SAR)

Code Section	*Summary of Provisions*	*Related CFRs*
14 U.S.C. § 102	**SAR as a Primary Duty.** Specifies duty of the Coast Guard to develop, establish, maintain, and operate rescue facilities for the promotion of safety on, under, and over the high seas and waters subject to the jurisdiction of the U.S.	33 CFR § 3.01-1
14 U.S.C. § 521	**Authority to Engage in SAR.** Authorizes the Coast Guard to perform any and all acts necessary to rescue and aid individuals, and to protect and save property.	
14 U.S.C. § 521(c)	**False Distress Calls.** Provides criminal penalties for false distress calls.	
14 U.S.C. § 521(d)	**Rescue Swimmer Training.** Authorizes the Secretary to establish a helicopter rescue swimming training program which may include rescue diver training.	
14 U.S.C. § 504(a)	**Authority to Maintain SAR Facilities.** Authorizes the Coast Guard to maintain air and water patrols, to operate shore facilities, to move vessels from one place to another, to acquire and maintain boats, to accept voluntary services in times of emergency in order to save lives or protect property, and to maintain radio transmitting and receiving stations.	
14 U.S.C. § 708	**Helicopters & Medical Emergencies.** Authorizes the Coast Guard to provide medical emergency helicopter transportation services.	
14 U.S.C. § 2744	**Lifesaving Medals.** Authorizes the Secretary to award lifesaving medals.	
14 U.S.C. § 942	**Sale of Fuel & Supplies.** Authorizes the Coast Guard to sell fuel and supplies to vessels.	33 CFR § 1
14 U.S.C. § 909	**Ready Boats.** Requires each Coast Guard boat station to maintain at least 1 vessel that is fully capable of performing offshore rescue operations within the station's area of responsibility, taking into consideration prevailing weather, marine conditions, and sand bars.	
31 U.S.C. § 1342	**Voluntary Assistance in Emergencies.** Authorizes acceptance of voluntary services in emergencies involving safety of human life or the protection of property.	
42 U.S.C. § 5170a-5170b	**Disaster Assistance.** On direction of the President in any major disaster, Federal agencies are authorized to provide general assistance and assistance essential to meet immediate threats to life and property.	
46 U.S.C. § 2304	**Duty to Render Assistance.** Requires a master or individual in charge of a vessel to render assistance to any	

Code Section	***Summary of Provisions***	***Related CFRs***
	individual found at sea in danger of being lost, so far as the master or individual in charge can do so without serious danger to the master's or individual's vessel or individuals on board.	
46 U.S.C. § 2306	**Reports of Lost & Imperiled Vessels.** Requires reporting of lost or imperiled vessels by an owner, charterer, managing operator, or agent of a vessel of the United States.	
46 U.S.C. § 80107	**Salvage Rights.** Lists authorities relating to wrecks, and salvage rights.	
47 U.S.C. § 363	**Global Maritime Distress & Safety System (GMDSS).** Authorizes the Coast Guard to make a determination that U.S. documented vessels have the equipment required to implement the Global Maritime Distress and Safety System (GMDSS) installed and operating in good working condition. (This provision is tied into FCC regulations connected with GMDSS.)	47 CFR § 80 (Subpart W)
P.L. 104-58(Sec. 401)	**Access to Radar Imagery & Transponder Information.** Authorizes the Commandant to allow United States nonprofit maritime organizations access to Coast Guard radar imagery and transponder information to identify and deploy towing vessels for the purpose of facilitating emergency response (Not codified). This requires Commandant (CG-LMI) concurrence.	

Appendix M
SAR Case Studies

Section M.1
Coast Guard SAR Case Study Policy

M.1.1 Overview

(a) SAR case studies are used for the continued improvement of the Coast Guard SAR system. They are not administrative investigations and are non-punitive in nature. SAR case studies are also valuable teaching tools that benefit current and future SAR professionals. In order to ensure an appropriate level of SAR case data is collected for analysis and review, two distinct formats are available. Each format is tailored based on the severity of the case, the number of SAR elements being assessed, and the amount of time required to complete a thorough review of the issue(s) identified.

(b) Section 2 of this appendix provides a job aid to assist personnel assigned to conduct a SAR case study. It highlights relevant policy and provides a SAR case study reviewer with a list of considerations and/or questions to help support a robust review and analysis of a specific SAR case. This job aid is simply a guide and does not capture every possible question that could be asked within a SAR case study.

M.1.2 Application

(a) **Format-1 (SAR Case Study**): SAR case studies triggered by Paragraph 3.9.4 of this instruction, require a more thorough analysis and review. Therefore, a SAR case study should be written as a standard Coast Guard memorandum. SAR case studies written under Format-1 should include, at a minimum, the following sections:

(1) Consolidated Case Narrative: This section provides a brief high-level summary of the case, the reason(s) for the case study, and any topics of interest or emphasis. In order to provide sufficient context for the reader, this section should broadly describe how the SAR system was activated, the search object in distress, overall effort expended by assigned SRUs, and the disposition of the case throughout the case timeline (case closed, suspended, reopened, etc.).

(2) Findings of Fact: This section describes the facts of the case in a neutral fashion that is not prejudicial to the reviewer's opinions, conclusions, or recommendations. It should contain enough facts to appropriately understand the underlying issues or concerns with the case. Elements include but are not limited to:

a. Overall composition and posture of the administrative and operational SAR chain of command. Relevant positions within an RCC/CC include Active Search Suspension (ACTSUS), SAR Mission Coordinator (SMC), Command Duty Officer (CDO), Operations Unit Controller (OU), On-Scene Coordinator (OSC), SAR Rescue Unit (SRU), and other support elements (i.e. current operational tempo, experience/training of member's assigned SAR duties, staffing constraints, etc.).

b. Operational risk management discussions that identify risk and associated mitigation strategies.

c. How the SAR system was activated to include the relevant facts that triggered the transition between emergency phases.

d. Assumptions made during the SAR case (i.e. distress position and times, search object, and scenario(s) utilized in SAROPS).

e. Environmental data used (water current, wind, and visibility, etc.).

f. Information on estimated function and/or survival time acquired using the Probability of Survival Decision Aid (PSDA).

g. Status or performance of equipment used or available in support of the SAR case (i.e. detection aids, communications equipment, SAROPS).

h. SAROPS input and output data (i.e. defined search area(s), SRU(s) assigned, search patterns used, planned and actual sweep widths and track spacing, sensor equipment utilized, computed datum points, and probability of success).

i. Effort expended by assigned SRUs (i.e. type of craft, total sorties, hours expended, hours searched, square nautical miles searched).

j. A comparison between a located search object and the SAROPS generated probability map in relation to completed or assigned search patterns.

k. Debriefing information from survivors (i.e. drift reconstruction, observed environmental conditions, and any sightings of search craft).

(3) Opinions: This section provides clear and concise statements that can be deduced from the facts of the case. In developing opinions, a SAR case study reviewer must rely on the facts and may rely on any reasonable inferences that may be drawn from those facts. In stating opinions, a SAR case study reviewer should refer to the findings of fact to demonstrate how the opinion was formulated. Pure speculation or unsupported opinions should be omitted from this section.

(4) Recommendations: When conducting a SAR case study, the overarching goal is to improve performance at all levels of the SAR system. SAR system improvements stem from SAR case study recommendations that take the form of proposed courses of action that are consistent with the findings of fact and opinions of a particular case. In developing recommendations, consider actions that could or should have been taken, as well as those which, although not typically expected, provided a benefit to the SAR system. A case study recommendation should provide important information to decision makers, share lessons learned, and alert Coast Guard officials to any need for, or desirability of, particular management decisions or actions. Recommendations within a SAR case study should be straightforward and forward-focused in order to foster continuous SAR system improvement.

