



UNITED STATES COAST GUARD

**REPORT OF THE INVESTIGATION
INTO THE
FOREIGN PASSENGER VESSEL
WORLD EXPLORER (IMO# 9835719)
PASSENGER DEATHS ON NOVEMBER 15, 2022**



MISLE ACTIVITY NUMBER: 7597646

U.S. Department of
Homeland Security

United States
Coast Guard



Commandant
United States Coast Guard

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16732/IIA #7597646
22 October 2024

**LOSS OF LIFE ON AN EXCURSION VESSEL OPERATING FROM
THE FOREIGN CRUISE SHIP WORLD EXPLORER (IMO# 9835719)
ON NOVEMBER 15, 2022**

ACTION BY THE COMMANDANT

The record and the report of the investigation convened for the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved subject to the following comments. This marine casualty investigation is closed.

COMMANDANT'S ACTION ON SAFETY RECOMMENDATIONS

Recommendation 1: It is recommended that the Commandant engage with the International Maritime Organization (IMO) to create excursion vessel regulations for all Safety of Life at Sea (SOLAS) convention signatory cruise ships operating in the Polar regions. The new IMO regulations should consider crew competency by requiring a national license for operators of these types of vessels and should consider covering minimum manning to account for the Standards of Training and Certification of Watchkeeping (STCW) requirement of maintaining a proper lookout at all times during excursion operations. In addition, these regulatory requirements should consider minimum personal protective equipment (PPE) requirements to protect against cold water immersion.

Action: I concur with the intent of this recommendation. Efforts are needed at all levels of the maritime community to prevent another loss of life or near miss onboard excursion craft operating from passenger ships. For a variety of reasons, including a moratorium on new work outputs of the IMO Maritime Safety Committee, there is not an immediate pathway to develop credentialing requirements as recommended by this Report of Investigation. Therefore, the Coast Guard recommends passenger ship operators, if not already included, develop and implement procedures and best management practices within their Safety Management System, required by SOLAS Chapter IX and the International Safety Management Code, to address excursion operations. Procedures and best management practices should include minimum manning to ensure proper lookout during all excursions, training for the given operating environment, and PPE with immersion protection for cold water regions.

Recommendation 2: It is recommended that the Commandant engage with the International Maritime Organization (IMO) to conduct a study to identify the prevailing risk of inflatable

excursion vessel operations and availability/criteria of casualty information and reporting, with emphasis on Polar regions. Accidents and near-misses that do not result in passenger deaths are not reported to the IMO and may be unreported or overlooked by cruise ship Flag State investigators.

Action: I concur with this recommendation. Recent casualties regarding inflatable excursion vessels in the Polar regions have led to the identification of other significant accidents and near misses which were not required to be reported under existing IMO protocols. An IMO led study could greatly enhance the understanding of risks associated with inflatable excursion vessel operations and any additional risks when these types of inflatable vessels are operated in the Polar regions. Identifying the number and cause of inflatable excursion vessel accidents resulting in injury, death, or near misses with the risk of serious injury or death would be very beneficial toward clearly understanding the associated risks to these types of vessel operations and to making informed future regulatory change requests.

Administrative Recommendation 1: It is recommended that the International Association of Antarctica Tour Operators (IAATO) and International Hydrographic Organization (IHO) focus hydrographic efforts on commonly visited cruise ship locations to better identify potential hazard areas and provide operators with amplifying subsurface information. Experience-based knowledge can be an effective tool to determine potential waterway hazards in excursion routes. However, the weather and sea conditions in the Antarctic region are highly variable, and it is impossible to experience every excursion route under all possible operating conditions. Thus, amplifying hydrographic information is needed so Zodiac operators can increase their knowledge and awareness of potential hazards in commonly visited excursion routes.

Action: I concur with the intent of this recommendation. Carrying out hydrographic efforts in “commonly visited cruise ship locations,” would be vast in scope, difficult to determine, and vary among passenger ship operators. In this case, because of high winds and seas at the preferred location on the north side of Elephant Island, the operators chose to carry out excursion operations on the south side of the island. If the waters of the south side of the island were not deemed a “commonly visited cruise ship location”, no hydrographic information would have been available and thus would not have helped to prevent the casualty. As an alternative, the Coast Guard will encourage passenger ship operators to develop and implement procedures for conducting pre-operational site specific surveys prior to conducting excursion operations. The Coast Guard will also forward a copy of this report to IAATO and IHO for their awareness and consideration of any potential actions.

Administrative Recommendation 2: It is highly recommended that Quark Expeditions and all other International Association of Antarctica Tour Operators (IAATO) members consider amending their current operating procedures to separate the role of vessel operator (operator and lookout) and tour guide until international regulations are established to capture excursion operations in the Polar regions. In this incident, Quark Expeditions’ most senior and experienced operator was not able to maintain complete situational awareness while fulfilling both roles. It is also recommended that these same parties consider the use of additional personal protective equipment (PPE) to protect against cold-water immersion while on Zodiac excursions.

