

CHAPTER 4 – SIGNALS

Time: One-half hour

GOAL: Students will be able to identify what constitutes an effective signal and use signals in an emergency situation.

NEED STATEMENT:

- 1.To be a survivor you must be rescued; to be rescued you must be seen.
- 2.Incomplete MAYDAYs cost time, and time can cost lives.
- 3.Your life depends on making the most out of your signals.

OBJECTIVES:

- 1.List two elements of an effective signal.
- 2.State the distress signal and EPIRB requirements for own vessel.
- 3.Describe the general alarm and the person(s) responsible to report an inoperable alarm.
- 4.Describe four steps in the safe procedure for firing pyrotechnic devices.
5. Demonstrate the 5 priority items in a MAYDAY call

Others from FISHSAC:

6. Identify two types of signals (ans- Passive, Active)
7. Identify three types of flares
8. List four steps to safely fire flares
9. Signal helicopter using proper signaling mirror technique
10. Identify general alarm & inactive alarm reporting
11. ID the two EPIRB satellite systems.
12. Define land user terminal, mission control center, rescue coordination center.
13. List six steps in most effective EPIRB use.
14. List seven steps in EPIRB maintenance.
15. Recognize six advantages of a Digital Selective Calling(DSC) radio.
16. State the four bits of emergency information a DSC/GPS enabled radio transmits.
17. Recite the three basic steps to set up a DSC radio.
18. Recognize the three basic steps to test a DSC radio.

SKILLS CHECKLIST:

1. Recite the 5 priority items in a MAYDAY call

2. List three elements of an effective signal
3. Demonstrate EPIRB test & activation (if dummy EPIRB) switch.
4. Identify standard alarm signals for fire and emergency, person overboard, and abandon ship.

EQUIPMENT NEEDED:

Handheld flares (dummy)

Parachute flares (dummy)

Smoke signals (dummy)

Dummy VHF radio or mics

Category 1, 406 EPIRB

Personal Locator Beacon (PLB)

Pocket Mirrors

Sample emergency instructions and station bills. Variety of signaling devices: mirrors, lights, etc.

TEACHING TIPS:

- *The more people do, the more they will remember. Don't be afraid to try new ways to get students involved with instruction.
- *The information in this, and other units will have the most relevance and impact if you can illustrate your points with local examples. Keep a newspaper clipping file on marine incidents and talk with local fisherman and Coast Guard to find examples.
- *Signal devices can be obtained from local retailers, and life raft repack stations.
- *If you have unusable immersion suits, cut off the arms and have students "suit up" (to their armpits) and try to light flares, or handle a radio or EPIRB/PLB.
- *Reinforce that survival requires a systems approach. It's not just one piece of equipment that saves lives but how they all work together and with you.
- *Pyrotechnics can be dangerous! Do not attempt a demonstration or practical unless you are experienced, have been trained in proper use, and are familiar with the ones you are using.

- *Important to demonstrate how to activate an ACR EPIRB. (Up-Over-Down)
- *An effective MAYDAY practice exercise can be done by distributing index cards containing emergency scenarios to each student. Students compose a proper MAYDAY and issue it over a handheld VHF (Switched off). This can be varied by giving students cards with incomplete information and asking the students to identify what is missing.
- *OR have students pair up. One becomes the vessel in distress and gives a MAYDAY from an imagined (or experienced!) emergency including name of FV, # POB, position, description of FV, type of emergency, while the other person takes down information as USCG would. Then have pair debrief 5 main elements. Then switch roles.
- *Ask students to pull out their personal survival kits. What have they included that could be used as a signal? What are its limitations? (Active, passive, cannot be used at night, etc.)