(5) Enclosures: Include all pertinent supporting documentation, including copies of computer SAR inputs and outputs.

(b) **Format-2 (SAR Case Review):** Although the circumstances of a SAR case may not trigger a SAR case study per Paragraph 3.9.4, Area/District SCs and Sector Commanders may still find value in reviewing actions taken in support of SAR. In these instances, Area/District SCs and Sector Commanders may choose to use the SAR Case Review form in Section 3 of this appendix to highlight specific areas of interest, promote unique actions that positively impacted the outcome of a SAR case, or analyze whether a full SAR case study is warranted. This format may also be initiated by other members of the SAR system and should be routed through the administrative SAR chain of command for endorsement. This abbreviated SAR case review format is designed to be less cumbersome and promotes an expedited method for informing the SAR system. The following “Parts” make up a SAR Case Review:

(1) Part-1 (Case Details): This section is designed to capture basic SAR case details and any associated SAR case review recommendations. Once completed, the form should be routed electronically, via Coast Guard memorandum, using the SAR administrative chain of command.

(2) Part-2 (Next Level Review): This section is divided into three subparts and is intended to allow Area/District SCs and Sector Commander, or their designees, the ability to review recommendations made by a subordinate unit. For example, if Part-1 was completed by a Station, Part-2a, 2b, and 2c would be reviewed and endorsed by the appropriate Sector, District, and Area respectively. If a District initiated Part-1, then only one endorsement (Part-2a) from the appropriate Area would be needed. All other sections would remain blank. Once all endorsements have been attained, the form should be forwarded to Commandant (CG-SAR).

(3) Part-3 (HQ Final Action Authority Review): This section provides an opportunity for respective Final Action Authorities to adjudicate recommendations and lessons learned. Once a final response has been crafted by the Final Action Authority, the form will be posted on Commandant (CG-SAR)'s page on CG-Portal to support the continued improvement of the SAR system.

M.1.3 Policy

(a) ***Regardless of format used, timelines and routing procedures described in Paragraph 3.9.4 of this instruction shall be followed.***

(b) ***SAR case studies and reviews shall be sent to Commandant (CG-SAR) via e-mail to***

(c) ***HQS-SMB- CG-SAR@uscg.mil or via standard shipping modes.***

(d) ***Format-1 (SAR Case Study) shall be used for SAR cases that involve triggers described in Paragraph 3.9.4 of this instruction. For all other SAR case reviews initiated by the Area/ District SC and Sector Commander, Format-2 (SAR Case Review) in Section 3 of this appendix shall be used.***

(e) ***Format-1 (SAR Case Study) shall include, at a minimum, a case narrative, findings of fact, opinions, recommendations, and relevant enclosures.***

(f) ***Any decision to waive a FOIA exemption and release an underlying SAR case study to the public shall be approved by Commandant (CG-SAR) with consultation from the respective servicing legal office pursuant to reference (k).***

Section M.2
Coast Guard SAR Case Study Job Aid

<table>
<tr><td rowspan="2">Purpose</td><td colspan="4">This document highlights SAR case study policy and provides a SAR case study reviewer with a list of considerations and/or questions that can be used to support a robust review and analysis of a SAR case.</td></tr>
<tr><td colspan="2">Page 1: SAR Case Study Overview</td><td>Page 2: SAR Case Study Format</td><td>Pages 3-6: Case Study Questionnaire</td></tr>
<tr><td>Overview</td><td colspan="4">SAR case studies are not Administrative Investigations and are non-punitive in nature. They are intended to be used primarily as a means of contributing towards the continued improvement of the SAR system. SAR case studies are also valuable teaching tools that benefit current and future SAR professionals. In order to ensure an appropriate level of SAR case data is collected for analysis, two distinct SAR case study formats are provided. Each is tailored based on the severity of the case, the number of SAR elements being assessed, and the amount of time required to complete a thorough review of the issue(s) identified.</td></tr>
<tr><td>Policy</td><td colspan="4">The following paragraph shall be quoted in its entirety at the beginning of each case study:
SAR Case Studies are not Administrative Investigations. They are intended to be used primarily as a means of contributing to the continuous improvement of the SAR system. SAR Case Studies are also valuable teaching tools that benefit current and future SAR professionals. In order to maximize utility and value, Case Studies should consider actions that could or should have been taken, as well as those actions which, although not typically expected, may offer a benefit to the SAR system.</td></tr>
<tr><td>Training and experience requirement</td><td colspan="4">Those assigned to conduct a SAR case study shall possess the Search and Rescue Officer Specialty Code (CG- OAR11). Coast Guard civilian employees and enlisted members with equivalent SAR training and experience (e.g., OU/CDO competency with two years of experience) may also be assigned. Those assigned to lead a SAR case study shall be billeted outside of the RCC/CC and not associated with the SAR watch team that prosecuted the case.</td></tr>
<tr><td rowspan="4">Reason for SAR Case Study</td><td></td><td colspan="3">A search object (person, vessel, aircraft, or other craft) was located after a search was suspended.</td></tr>
<tr><td></td><td colspan="3">A search object (person, vessel, aircraft or other craft) was located outside of the search area.</td></tr>
<tr><td></td><td colspan="3">As directed by the Office of Search and Rescue (COMDT (CG-SAR)).</td></tr>
<tr><td></td><td colspan="3">Other:</td></tr>
<tr><td rowspan="13">Tasking upon conclusion of the SAR case</td><td rowspan="2">Sector CDR</td><td>Within 5 days</td><td colspan="2">Assign a member to lead a SAR case study.</td></tr>
<tr><td>Within 30 days</td><td colspan="2">Complete analysis. Route to District SC through SAR admin chain of command.</td></tr>
<tr><td rowspan="3">District SC</td><td>Within 5 days</td><td colspan="2">Assign a member to lead a SAR case study.</td></tr>
<tr><td>Within 30 days</td><td colspan="2">Complete analysis. Route to Area SC through SAR admin chain of command.</td></tr>
<tr><td>Within 20 days of receiving a SAR case study from a subordinate</td><td colspan="2">Endorse and/or adjudicate any recommendations within your purview as Final Action Authority; route to Area SC.</td></tr>
<tr><td rowspan="3">Area SC</td><td>Within 5 days</td><td colspan="2">Assign a member to lead a SAR case study.</td></tr>
<tr><td>Within 30 days</td><td colspan="2">Complete analysis. Route to CG-SAR through SAR admin chain of command.</td></tr>
<tr><td>Within 20 days of receiving a SAR case</td><td colspan="2">Endorse and/or adjudicate any recommendations within your purview as Final Action Authority; route to CG-SAR.</td></tr>
<tr><td rowspan="4">COMDT (CG-SAR)</td><td colspan="3">Upon receipt of a SAR case study from an Area SC, route the SAR case study to any other appropriate COMDT HQ office(s) with Final Action Authority responsibilities.</td></tr>
<tr><td colspan="3">Shall, if required, facilitate a unified SAR case study response between multiple Coast Guard HQ Final Action Authorities.</td></tr>
<tr><td>Within 45 days of SAR case study receipt</td><td colspan="2">Shall provide a consolidated Final Action Memo that endorses and/or adjudicates recommendations from all HQ Final Action Authorities. The final action report shall be routed to the SAR case study originator through the SAR administrative CoC.</td></tr>
<tr><td colspan="3">Shall establish a repository and archive the final action report and any relevant enclosures to ensure transparency and continued dialogue throughout the Coast Guard SAR System.</td></tr>
</table>