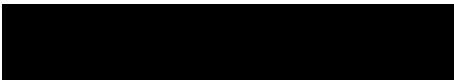
Action: I concur with this recommendation. A distracted inflatable vessel operator who was serving as a tour guide coupled with inadequate PPE that provided no cold-water immersion protection for the passengers contributed to the incident and loss of life in this case. Until international standards are enacted to address these risks, the Coast Guard recommends cruise line operators establish and implement procedures to limit duties of the boat operator, including the addition of a tour guide or to focus on safe operation of the excursion boat and to provide PPE to all passengers that offer suitable immersion protection for cold water regions. To help raise awareness of this recommendation, a copy of this report will be sent to IAATO and the Cruise Lines International Association (CLIA).

Administrative Recommendation 3: It is recommended that the Commandant of the Coast Guard provide a copy of this report to the next-of-kin of the deceased.

Action: I concur with this recommendation. In accordance with Coast Guard policy, a copy of the report and this final action memorandum will be provided to the next-of-kin prior to public distribution.

Administrative Recommendation 4: Recommend this investigation be closed.

Action: I concur with this recommendation. This investigation will be closed in accordance with Commandant Instruction M16000.10(series).


A. M. BEACH
Captain, U.S. Coast Guard
Director of Inspections & Compliance (CG-5PC)

U.S. Department of
Homeland Security

United States
Coast Guard



Commander
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16732
31 JAN 2024

**FOREIGN PASSENGER VESSEL WORLD EXPLORER (IMO# 9835719) PASSENGER
DEATHS ON NOVEMBER 15, 2022**

ENDORSEMENT BY THE ATLANTIC AREA COMMANDER

The record and the report of the investigation convened for the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved subject to the following comments. It is recommended that this marine casualty investigation be closed.

ENDORSEMENT/ACTION ON RECOMMENDATIONS

Safety Recommendation 1. It is recommended that the Commandant engage with the International Maritime Organization (IMO) to create excursion vessel regulations for all SOLAS signatory cruise ships operating in the Polar regions. The new IMO regulations should consider crew competency by requiring a national license for operators of these types of vessels and should consider covering minimum manning to account for the STCW requirement of maintaining a proper lookout at all times during excursion operations. In addition, these regulatory requirements should consider minimum PPE requirements to protect against cold water immersion.

Endorsement: Concur. I have reviewed and concur with this safety recommendation.

Safety Recommendation 2. It is recommended that the Commandant engage with the IMO to conduct a study to identify the prevailing risk of inflatable excursion vessel operations and availability/criteria of casualty information and reporting, with emphasis on Polar regions. Accidents and near-misses that do not result in passenger deaths are not reported to the IMO and may be unreported or overlooked by cruise ship Flag State investigators.

Endorsement: Concur. I have reviewed and concur with this safety recommendation.

Administrative Recommendation 1. It is recommended that International Association of Antarctica Tour Operators (IAATO) and International Hydrographic Organization (IHO) focus hydrographic efforts on commonly visited cruise ship locations to better identify potential hazard areas and provide operators with amplifying subsurface information. Experience-based knowledge can be an effective tool to determine potential waterway hazards in excursion routes. However, the weather and sea conditions in the Antarctic region are highly variable, and it is impossible to experience every excursion route under all possible operating conditions. Thus,

amplifying hydrographic information is needed so Zodiac operators can increase their knowledge and awareness of potential hazards in commonly visited excursion routes.

Endorsement: Concur. I have reviewed and concur with this administrative recommendation.

Administrative Recommendation 2. It is highly recommended that Quark Expeditions and all other IAATO members consider amending their current operating procedures to separate the role of vessel operator (operator and lookout) and tour guide until international regulations are established to capture excursion operations in the Polar regions. In this incident, Quark Expeditions' most senior and experienced operator was not able to maintain complete situational awareness while fulfilling both roles. It is also recommended that these same parties consider the use of additional PPE to protect against cold-water immersion while on Zodiac excursions.

Endorsement: Concur. I have reviewed and concur with this administrative recommendation.

Administrative Recommendation 3. Recommend that the Commandant of the Coast Guard provide a copy of this report to the next-of-kin of the deceased.

Endorsement: Concur. I have reviewed and concur with this administrative recommendation.

Administrative Recommendation 4. Recommend this investigation be closed.

Endorsement: Concur. I have reviewed and concur with this administrative recommendation.