INSTRUCTIONAL OUTLINE:

I. ELEMENTS OF AN EFFECTIVE VISUAL SIGNAL

A. Must attract attention.

1. Bigger
2. Brighter
3. Different

B. Must give a message that you need help.

II. RADIO DISTRESS SIGNALS

A. General Considerations

1. All personnel, especially those on watch, should know proper radio distress call procedures.
2. Radio equipment should always be able to reach SAR resources::
 - a. Radio should have appropriate signal strength.
 - b. Radio must have an emergency source of electrical power. [CFR 28.245(i)]

B. Radio Types and Emergency Channels

1. VHF - Channel 16. Range up to 40 miles. Handheld, 5-10 miles.
2. CB - depends on local SAR. Along with VHF operates line of sight.
- 3 Cellular phone - dial *CG (in Alaska only)
 - a. never as primary marine emergency signal.
 - b. not universal coverage
 - c. other vessels can't hear you.
 - d. cannot "direction find" on cellular phone easily.
4. SSB- channel 4125 or alternates 6215.0 and 8291.0.

4. Digital Select Calling (DCS)

- a. **Where available.**

b. Advantages:

- Clearer transmission of emergency for longer VHF range.
- Faster response.
- Reports GPS position (if hooked up to GPS).
- Reduces coverage gaps.
- Secure channel to channel communications.
- If you have GPS plotter can pin point position.

c. Information provided by DSC:

- Distress message.
- Lat/Long.
- Vessel description.
- POB capacity of vessel.

d. Basic steps to set up DSC:

- Obtain MMSI number-enter # into radio.
- VHF to GPS connection.
- Read and follow owner's manual.

e. How to test DSC:

- Don't use distress button as test.
- Call another DSC VHF radio.
- You must know the MMSI number of another user.

III. TYPES OF EMERGENCY BROADCAST

A. SECURITE - lowest urgency; calls attention to weather, navigation hazards.

B. PAN - calling station has an urgent message to transmit.

C. MAYDAY - highest urgency; immediate life threatening danger.

1. MAYDAY, MAYDAY, MAYDAY

2. Vessel's name /call sign three times.

3. Location: latitude/longitude and geographic reference if possible.

a. If geographic reference, use names on charts so rescuers can locate you.

4. Nature of the distress (fire, grounding, medical emergency, etc.)

5. Number of persons on board.

AND IF TIME ALLOWS ADD:

6. Amount and type of survival gear on board (immersion suits, EPIRBs, liferaft, etc.)

7. Vessel description (length, type, color).
8. Listen for response. If none, repeat the message until it is acknowledged or you are forced to abandon ship.
9. If abandoning vessel, state "abandoning vessel" and last known position.

D. Receiving MAYDAY (if unanswered by USCG)

1. You must answer and log details
2. Advise vessel in distress what assistance you can offer.
3. Contact the Coast Guard to ensure they received the call.

E. MAYDAY Relay

1. Acquire information from vessel in distress if no one answers MAYDAY
 - a. YOUR name/call sign & location
 - b. Name and call sign of vessel in distress
 - c. Location of vessel in distress from MAYDAY
 - d. Nature of problem.
 - e. Number of persons on board.
 - f. Description of vessel.
 - g. Survival equipment onboard
 - h. Seaworthiness
2. Transmit MAYDAY relay:
 - a. MAYDAY RELAY, MAYDAY RELAY, MAYDAY RELAY
 - b. Your vessel name/call sign.
 - c. Name/call sign of vessel in distress and position.
 - d. Nature of the problem.
 - e. Degree of assistance needed.
 - f. Listen for acknowledgement.

g. Transmit additional information.

F. PRACTICE MAYDAYS in class.

IV. GENERAL ALARMS

A. A means of notifying all individuals on board of an emergency situation.

1. Must be heard or seen in all accommodation or working spaces on board the vessel.
 - a. In work areas where background noise makes a general alarm difficult to hear, a flashing red light must be installed.
2. Must be checked before each voyage and once a week while underway.
3. Must be distinct from other alarms.

4. Other means of alerting all on board (loud hailer, P.A.) may be used in lieu of a general alarm system:

- a. if it meets #1 and 2 and;
- b. if it can be activated from the operating station.

B. Activating the general alarm.

1. General alarm is the signal to all on board to report to assigned crew muster stations.
2. Importance of general alarm (Aleutian Enterprise capsized).
3. Required to have a flashing light in high noise areas. **MUST BE HEARD OR SEEN BY ALL.**
4. Standard alarm signals:
 - a. Fire and emergency - continuous ringing of the general alarm; continuous blast of ship's whistle.
 - b. Abandon ship - at least 7 short blasts followed by 1 long blast.
 - c. Person overboard - 3 long blasts repeated at least 4 times.
 - d. or as designated by master and practiced by crew.