		Shall evaluate and approve any decision to waive a FOIA exemption and release an underlying SAR case study to the public.
Units completing a SAR case study		Units completing a SAR case study shall ensure that the final report and accompanying enclosures are attached to the SAR case file within MISLE.
Case Narrative		Provide a brief high-level summary of the case, the reason(s) for the case study, and any topics of specific interest or emphasis. In order to provide sufficient context for the reader, this section should describe broadly how the SAR system was activated, the search object in distress, overall effort expended by assigned SRUs, and the disposition of the case throughout the case timeline (case closed, suspended, reopened, etc.).
Facts of the Case		Describes the facts of the case in a neutral fashion that is not prejudicial to the opinions, conclusions, or recommendations of later paragraphs but includes all pertinent information needed for the purposes of the case study. Elements include but are not limited to:
	a	Assumptions used in each search effort, including distress positions and times, search object and scenarios utilized in the current search planning program (SPP).
	b	Environmental data used, including water current, wind, and visibility.
	c	Actual distress positions and times, and actual search object type.
	d	Information on estimate of function and/or survival time (PSDA).
	e	Information on use or lack of detection aids, performance of equipment, and communications of person or vessel/craft in distress.
	f	For each day of the operation, include search area coordinated, type of craft assigned, search patterns used, planned and actual sweep widths and track spacing, sensor equipment utilized, computed datum points, and POS.
	g	Information on objects and persons located, including reference to their location as compared to the SAROPS generated probability map (if SAROPs is used).
	h	Information on types of RCC/Command Center equipment used to include data obtained.
	i	Debriefing information from survivors, giving actual drift reconstruction, observed environmental conditions, and any sightings of search craft. See Section 3.9.4.5 for information regarding survivor debriefing.
	j	Information on any operational risk management discussions between the SAR operational chain of command.
	k	Information on experience (length of time certified) and training (completion of last standardized training) for all involved personnel to include Command Cadre.
	l	Electronic media containing all SAROPS calculations and output including drift planning, icons, chart reference, file name, location on shared drive, etc.
	m	Whenever practicable, interview or obtain statements from all SAR planners and watchstanders who participated in case prosecution. Include reference to the performance and adequacy of RCC/Command Center equipment.
Opinions		This section provides clear and concise statements that can be deduced from the findings of fact that are of particular interest. In developing opinions, a SAR case study reviewer must rely on the facts and may rely on any reasonable inferences that may be drawn from those facts. In stating opinions, a SAR case study reviewer should refer to the findings of fact to demonstrate how the opinion was formulated. Pure speculation or unsupported opinions should be omitted from this section.
Recommend-ations		The recommendations section considers actions that could or should have been taken, as well as those which, although not typically expected, provide a benefit to the SAR system. If appropriate, include recommendations for improvements to the SAR System (policies, procedures, and capabilities). As discussed above, when conducting a SAR Case Study the overarching goal is to improve performance at all levels of the SAR system through a thorough analysis of significant facts and events. A Case Study should provide important information to decision makers, share lessons learned, and alert Coast Guard officials to any need for, or desirability of, particular management decisions or actions. With these goals in mind, the recommendations within the Case Study should be straightforward and forward-focused in order to foster continuous improvement, which is the hallmark of Coast Guard Search and Rescue.
Enclosures		Include all pertinent supporting documentation, including copies of computer SAR inputs and outputs.

Case Study Questionnaire

Purpose: The following is a list of considerations when conducting a SAR case study. This is NOT an all-inclusive list. Your SAR case study will likely raise additional questions.					
COMMAND CENTER CONSTRUCT & PERSONNEL					
At the time of the SAR case…					
Command Center Training Program	Did watchstanders meet the required initial training PQS JQR?				
	Did watchstanders meet the required currency training requirements?				
	Were watchstanders properly certified as per Command Center Manual (CCM)?				
	Did the SAR Planner(s) meet the minimum quarterly SPP training?				
Command Center Construct	Were there gaps within the PAL?				
	Does PAL provide sufficient # of watchstanders?				
	What was the status of qualified watchstanders in each SAR position?				
	Were there existing waivers authorizing the Unit to deviate from watch positions as per the CCM.				
	Does the Command Center staff have additional SAR watch positions during peak SAR season? If so, were position(s) available & manned during/throughout the SAR case?				
	Did this SAR case warrant/require the use of additional watchstanders/personnel?				
Personnel	What was the experience level of the following Command Center personnel engaged in the SAR case?				
	CU(s) OU(s) CDO(s) SMC(s)	Time qualified in position (at Unit)?	Time qualified in position (Career)?	Date last attended MSP/MSP2 course?	Considered a factor affecting the SAR case? If yes, explain.

EXISTING CONDITIONS	
Command Center	Was the Command Center fully manned?
	Were break-in watchstanders standing watch?
	Were break-in watchstander's allowed to execute the duties of the watch position during the SAR case? If so, were their decisions/actions monitored and validated by qualified/certified watchstanders before carrying out their decisions?
Unit Status	Were restrictions on Boats/Aircraft/Cutters in place at the time of the SAR case that prevented their use?
Weather	What were the conditions at the time of the initial report? (Calm, Small craft, Storm, Hurricane)
	Sea height/direction, cloud coverage/ceiling, wind velocity/direction, visibility, tide (flood, ebb, slack), sea temperature, air temperature, etc.
	Did weather conditions improve or deteriorate throughout the SAR case?
	Were predicted weather conditions verified by on-scene SRUs?
	Did weather conditions affect the ability for SRUs to conduct the search as assigned?

AWARENESS					
COMMs	Equipment degradations with Command Center equipment (R-21, telephones, RFF on V-SAT, HF-ALE, etc.)?				
	Known equipment degradations (RFF side mount DF equipment, RFF w/o DF equipment, known dead spots.)?				
	Status of SARSAT receiving capabilities (SPP, Fax)?				
	Additional communications issues affecting the SAR case?				
Common Operating Program (COP)	Program		Available?	Utilized?	Issues affecting the SAR case?
	SAROPS	OPTIDE			
	CG1V	VMS			
	AIS	GCCS			
	E-AIS [Blue Forces]	Other:			