Kevin E. Lunday
Vice Admiral, U.S. Coast Guard
Commander, Atlantic Area

- Enclosures: (1) Executive Summary
(2) Investigating Officer's Report
(3) Endorsement by the OCM



16732
5 Oct 2023

FOREIGN PASSENGER VESSEL WORLD EXPLORER (IMO# 9835719) PASSENGER DEATHS ON NOVEMBER 15, 2022

ENDORSEMENT BY THE OFFICER IN CHARGE, MARINE INSPECTION

The record and the report of the investigation convened for the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved subject to the following comments. It is recommended that this marine casualty investigation be closed.

ENDORSEMENT/ACTION ON RECOMMENDATIONS

Safety Recommendation 1. It is recommended that the Commandant engage with the International Maritime Organization (IMO) to create excursion vessel regulations for all SOLAS signatory cruise ships operating in the Polar regions. The new IMO regulations should consider crew competency by requiring a national license for operators of these types of vessels and should consider covering minimum manning to account for the STCW requirement of maintaining a proper lookout at all times during excursion operations. In addition, these regulatory requirements should consider minimum PPE requirements to protect against cold water immersion.

Endorsement: Concur. I have reviewed and concur with this safety recommendation.

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Endorsement: Concur. I have reviewed and concur with this safety recommendation.

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amplifying hydrographic information is needed so Zodiac operators can increase their knowledge and awareness of potential hazards in commonly visited excursion routes.

Endorsement: Concur. I have reviewed and concur with this administrative recommendation.

Administrative Recommendation 2. It is highly recommended that Quark Expeditions and all other IAATO members consider amending their current operating procedures to separate the role of vessel operator (operator and lookout) and tour guide until international regulations are established to capture excursion operations in the Polar regions. In this incident, Quark Expeditions' most senior and experienced operator was not able to maintain complete situational awareness while fulfilling both roles. It is also recommended that these same parties consider the use of additional PPE to protect against cold-water immersion while on Zodiac excursions.

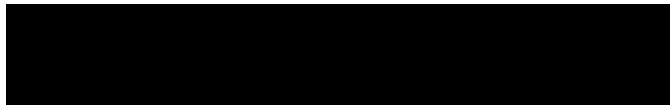
Endorsement: Concur. I have reviewed and concur with this administrative recommendation.

Administrative Recommendation 3. Recommend that the Commandant of the Coast Guard provide a copy of this report to the next-of-kin of the deceased.

Endorsement: Concur. I have reviewed and concur with this administrative recommendation.

Administrative Recommendation 4. Recommend this investigation be closed.

Endorsement: Concur. I have reviewed and concur with this administrative recommendation.



G. M. BAILEY
Captain, U.S. Coast Guard
Officer in Charge, Marine Inspection

Enclosures: (1) Executive Summary
(2) Investigating Officer's Report

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LIST OF ACRONYMS

Acronym	Title
ATS	Antarctic Treatment System
CFR	Code of Federal Regulations
DNV	Det Norske Veritas Germanischer Lloyd – Classification Society
IAATO	International Association of Antarctica Tour Operators
IHO	International Hydrographic Organization
IMO	International Maritime Organization
MOB	Man Overboard
PFD	Personal Flotation Device
PPE	Personal Protective Equipment
SOLAS	Safety Of Life At Sea
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers



16732

October 5, 2023

FOREIGN PASSENGER VESSEL WORLD EXPLORER (IMO# 9835719) PASSENGER DEATHS on NOVEMBER 15, 2022

EXECUTIVE SUMMARY

On the evening of 15 November 2022, the Portuguese-flagged passenger vessel WORLD EXPLORER was anchored off the coast of Elephant Island near Antarctica. Quark Expeditions (Quark), the vessel charterer, was conducting wildlife sightseeing excursion operations and had eight Zodiacs in the water. The inflatable small boats with outboard motors called "Zodiacs" were operated by Quark staff members who held no mariner licenses or credentials, and each vessel carried approximately six passengers per excursion. Zodiac #4 was manned by Quark's expedition leader and was carrying six passengers, including five U.S. citizens, and a Quark ornithologist to assist with spotting wildlife. The passengers and ornithologist were seated on the Zodiac's side pontoon sponsons (inflatable boat tubes), and the vessel operator was standing on the stern manning the tiller on the Zodiac's outboard engine.

Zodiac #4 was travelling at approximately two knots westerly in the direction of Cape Lookout approximately 100 meters away from the shoreline. While the Zodiac was approximately 50 meters outside the surf zone, the operator turned the bow of the vessel starboard towards the surf zone so the passengers could get a better look at the wildlife ashore. After approximately one to two minutes, the operator began turning the boat to port to continue cruising along the shoreline. As the boat was turning, one of the passengers seated on the starboard side of the vessel was the first to identify the hazard and alerted the operator of an approximate two-meter-high wave heading towards the Zodiac. The operator began maneuvering the bow of the Zodiac to port in the direction of the wave.