C. Reporting inoperative alarms

1. Inoperative alarms must be immediately reported to the vessel owner or operator.

V. **EMERGENCY POSITION INDICATING RADIO BEACONS (EPIRB)**

A. All commercial fishing vessels operating beyond 3 miles (unless they do not have a galley and sleeping facilities) are required to carry a 406 MHz Category 1 EPIRB.

B. Function of the EPIRB is to communicate distress and your position accurately and quickly to SAR resources.

C. Broadcasts signal to an international public satellite system.

C. Features of Category 1, 406 EPIRBs:

1. Broadcasts on 406 and 121.5 MHz.
 - a. The 406 MHz signal is picked up by passing satellites and downloaded to earth stations to initiate a rescue.
 - b. 121.5 MHz signal is only a homing signal which is only picked when SAR is close within a few miles.
 - c. Category 1 EPIRBs are self-activating and deploy automatically.
3. Signal identifies boat and owner (if registration information sent to NOAA.)
4. EPIRBs are now common with built-in GPS location accuracy and are called "GPIRBs".
5. Every EPIRB should have GPS capacity to save rescue time.
6. Category 1 transmits for 48 hours continuously even in cold climates.

D. Features of Category 2 EPIRBs

1. They also float but are not designed to automatically deploy.
2. Work on the same 406 and 121.5 MHz satellite systems.

E. Personal Locator Beacons (PLB) features

1. Are pocket sized.

2. Work off same 406 and 121.5 MHz frequency and satellite systems.
3. Some brands may not float.
4. Do not meet USCG carriage requirements.
5. Operate for 24 hours or less.

F. Private Electronic Emergency reporting systems

1. Do not meet USCG carriage requirements
2. Do not work off the 406 MHz system.
3. Do not float or automatically activate.
4. Do not work well in extreme northern or southern latitudes.
5. Provide other features such a text, pre-determined messages, map tracking and much more.
6. Are not linked directly into public international SAR.
7. Have useful features but should not replace 406 system.

E. Using the Category 1 and 2, 406 EPIRB:

1. Install properly.
2. Test monthly, following manufacturers' instructions.
(99.5 FM tests only 121.5 signal)
3. Once turned on, leave it on, if used in an emergency.
4. Keep with you when leaving the vessel.
5. Keep antennae vertical.
6. Do not allow antennae to touch solid objects - this causes grounding.
7. Include EPIRB use in station bill assignments.
8. The beacon is designed to operate best while floating in water. Hand held operation should be avoided when possible. Do attach beacon to raft or person after deployment.

F. Maintenance

1. Send in your EPIRB registration card.

2. Mount correctly; place in "arm" position.
 3. Avoid overhangs and obstructions; mount in float free location.
 4. Test once a month and log the test. Check antenna for tightness and cracks, check bracket and beacon for deterioration and or residue build up.
 5. Check during and after rough passages.
 6. Instruct all crew in operations; include in orientation.
 7. Replace hydrostatic release every two years or according to manufacturer's specifications.
 8. Replace battery every 5 years or according to manufacturer's specifications.
 9. Confirm registration every 2 years and place new proof of registration decal on EPIRB.
 10. Be sure in confirming registration that the alpha-numeric numbers on the EPIRB are the same as on the registration. Errors have been made that delayed rescue and resulted in fatalities. Confirm the NOAA registration decal alphanumeric number with the EPIRB Unites UIN.
 11. Make sure that a person is tasked with getting the EPIRB in an emergency on their emergency assignment.
 12. Be sure to transfer the EPIRB registration to new owner if it is sold with the vessel.
 13. Make sure the Category 1 EPIRB is installed in the canister correctly, facing correct side.
- G. Demonstrate and TEST EPIRBS IN CLASS with working or dummy EPIRB.
Test may be done on operational EPIRB without alerting SAR.

VI. PYROTECHNICS (Flares)

- A. Approval types.
 1. SOLAS- Saving of Life at Sea.