AWARENESS (continued)		
Initial Notification		Was the Coast Guard the first to be notified of the distress?
		Who reported the initial distress? (Distressed mariner, CG, 911 dispatch, 3rd Party, etc.)
		If the initial report was not from the distressed mariner, how long did it take for the initial report to reach the CG?
		Was the initial report considered reliable?
		How was the initial report received? (Radio, Landline, Cell phone, e-mail, SARSAT, etc.)
Interview		Were appropriate checksheets/Job Aids utilized?
		Was the 'Big 4' obtained? (Position, nature of distress, description, # of persons)
		Were factors present - making the interview difficult? (Foreign language/accent, age, coherency, speech impediment, etc.)
INITIAL ACTIONS		
Broadcast(s)		Appropriate broadcast(s) issued? (UMIB, MARB SAFETY-NET, HYDROPAC)
		How long did it take to initiate the broadcast?
		Were responses received from the public?
Resources		Were SRUs launched immediately if applicable? If not, explain.
		Were other government agencies available/notified/sought out for assistance?
		Was AMVER utilized? If not, could it have impacted the outcome of the SAR case?
PLANNING		
Search Planning & Search Planning Program (SPP)		Was the SPP utilized?
		How far into the SAR case was the SPP utilized?
		Experience of the SPP user(s)?
		Was risk management taken into account when developing a search plan? Did the results affect the search plan?
	Search Object	Was the actual search object(s) listed within the SPP – or was a 'match-up' required?
		Were multiple search objects considered/selected? If so, were they considered appropriate?
	Scenario Type	Was the scenario/multi-scenario selection(s) considered appropriate?
		Was an appropriate amount of error applied to the distress position?
	Incident Time	Was the distress time known/validated?
		Was time error required? If so, was it appropriate?
	Distress Location	Was the initial distress position initially known/assumed?
		Was the established initial distress position validated?
		Was the initial distress position changed during the SAR case?
		Did the SAR planner account for continued movement by the distressed mariner while reporting the distress? E.g. Was the distressed mariner still under power - making way, at the time of the distress report – resulting in the distressed mariner's actual position being in a different location by the time he/she actually lost power?
	Area Of Interest (AOI) Time	Was the AOI time entry sufficient to account for drift throughout the entire search?
	Environmental Data Server (EDS)	Were desired EDS models available? If so, were they utilized?
		Was an appropriate Wind model selected?
		Was an appropriate Surface current model selected?
		Upon SRU arrival, were predicted onscene weather conditions verified?
	DMB/SLDMB	Were DMB(s)/SLDMB(s) deployed IAW COMDT policy?
		How long into the SAR case were DMB(s)/SLDMB(s) deployed?
		Was DMB/SLDMB data utilized to validate EDS selection for accuracy?
		Were EDS models validated against DMB/SLDMB data?

PLANNING (continued)		
Search Planning & Search Planning Program (SPP) (continued)	Data Entry Assumptions	Were assumptions made to any of the data entries? If yes, what were the assumptions?
		Were assumptions verified at some point? If so, when?
		If assumptions were proven inaccurate, was the data adjusted to reflect the information?
	Search & Rescue Unit (SRU) data entries	Was the SRU(s) selection considered adequate/appropriate? Were Other Government Agencies (OGAs) involved?
		Was the amount of effort considered adequate/appropriate?
		How long did it take to notify/launch SRU(s) from the time of initial notification?
		Were search plans provided prior to SRU arrival onscene?
		SRU Speed?
		Onscene WX conditions?
		Search Altitude?
	Reverse Drift (if applicable)	Was the actual located object(s) listed within the SPP – or was a 'match-up' required?
		Was the located object back-drifted to a known distress incident time? If not, what time back- drift time was utilized?
		Did the reverse drift tool provide what appeared to be a reasonable 'probable' distress incident location?
Search Plan Evaluation	Was search plan evaluation conducted by the next higher level authority prior to execution of the search plan?	
	Were adjustments made to the search plan? If so, were they considered appropriate?	
	Were changes made properly documented?	
	If changes were made to the search plan – were they properly accounted for during subsequent search planning?	
	Were cellular phone forensics utilized? If not, why not? If so, were the results taken into account?	
Subsequent Search Planning	Were previous search results properly evaluated?	
	Were previous search results properly accounted for within the 'Previous search results' section of the SPP?	
	Were previous search results properly documented?	

OPERATIONS	
Onscene Operations	Was an Onscene Coordinator (OSC) warranted? If so, was an OSC assigned? Was the OSC selection considered appropriate? Were OSC properly trained for the role?
	Was an Aircraft Coordinator (ACO) warranted? If so, was one assigned? Was the ACO selection considered appropriate?
	Were communications between the OSC and SRU(s) considered adequate?
	Were communications between the OSC and Command Center considered adequate?
Rescue Operations	Was the SRU(s) that located the survivor(s) capable of performing the rescue?
	Were communications between the SRU and survivor(s) established immediately? If not, why not? How long did it take to establish communications between the SRU and survivor(s)?
	Was the situation quickly ascertained? If no, why not?
	Was risk management taken into account when developing a rescue plan?
	If the rescue was not able to be performed by the locating SRU(s), how long did it take for an appropriate rescue facility to arrive and perform the rescue?

		Was an SRU able to remain onscene until a rescue facility arrived? If not, why not?
		If a rescue swimmer/cutter swimmer was utilized, were there issues that inhibited a rescue?
		Were there issues with the method of retrieval (harness, basket, tow, etc.)?
Probability Survival Decision Aid (PSDA)		Was PSDA model available? Utilized?
		Were PSDA entries considered reasonable?
CONCLUSION		
ACTSUS (if applicable)	SUSPENSION Checklist	Was the suspension checklist utilized?
		If so, was it properly completed?
		Was the checklist briefed through the Chain of Command prior to granting ACTSUS?
		Were POS values correctly evaluated prior to ACTSUS granted?
	Were PSDA values taken into account when considering ACTSUS?	

ADDITIONAL CONSIDERATIONS	
SAR Briefings	Was SAR Chain of Command (CoC) briefed/kept informed throughout the entire SAR case?
	Did the SAR CoC provide guidance at any point throughout the SAR case?
	Were NOK briefings well timed, professional, compassionate, informative, and well planned?
Media	Was media utilized at any point to assist in the search throughout the SAR case? (TV, radio, Facebook, etc.)
	If utilized, did results affect the SAR case in any way?

Section M.3
Coast Guard SAR Case Review Form

SAR CASE REVIEW

PART 1: Case Details		
CASE DATE:		MISLE CASE #:
CASE TYPE (OVERDUE, PIW, etc.):		UNIT SUBMITTING REPORT:
SMC (UNIT):		RCC (UNIT):
RECOMMENDATION TYPE		BRIEF CASE SUMMARY
LESSON LEARNED	☐	Briefly describe the facts of the case, issue identified, and its overall impact to the SAR system. If additional room is needed, continue within supplemental page.
POLICY UPDATE/REVISION	☐	
EQUIPMENT	☐	
TRAINING PROGRAM	☐	
QRC	☐	
RECOMMEND FULL CASE STUDY	☐	
OTHER	☐	

RECOMMENDED ACTIONS:

Describe a recommended course of action or desired outcome that could help mitigate the issue identified.

PART 2a: NEXT LEVEL REVIEW (Sector Commander, District SC, or Area SC as needed)	
DATE REVIEWED:	REVIEWED BY (UNIT):
REVIEW RECOMENDATIONS	BRIEF SUMMARY OF ACTIONS TAKEN
RECOMMENDATION(S) ENDORSED ☐	Describe any internal actions taken to mitigate issue identified.
RECOMMENDATION(S) PARTIALLY ☐	
RECOMMENDATION(S) NOT ☐	
RECOMMEND FULL CASE STUDY ☐	
ENDORSEMENT	

PART 2b: NEXT LEVEL REVIEW (Sector Commander, District SC, or Area SC as needed)	
DATE REVIEWED:	REVIEWED BY (UNIT):
REVIEW RECOMENDATIONS	BRIEF SUMMARY OF ACTIONS TAKEN
RECOMMENDATION(S) ENDORSED ☐	Describe any internal actions taken to mitigate issue identified.
RECOMMENDATION(S) PARTIALLY ☐	
RECOMMENDATION(S) NOT ☐	
RECOMMEND FULL CASE STUDY ☐	
ENDORSEMENT	

PART 2c: NEXT LEVEL REVIEW (Sector Commander, District SC, or Area SC as needed)	
DATE REVIEWED:	REVIEWED BY (UNIT):
REVIEW RECOMENDATIONS	BRIEF SUMMARY OF ACTIONS TAKEN
RECOMMENDATION(S) ENDORSED ☐	Describe any internal actions taken to mitigate issue identified.
RECOMMENDATION(S) PARTIALLY ☐	
RECOMMENDATION(S) NOT ☐	
RECOMMEND FULL CASE STUDY ☐	
ENDORSEMENT	

Part 3: HQ Final Action Authority Review (CG-SAR, CG-741, CG-6, etc.)	
DATE REVIEWED:	REVIEWED BY (Office):
ACTIONS TAKEN	SUMMARY OF ACTIONS TAKEN
RECOMMENDATION(S) ENDORSED	☐
FORWARDED TO OTHER FINAL ACTION AUTHORITY	☐
SAR CASE REVIEW POSTED ON PORTAL	☐
RECOMMEND FULL CASE STUDY	☐
ADDITIONAL COMMENTS FROM FINAL ACTION AUTHORITY	

Appendix N
SAR Controller Performance Qualification Standard (PQS)

The following pages comprise the standard minimum requirements for qualification of Search and Rescue Controllers at Coast Guard Command Centers. Commands may waive (NOT delete) those items that do not apply in their geographic region. Commands may also ADD requirements specific to their needs. This long overdue qualification tool is a result of significant work by the PQS working group and will eliminate the need for duplicative effort at each command.

	RECORD OF PERFORMANCE QUALIFICATIONS COMMAND CENTER CONTROLLER (SAR)

INSTRUCTIONS

Record of Performance Qualifications shall be completed for all Command Center Controllers and watch standers whose duties involve planning SAR missions, assuming SMC, and briefing Command Staff of SAR missions. As proficiency in each performance qualification is demonstrated, a qualified Controller shall complete the DATE and INITIALS column. Personnel are required to demonstrate proficiency in each qualification level without assistance. This qualification covers required skills in the area of Search and Rescue Command Center watch standing and administration.

REFERENCES

a.	International Aeronautical & Maritime SAR Manual (IAMSAR)	Doc 9731-AN/958
b.	U.S. National SAR Supplement to the IAMSAR Manual (NSS)	April 2018
c.	Coast Guard Addendum to the United States National SAR Supplement to the International Aeronautical & Maritime SAR Manual (CGADD)	COMDTINST 16130.2 (series)
d.	Communications Watchstander Guide	COMDTINST M16120.7 (series)
e	U. S. Coast Guard Boat Operations and Training Manual Volumes I	COMDTINST M16114.32
f.	U. S. Coast Guard Boat Operations and Training Manual Volumes II	COMDTINST M16144.33
g.	Communications Watchstander Qualification Guide	COMDTINST M16120.7 (series)
h.	Incident Command System	COMDTINST M3120.14 (series)
i.	USMCC National Rescue Coordination Center and Search and Rescue Point of Contact Alert and Support Messages	
j.	Staffing Standards Manual	COMDTINST M5312.11 (series)
k.	The Coast Guard Communications Manual	COMDTINST M2000.3 (series)
l.	Risk Management (RM)	COMDTINST 3500.3
m.	Critical Incident Stress Management (CISM)	COMDTINST 1754.3
n.	GMDSS Watchstanders' Handbook	
o.	Probability of Survival Decision Aid (PSDA) Software	
p.	Digital Voice Logger User Handbook	

DATE COMPLETED ALL PERFORMANCE QUALIFICATIONS FOR EACH LEVEL

QUALIFICATION	**DATE**
Command Center Controller	
Name	**Phone Number**
Unit	

SIGNATURE OF SUPERVISOR				
DATE	**NAME/SIGNATURE**	**INITIALS**	**RATE**	**UNIT**

1.0 <u>Prerequisites</u>

Maritime Search Planning – required for all Command Center Controllers.

Setup user access for each program, i.e.: MMSI, SAROPS, MISLE.

2.0 <u>Area Familiarization</u>

Complete AOR familiarization at designated subordinate commands under your command's operational control.
Operational Control *(Area/District) (Sector)*

Complete appropriate over flight(s) within your AOR (CGAux, CG Helo/Fixed wing)
State prominent maritime points of interest in your AOR.

a. Bays
b. Sounds
c. Towns
d. Boat ramps
e. Major AtoN
f. Rivers
g. Other

3.0 <u>911 Operator Assistance</u>

1. Conduct a familiarization visit to a 911 Operations Center.
2. Describe the information required by C.G. for relay from 911 personnel.
3. Describe the complications associated with receiving initial notifications of an incident via a 911 operator.
4. Describe the importance of call back information to operator or supervisors to obtain additional SAR data.

4.0 <u>General Knowledge</u> (Ref. C.)

1. List the two SAR Program Goals
2. List and briefly explain the seven primary SAR Program Standards
3. State and briefly explain the SAR Response Standard
4. Discuss the National SAR Plan, where it is found and the relevance it has with respect to SAR policy
5. Understand the Navigational Assistance Policy

5.0 <u>PUBLIC AFFAIRS</u>

1. State USCG policy on who may conduct interviews
2. State the list of information that can be released to the media
3. State the list of information that cannot be released to the media
4. State the Public Affairs resources available to your unit

6.0 <u>SAR ASSETS</u>

1. List all USCG SAR assets for your AOR and describe with the following:

   a. Capabilities
   b. Limitations

c. Launch authority

2. Be familiar with USCG Auxiliary assets in your AOR and describe with the following:

    a. General capabilities
    b. Limitations
    c. Launch Authority

3. List all other SAR assets in your AOR and describe with the following:

    a. Capabilities
    b. Limitations
    c. Launch authority

4. Describe any local or international SAR agreements that pertain to your AOR.

7.0 SMC RESPONSIBILITY

1. State the criteria when a unit should assume and designate a SMC.
2. State the criteria when SMC should be passed to another SMC authority.

8.0 SAR CHECK SHEETS

1. Demonstrate a familiarity with the required check sheets in the CG Addendum.
2. Demonstrate a familiarity with unit specific check sheets.
3. State CG policy on use and retention of SAR check sheets.

9.0 CASE SUSPENSION

1. State the levels of authority for granting ACTSUS.
2. State the information that is to be included when requesting a suspension.
3. Conduct a simulated Case Suspension Brief including a suspension checklist.
4. State the policy for Next of Kin (NOK) notification.
5. Describe the process of keeping NOK informed.
6. Describe the following outside influences concerning Case Suspension;

    a. Political
    b. Media
    c. Next of Kin

7. Discuss circumstances under which a case may be terminated.

10.0 FLOAT PLANS

1. State the Coast Guard’s general policy regarding float plans.
2. Explain the options available to the boating public for filing a float plan.
3. Describe the policy regarding mariners insisting on filing a float plan with the Coast Guard.
4. Describe the actions required when receiving float plans.

11.0 MARITIME SAR ASSISTANCE POLICY

1. Define the three emergency phase classifications.
2. State the factors used to determine between distress and non-distress.
3. State the appropriate response efforts for distress and non-distress cases in accordance with the CG Addendum.
4. State when the following resources can be used:
    a. Commercial
    b. USCG Auxiliary
    c. USCG Assists
    d. Other agencies
    e. Good Samaritans
    f. Foreign entities
5. Define and state the following:
    a. MARB
    b. MARB minimum required broadcast time
    c. Procedure if commercial assistance declined
    d. Procedure to determine if response vessel is capable of assistance
6. State the cases requiring Command, District, and Area level briefings.
7. Demonstrate proficiency at adequately briefing a SAR case.
8. State the purpose of conducting SMC, SRU, and Command level briefings (i.e. ensuring proper risk assessment is conducted at all levels).
9. Define safe haven and list the primary safe havens in your AOR.
10. State issues to be considered for relief of tow and when it is appropriate.