- a. International standard for vessels operating further from shore
- c. Higher quality, brightness and range.
- 2. If only USCG approved:
 - a. Usually meet requirements only for near shore vessels.
 - b. Lesser quality, brightness and range.
- B. Types- Only red color signals emergency.
 - 1. Meteors:
 - a. Best at night.
 - b. Up to 100 foot height.
 - d. Fast burn time; less than 10 seconds.
 - d. Meets only coastal requirements.
 - 2. Parachute flares:
 - a. Best at night.
 - b. 45-60 second burn time.
 - c. Up to 1000 ft. height.
 - 3. Hand-held flares:
 - a. Longer burn time, 1-2 minutes.
 - b. Best at night.
 - 4. Smoke:
 - a. Best in daytime.
 - b. Most effective in little/no wind.
 - c. Effective 2 to 5 minutes.
 - 5. Dye:
 - a. Best in daytime.

- b. Most effective in calm seas.
- c. Not required for fishing vessels.

B. Safety

1. Treat like a firearm.
2. Read instructions BEFORE you need in an emergency.
3. Hand-helds:
 - a. Can produce hot, dripping slag.
 - b. Use gloves if possible.
4. Meteors and Parachute flares:
 - a. Wind to your back or side.
 - b. Hold at an angle 60 - 80 degrees from horizon, above head.
 - c. Prepare for "kickback" when using parachute flare.
5. Know how to use beforehand.
 - a. Find out what's packed in your raft.
 - b. Purchase the same pyrotechnics for use on board.
6. Turn face away before firing.
7. Do not fire at aircraft.

C. Other Factors:

1. Keep flares in current date.
2. Fire most visible flare first, conserve others.
3. Use others when rescuers are in sight.
4. Fire well in front of aircraft or vessel.
5. On uninspected fishing vessels, outdated flares can be kept in a secondary not as obvious location, for spares.
6. Assign flares to specific person in emergency assignments.

VII. OTHER SIGNALS

- A. Whistles – 3 to 5 times louder than the human voice.
- B. Strobe and other lights:
 - 1. Strobe and “steady” lights
 - a. Update batteries.
 - b. Check bulb regularly.
 - 2. Chemical light sticks:
 - a. Dim in cold water.
 - b. Green and blue light sticks cannot be seen by night vision goggles.
- C. Reflective Tape
 - 1. Replace if yellowed.
 - 2. Replace if torn/damaged.
- D. Mirrors
 - 1. Visible up to 50 miles by aircraft on a clear day.
 - 2. Still useful if overcast, even at night if used with strobe.
- E. Handheld VHF radio
 - 1. Place in waterproof bag.
 - 2. Waterproof radio may be packed with your liferaft.
 - 3. Consider waterproof, floating VHF handheld with DSC.
- F. Electronic flares
 - 1. Waterproof and floats.
 - 2. Lite can be steady stream or pulse.
 - 3. Lasts about 12 hours.
 - 4. Not USCG approved for commercial fishing vessels

VIII. GENERAL SIGNAL TYPES

A. Passive signals – work without you.

1. EPIRBS, lights, wreckage.
2. Use continuously.

B. Active signals – only work with you.

1. Flares, whistles, mirrors.

Generally use only when rescuers are in sight.

2. Radios

IX. GENERAL RULES FOR SIGNAL USE

A. Stay alert; maintain watches.

B. Always have active signals on hand and ready.

C. Protect from accidental loss

D. Emergency signals often used in sets of three; attracts more attention.

X. SUMMARY

- A. Elements of a signal:
 - 1. Attract attention.
 - 2. Send a message.

- B. MAYDAY distress call must include:
 - 1. Vessel name/call sign
 - 2. Location
 - 3. Nature of distress
 - 4. Number POB
 - 5. Vessel description

- C. General alarm:
 - 1. Needs to be heard or seen in all spaces
 - 2. Must be checked before each voyage and once a week.
 - 3. Inoperative alarms must be reported to the vessel operator or owner.

- D. EPIRBS
 - 1. Must be installed properly.
 - 2. Must be tested monthly and logged.
 - 3. Should be included in drills.
 - 4. Send in your 406 registration card!