12.0 UNCORRELATED DISTRESS

1. Read and summarize USCG policies/messages pertaining to uncorrelated distress.
2. Define what constitutes an uncorrelated distress.
3. Define what constitutes a probable hoax.
4. Define what constitutes a hoax.
5. Define Reasonable Search Area (prevailing conditions, available information, available assets).
6. Explain the factors to consider when articulating a reasonable search area. (DF signal obtained, number of high sites, etc.)
7. Define alert types:
    a. Voice transmission
    b. Auto SOS
    c. Digital Selective Calling (DSC)
    d. HF Alert Tone
    e. “MAYDAY Mike”
    f. Other
8. Describe what emergency phase is associated with Uncorrelated Distress.
9. Locate all High Sites in AOR and how they interact with other high sites for determining reasonable search area.
10. Define Coast Guard assumed ranges for high level and low level reception (distance a signal can be heard).
11. Locate all low level sites in AOR with live watches.
12. Demonstrate the use of C2PC overlays for High Sites and DF sites.
13. Locate all DF sites within AOR.

14. Explain the capabilities and limitations of DF equipment.
15. Describe the minimum response to an Uncorrelated Distress.
16. Describe the briefing matrix relating to an uncorrelated Distress.
17. State the minimum requirements of a UMIB.
18. Demonstrate proficiency with available audio manipulation software.
19. Demonstrate proficiency with available data recording devices.
20. Describe how a Search Object is determined for Uncorrelated Distress.

13.0 FIRE FIGHTING ACTIVITIES POLICY

1. State the USCG policy on marine fire fighting.
2. Describe how USCG assets are to be used in the following fire fighting incidents:
    a. Incidents involving people
    b. Incidents involving Property/Salvage
    c. Incidents involving pollution
3. Describe the responsibilities of the following agencies in marine firefighting;
    a. COTP/MSU/MSD
    b. Local Fire Department
    c. Commercial operators
4. Demonstrate the use of the appropriate Quick Response Card (QRC).

14.0 SALVAGE OPERATIONS

1. State the USCG policy for conducting salvage operations.
2. State the USCG Auxiliary policy for conducting salvage operations.
3. List commercial salvage companies within your AOR and describe with the following:
    a. Capabilities
    b. Current Memorandum of Understanding (MOU)
4. Visit a commercial salvage company within your AOR.

15.0 ICE RESCUES

1. List the following ice rescue resources within your AOR and their capabilities:
    a. USCG/Federal
    b. State
    c. Local
2. State the ice breaking capabilities and ice operating restrictions of USCG assets in your AOR.
3. Define the following:
    a. Hypothermia
    b. Frost Bite
4. State the ice thickness minimums to support the following:
    a. Single person
    b. Two persons
    c. ½ ton truck
    d. ¾ ton truck
    e. Snowmobile

5. State resource prioritization policy when responding to an ice rescue.
6. State the policy for ice rescue of animals.
7. Identify ice-breaking routes within your AOR and broadcast notification procedures.

16.0 MESSAGE TRAFFIC

1. Draft the following message traffic as an exercise:

    a. SITREP
    b. Search Action Plan (SAP)
    c. UMIB
    d. MARB
    e. BNM
    f. SAFETYNET
    g. Other
    h. State the release authority for the above traffic for your command

17.0 VOICE MANIPULATION SOFTWARE

1. Locate the Voice Manipulation Software on the Command Center computer.
2. Locate the Default Save Directory and access files from it.
3. Open the Goldwave software program.

    a. Open a new file.
    b. Record a WAV file.
    c. Save a WAV file.
    d. Adjust time length recording.
    e. Demonstrate speeding and slowing audio files.
    f. Demonstrate use of the Low/High Pass Filter.
    g. Demonstrate use of the Noise Reduction Filter in background noise reduction.
    h. Demonstrate cut and paste of a WAV file.
    i. Demonstrate use of loop play.
    j. Demonstrate knowledge of device controls.

4. Convert a WAV file to Mpeg Layer 3 Format.
5. Diagram and explain wiring configuration of DVL to Goldwave Interface.
6. State policy on retention of original and enhanced DVL recordings and Goldwave recordings.
7. State policy and standards for naming case WAV files.

18.0 DIGITAL VOICE LOGGER

1. State the function of the DVL.
2. State all the circuits, radio channels, and other comms recorded by the DVL.
3. State the operating system of the DVL.
4. State the medium used by the DVL to record upon.
5. Demonstrate the following:

    a. Record and playback functions
    b. Select channels for playback
    c. Select proper time interval selection (T 10, T 20, T 30)

6. State the importance of time synchronization.

19.0 SAROPS FUNCTIONS

1. Demonstrate the ability to display raster charts.
2. Demonstrate the ability to display high sites and display descriptive information.
3. Demonstrate the ability display existing overlays.
4. Demonstrate the ability to display maps.
5. Demonstrate the ability to e-mail .sar files.
6. Demonstrate the ability to save .sar files to electronic folders.

20.0 SAROPS KNOWLEDGE

1. Demonstrate and describe the following functions:

   a. SAROPS Simulator
   b. SAROPS Planner
   c. DMB/SLDMB Tool
   d. Environmental Data Server winds and currents viewers

2. Conduct a simulated exercise utilizing SAROPS

   a. Coastal environment
   b. Oceanic environment

21.0 TIDES AND CURRENTS

1. Discuss the application of the following tides and currents found in your AOR:

   d. Tidal current
   e. River current
   f. Long shore current
   g. Reversing tidal current
   h. Spring tide
   i. Sea current
   j. Rip current
   k. Lake current
   l. Wind current
   m. Rotary current
   n. Local knowledge

2. Identify two sources of obtaining WX data for applicable locations for last 48 hours.
3. Describe the importance and limitations of the DMB / SLDMB drift computations.

22.0 FLARE CONE (SAROPS use)

1. State the USCG policy on flares.
2. Conduct a simulated flare sighting case:

   a. Incorporate the "Fist Method"
   b. Utilize SAROPS SAR Tools flare tool
   c. Generate a flare cone
   d. Generate a Flare Check Sheet

3. Conduct a SAROPS case using a simulated flare cone to establish the distress location.

4. Conduct a first-light drift of a simulated flare cone initial position within SAROPS.
5. State the suspension criteria for flare cases.

23.0 SWEEP WIDTH

1. Define sweep width.
2. Describe the relationship between sweep width and track spacing.
3. Demonstrate how to use the sweep width calculator within SAROPS.
4. Know when to apply the daytime sweep width tables and the electronic sweep width tables.

24.0 SEARCH PATTERNS

1. List the eight major Search Pattern types.
2. State the following factors for the above pattern types:

    a. Selection criteria
    b. Major axis selection criteria
    c. Commence search point selection criteria
    d. Aircraft altitude selection criteria

3. State the basic information needed by an SRU to conduct a search pattern.

25.0 SUBSEQUENT SEARCH (SUBSEQUENT DRIFT)

1. Define a Subsequent Search.
2. Demonstrate the procedures for conducting a Subsequent Search in SAROPS.
3. State the information transferred from a first search to Subsequent Search.
4. State the factors to consider when conducting Subsequent Search.

26.0 SEARCH EFFECTIVENESS

1. Define the following:

    a. Probability of Detection (POD)
    b. Probability of Success (POS)
    c. Probability of Containment (POC)
    d. Coverage factor

2. Discuss the relationships and trade-offs of the above definitions in optimal solutions.
3. State the USCG policy for coverage factor goal.

27.0 AMVER

1. Describe the Amver program.
2. State the policy for release of Amver information.
3. Demonstrate the ability to run the following Amver SURPICS:

    a. Radius
    b. Rectangle
    c. Snapshot
    d. Moving point

4. Demonstrate the ability to access and interpret voyage info.
5. Demonstrate the ability to locate an Amver ship participants capabilities.
6. Demonstrate the ability to contact an Amver participant via Inmarsat.
7. Describe follow-up notifications required when using an Amver vessel.

28.0 DATABASE/INTERNET RESOURCES

1. Define, explain and obtain access to the uses of databases, i.e.:
   a. MISLE
   b. MARS
   c. State Registry
   d. Inmarsat
2. State commonly used appropriate Internet sites in conducting SAR.

29.0 PROBABILITY OF SURVIVAL DECISION AIDE (PSDA)

1. Demonstrate the use of the PSDA online software.
2. Conduct a simulated use of the tool in a probability of survival case that may require ACTSUS.
3. Describe the limitations of the software.
4. Describe results of PSDA data and state proper interpretation of it.

30.0 DIRECTION FINDER

1. State the DF capabilities within your AOR with the following descriptors:
   a. Location
   b. System type
   c. Recording method
2. Conduct a simulated exercise on SAROPS highlighting the following:
   a. Plotting DF bearings
   b. Search object selection
   c. Search pattern selection
   d. Subsequent search (drifted)

31.0 GMDSS/ SARSAT/ EPIRB

1. DEFINE and provide info on the following terms:
   a. AOR-E
   b. AOR-W
   c. CAMSLANT
   d. CES
   e. Doppler Shift
   f. DSC
   g. EGC
   h. EPIRB
   i. PPIRB
   j. GPIRB
   k. ELT
   l. PLB
   m. Geostationary Satellite Orbit

n. IMO
o. Inmarsat
p. IOR
q. ITU
r. LUT
s. MSI
t. SRR
u. MMSI
v. NAVAREA Warning
w. NAVTEX
x. NBDP
y. NOAA
z. Polar Orbiting Satellite
aa. POR
bb. RCC
cc. SART
dd. SOLAS
ee. USMCC

3. State the Sea Areas for the following coverages:

   a. One coast station
   b. Radiotelephone of one coast station
   c. Inmarsat with continuous alerting
   d. Area outside of A-1, A-2, A-3

4. Name the system that has EPIRBs associated with GMDSS.
5. State the main type of EPIRB associated with the satellite system.
6. Demonstrate the use of a SARSAT Incident Feedback Report.

32.0 GLOBAL COMMAND AND CONTROL SYSTEM

1. State the purpose of the GCCS.
2. Demonstrate the ability to use the GCCS.
3. Demonstrate requesting technical support for GCCS:

   a. During normal work hours
   b. After working hours

4. State the procedure for a system casualty.

33.0 SEARCH AND RESCUE OPTIMAL PLANNING SYSTEM (SAROPS)

1. State the requirements to open a SAROPS case
2. State the limitations of SAROPS
3. Demonstrate the following:

   a. Use of SAROPS planning tool to develop an optimal search plan.
   b. Interpret a SAROPS probability map
   c. Evaluate a search area using SAROPS
   d. Import search areas
   e. Obtain optimal search area

4. Demonstrate the selection of environmental data from the Environmental Data Server (EDS)
5. State the limitations of the data sets within the EDS

34.0 <u>RISK MANAGEMENT</u>
 	
1. Discuss the GAR risk management tool.
2. Discuss the SPE risk management tool.
3. State the roles of the following with reference to Operational Risk Management:
    a. Command Center Controller
    b. SRU
    c. OSC
    d. SMC		

NAME: (LAST, Middle Initial)		

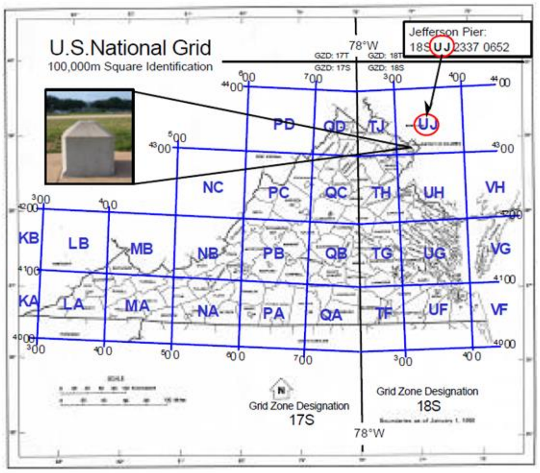
Appendix O
Interpreting U.S. National Grid (USNG) Coordinates

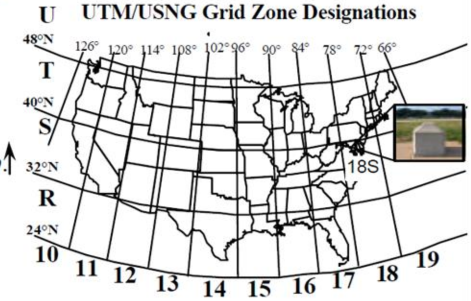
Background. The Federal Geographic Data Committee's (FGDC) consensus based USNG standard provides a nationally consistent *language of location -- optimized for local applications --* for maps, Global Positioning System (GPS) receivers, and mapping web portals. It is an alpha-numeric point reference system overlaid on the Universal Transverse Mercator (UTM) numerical grid. Truncated USNG coordinates (geoaddresses) range in precision from 1,000 to 1-meter and provide universal map index values for streets and other features. USNG and Military Grid Reference (MGRS) values are identical when referenced to WGS 84 or NAD 83 datum -- USNG only uses a single 100,000-m Square Identification scheme regardless of datum. This example locates the Jefferson Pier at USNG: 18S UJ 23371 06519.

Grid Zone Designation (GZD):
6° x 8° longitude zone / latitude band.
100,000-m Square Identification:

18S UJ 2337 0651

Grid Coordinates:
Read ***right***, then ***up***.





Users determine the required precision. These values represent a point position (southwest corner) for an area of refinement.

Four digits:	23 06	Locating a point within a 1,000-m square.
Six digits:	233 065	Locating a point within a 100-m square.
Eight digits:	2337 0651	Locating a point within a 10-m square.
Ten digits:	23371 06519	Locating a point within a 1-m square.

Only an 8-digit grid is typically required to locate a modest size home out of a local area.

Full USNG: 18S UJ 2337 0651 - World wide unique.
Without Grid Zone Designation (GZD): UJ 2337 0651 - Regional areas.
Without GZD and 100,000-m Square ID: 2337 0651 - Local areas.

Reading USNG Grid Coordinates.

- The UTM 10,000 and 1,000 digit values are known as Principal Digits.