- E. Pyrotechnics
 - 1. Handle like a firearm.
 - 2. Become familiar with what you have on board.
 - 3. Use when rescuers in sight.

- F. You can't be rescued if no one can see or understand you.

G. Emergency instructions must include procedures for making distress calls.

1. Assignments must be made in the station bill.
2. Should be practiced during drills.

REVIEW QUESTIONS:

1. List two elements of an effective signal.

ANS: Attract attention, send a message.

2. List three advantages of the 406 EPIRB system.

ANS:Signal identifies owner and vessel; faster response; more accurate location.

3. State precautions used when firing flares.

ANS:Know how to use before emergency; read the directions; wind to back or side; protect self from dripping slag; turn face away when firing; do not fire at aircraft.

4. Describe the standard alarm signal for fire and emergency, person overboard, and abandon ship.

ANS:Fire and emergency: continuous ringing of the general alarm or continuous blast of the ships whistle; POB: 3 long blasts repeated four times; abandon ship: 7 short blasts followed by one long, or other signals as determined by master and practiced by crew.

5. All commercial fishing vessels are required to carry day and night visual distress signals. True or false?

ANS:True.

6. Using the flow chart in appendix on EPIRB requirements state what type is required for your vessel.

SKILLS CHECK:

1.Check off for issuing MAYDAY call can be done during class practice or during practice drills.

2. EPIRB testing, arming and battery replacement. Check off can be done during a class practice session.
3. Identify standard alarm signals for fire, emergency, person over board and abandon ship.
4. Use of a signaling device can include a pyrotechnics session if time, expertise and resources allow. DO NOT attempt a hands-on pyrotechnics session unless you can adhere to all safety precautions and are comfortable with the devices being used. Due to safety concerns, this should NOT be a required skill for certification. Remember signaling devices include mirrors, lights and smokes; these are readily available and more safely practiced under minimal supervision.

GUIDELINES FOR PYROTECHNICS DEMONSTRATION

Pyrotechnic demonstrations must be well organized and closely supervised. Set up the procedures for your site following these guidelines and be sure participants understand them. If, at any time, changing circumstances compromise the safety of participants, (changing weather, traffic patterns, etc.) cancel the demonstration. Flare demonstrations are effective but they are also one of the more high risk activities you can conduct.

Select a demonstration site away from hazards (1500 feet vertically and horizontally) and over water, if possible. Pay special attention to vessel traffic, aircraft, fuel tanks, and woods in the area. Plan ahead!

Notify FAA, USCG, SAR organizations, police and fire departments as appropriate. Notify nearby businesses and/or agencies. Give a *Securite* broadcast on VHF radio, channel 16 immediately before and after demonstrations.

Flare demonstrations done during daylight are still effective and allow students to read instructions more clearly.

Survey current weather conditions at the demonstration site. Beware of higher altitude winds which may be different from winds at ground level in force and direction. If the weather poses safety hazards during the demonstration, CANCEL IT!

Be sure to bring:

Flashlight

Flares, carried in metal box

Extra metal box for used flares

First aid kit with burn care supplies

Leather gloves and safety goggles for students

Metal bucket with water for "duds"

Fire extinguisher to extinguish unintentional fires.

Advise students beforehand:

NO SMOKING

Wear old clothes; avoid synthetics like polypropylene, that melt on skin if ignited.

Advise of potential hazards

Children under 18 years should NOT be allowed to handle flares.

Flares should be used by those who have carefully read and understand the instructions. Meteors should be fired one at a time. All flares should be fired away from onlookers in a designated area. Caution students to fire flares so that the wind will take slag and exhaust away from face and hands. Warn students of need to hold parachute flares firmly and expect “kick back” when firing. Direction of parachute flares can be hard to control. If in doubt regarding safety, cancel part or all of this exercise.

POTENTIAL HAZARDS

Burns from exhaust and slag

Meteor flares firing horizontally instead of vertically

Meteors hang up in tube; delayed firing

Flares that fire out the wrong end of tube

Unexpected appearance of vessels, aircraft or traffic in firing area

After the demonstration, clean the area of all firing debris and give a *Securite* broadcast on the radio that the demonstration has concluded. Dispose of expended flares properly.