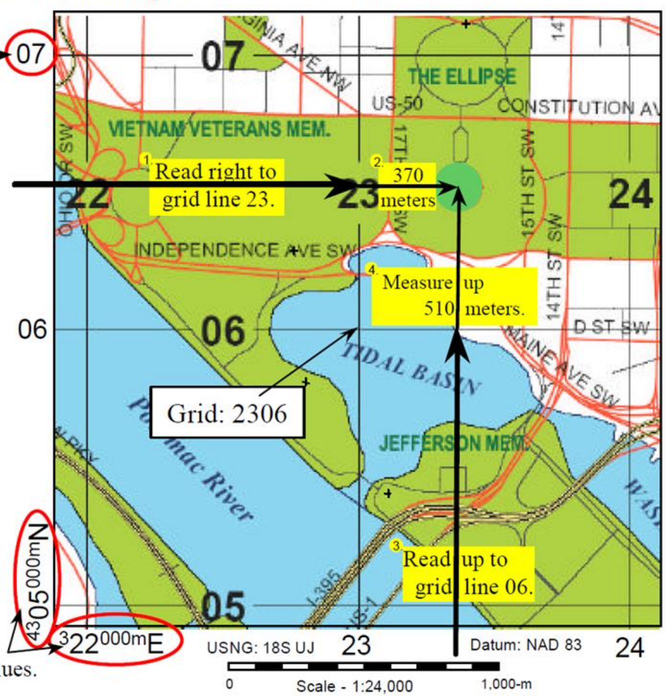
- Coordinates are always given as an even number of digits (i.e. 23370651).

- Divide coordinates in half (2337 0651).

[1] Read right to grid line 23. [2] Then measure right another 370 meters. (Think 23.37)

[3] Read up to grid line 06. [4] Then measure up another 510 meters. (Think 06.51)

Grid:	Examples:
228058	FDR Memorial:
231054	George Mason Memorial:
2338 0710	Zero Milestone:
2275 0628	DC War Memorial:
213017	Ft. Scott Park:



Edition: 20051116 - 1Sheet_USNGInstruct_v2

USNG values are formally written as a single string: 18SUJ23370651 or parsed to ease viewing: 18S UJ 233065

Appendix P
Summary of Major Changes

P.1 The following is a Summary of Major Changes for COMDTINST 16130.2G

P.1.1 General changes affecting multiple sections:

(a) Communications Area Master Stations (CAMS) for both LANTAREA and PACAREA have consolidated to Communications Command (COMMCOM).

(b) Changes to reflect the renumbering of title 14 United States Code (ALCOAST 410/18).

P.1.2 Consolidated Table of Contents:

(a) Updated all references.

(b) Deleted previous version of Table 2-2. Watchstanders are now required to acknowledge all DSC Alerts to include those alerts with no MMSI or GPS position (ALCOAST 462/15). Subsequent table numbers have been adjusted.

P.1.3 Chapter 1:

(a) 1.2.2.3: Added clarification that SMC designations do not need to be re-issued upon the change of command (ACN 071/19).

(b) 1.2.2.3: Added that SMC designations shall be officially recorded in Direct Access (ALCOAST 460/15).

(c) 1.3.2.4: Added language making the option for a waiver for the MSP course ONLY available to Sector Commanders and Deputy Sector Commanders (ACN 026/17).

(d) 1.3.2.4: Revised to reflect satisfaction of course refresher through the MSP2 course (ACN 058/18).

(e) 1.3.5.2: Added new section regarding the Maritime Search Planning 2 Course (ACN 058/18).

(f) 1.3.5.3: Updated course name to SAR Mission Coordinator (SMC) Course.

(g) 1.3.5.4: Adjusted wording for accuracy. Districts no longer provide funding for the SC&E Course; funding is coordinated through FORCECOM and Commandant (CG-SAR).

(h) 1.3.5.5: Updated the course code for the SAR Fundamentals Course. Deleted wording which required the e-SAR end-of-course-test to be proctored by the unit Education Services Officer.

P.1.4 Chapter 2:

(a) Updated Chapter 2 to remove information regarding MF monitoring and notating that HF voice is only monitored in the Alaskan AOR on 4125.

(b) 2.1.5.7: Updated section on 406MHz EPIRBs/ELTs/PLBs with 2013 COSPAS-SARSAT policy (Commandant (CG-SAR) Policy Memo dated 13SEP2016).

(c) 2.1.5.9: Added new material regarding responding to AIS-SART (ACN 148/19).

(d) Updated section 2.2 to reflect the termination of USCG requirement to monitor 2182 khz (voice) and 2187.5 khz (Digital Selective Calling (DSC)) for distress calls (ALCOAST 263/13).

(e) 2.2.2.3: Updated to reflect shore units shall now acknowledge all DSC alerts (ALCOAST 462/15).

(f) 2.3.4.2: Deleted previous section 2.3.4.2 regarding "Receiving Broadcast Messages" due to receivers no longer being in operation. All subsequent section numbers in 2.3.4 have been adjusted.

(g) 2.7.1.4: Incorporated new guidance on obtaining cell phone location data for SAR (ACN 076/19).

P.1.5 Chapter 3:

(a) 3.4.3.3(a) – (b): Deleted sections establishing additional factors to be considered when making case suspension decisions for reports of red and orange flares (ACN 014/22).

(b) 3.4.4.2 – 3.4.4.11: Updated section on COSPAS-SARSAT (Commandant (CG-SAR) Policy Memo dated 13SEP2016).

(c) 3.4.15: Updated section regarding a bearing error change to the SAROPS program (ALCOAST 510/12).

(d) 3.8.3.1(b): Updated ACTSUS authority delegation to clarify that authority shall remain in effect unless specifically cancelled or superseded (ACN 071/19).

(e) 3.9.4: Updated entire section on SAR Case Studies, updated Appendix M (ACN 018/19).

(f) 3.9.5: Added new section on Survivor Immersion Data. Discusses importance of procedures for data collection. References new SAR Survivor Immersion Data Checksheet in Appendix G.

P.1.6 Chapter 5:

(a) Updated information regarding USCG assets and resources.

P.1.7 Chapter 7:

(a) Created Chapter 7 to advise on Emergency Support Function (ESF) #9/ Catastrophic Incident Search and Rescue (CISAR) Policy (Commandant (CG-SAR) Policy Memo dated 22JUN2018).

P.1.8 Appendix G:

(a) Initial SAR Checksheet: Updated to clarify questions regarding Personal Floatation Devices (PFDs) in question number 5 (ACN 014/18).

(b) Replaced Flare Sighting Checksheet (Commandant (CG-SAR) Policy Memo dated 09NOV2016).

(c) Replaced Mass Rescue Operation Supplemental Checksheet. Removed old Annex (1) "GMDSS Operating Guidance for Masters of Ships in Distress Situations" (Commandant (CG-SAR) Policy Memo dated 01NOV2018).

(d) Added new U.S. Coast Guard Search and Rescue Survivor Immersion Data Checksheet.

P.1.9 Appendix H:

(a) H.4.2.3: Updated section on Search Epochs (ALCOAST 510/12).

(b) H.4.2.3.1: Added new section on naming of externally developed search patterns (ALCOAST 510/12).

P.1.10 Appendix I:

(a) I.1.1: Added wording to clarify determining the requirement to conduct a first light search (ACN 014/22).

(b) Section I.7: Deleted old version of Flare Sighting Checksheet (Commandant (CG-SAR) Policy Memo dated 09NOV2016).

P.1.11 Appendix J:

(a) Replaced old EPIRB Registration Form with new form from the NOAA website.

P.1.12 Appendix L:

(a) Updated numbering associated with title 14 United States Code to comply with the Frank Lobiondo Coast Guard Authorization Act of 2018 (ALCOAST 410/18).

P.1.13 Appendix M:

(a) Updated Appendix M with a complete revision of the SAR Case Study policy (ACN 018/19).

P.1.14 Appendix O:

(a) Added Appendix O to explain how to interpret U.S. National Grid (USNG) Coordinates (Commandant (CG-SAR) Policy Memo dated 22JUN2018).

P.1.15 Appendix P:

(a) Shifted content from Appendix O to Appendix P and revised Appendix P with specific updates to this instruction highlighting changes from Edition F to Edition G.