The breaking wave hit the Zodiac on the port bow and capsized the vessel. All persons onboard were thrown into the water, and three passengers and the ornithologist were trapped underneath the capsized Zodiac. The ornithologist assisted in getting most of the trapped passengers from underneath the Zodiac, and all persons exited the water, approximately 10 to 15 minutes after the capsize, onto shore with assistance or on their own. Two of the male passengers, one 74 years of age and another 80 years of age, on the port side sponson were unresponsive when they were pulled from the water and died as a result of the incident. The other four passengers and two Quark staff members were diagnosed with varying degrees of hypothermia due to their cold-water immersion and lack of hypothermia protection. The WORLD EXPLORER crew, along with Quark staff, conducted emergency rescue operations and assisted with getting all passengers back to the WORLD EXPLORER.

As a result of its investigation, the Coast Guard has determined that the initiating event for this casualty was the capsizing of Zodiac #4 near Elephant Island. This resulted in all persons being discharged into the water leading to the subsequent death of two passengers from asphyxiation by submersion (i.e., drowning) and injury to four passengers and two Quark staff members from cold-water immersion. The causal factors that contributed to this casualty include: (1) failure of Zodiac operator to maintain situational awareness while navigating the Zodiac, (2) the lack/inadequacy of international regulations or industry standards for cruise ship excursion vessels in the Antarctic, (3) a lack of Quark Expeditions policy for lookouts to maintain situational awareness during excursions, (4) a lack/inadequacy of hydrographic data via navigational charts to identify potential navigation hazards, (5) inadequate PPE to protect against cold-water immersion, (6) inability to provide immediate rescue response due to location of the capsizing, and (7) potential complications due to the passengers' age and pre-existing health conditions.



16732
October 5, 2023

**FOREIGN PASSENGER VESSEL WORLD EXPLORER (IMO# 9835719) PASSENGER
DEATHS on NOVEMBER 15, 2022**

INVESTIGATING OFFICER's REPORT

1. Preliminary Statement

- 1.1. This marine casualty investigation was conducted and this report was submitted in accordance with Title 46, Code of Federal Regulations (CFR), Subpart 4.07, and under the authority of Title 46, United States Code (USC) Chapter 63.
- 1.2. Parties In Interest: None
- 1.3. Cooperation with Other Parties
 - 1.3.1. GAMA – Portuguese Maritime Accident Investigation and Aeronautical Meteorology Authority Office
 - 1.3.2. JST – Argentina Marine, Inland Water and Lakes Investigation
 - 1.3.3. NTSB – National Transportation Safety Board
- 1.4. All times listed in this report are approximate and in local time for the area the incident occurred, which is UTC-3 using a 24-hour format.
- 1.5. Units of measurements for distance, length, location, bearings, etc are as indicated.

2. Vessels Involved in the Incident



Figure 1- Photograph of WORLD EXPLORER in Ushuaia Anchorage (taken by USCG 1Dec2022)

Vessel Name:	WORLD EXPLORER
Vessel Identification #:	IMO# 9835719
Vessel Owner	Mystic Cruises
Vessel Charterer	Quark Expeditions
Flag:	Portugal
Call Sign	CQAJ7
MMSI	255806193
Vessel Class/Type/Sub-Type	Foreign Passenger Ship
Passenger # / Crew # (Onboard)	69/108
Build Year:	2019
Gross Tons:	9,923 GT ITC
Length:	126 meters
Breadth:	19 meters
Draft	4.75 meters
Main/Primary Propulsion:	2 Diesel Engines – Bergen C25:33L8P 5330 Kw



Figure 2- Photograph of Zodiac 14 – Same model as capsized Zodiac #4 (taken by USCG 29Nov2022)

Vessel Name:	ZODIAC #4
Call Sign	CQAL5
VIN #	FR-XMPD345CG819
Flag:	N/A
Vessel Class/Type/Sub-Type	Passenger Excursion Vessel, Zodiac MILPRO MK 5 HD
Max Persons	15 total persons (per Mfr data plate)
Build Location	Paris, France
Length:	5.85 meters
Breadth:	2.48 meters
Main/Primary Propulsion:	Yamaha Outboard – Gasoline 60hp

3. Record of Deceased, Missing, and Injured

3.1. WORLD EXPLORER Zodiac #4

Name (First, MI, Last)	Nationality	Sex	Relationship to Vessel	Age	Status
James R. Duport	U.S.	M	Passenger – Cabin 622	74	Deceased
Rex L. Young	U.S.	M	Passenger – Cabin 624	80	Deceased
Injured Passenger #1	U.S.	F	Passenger – Cabin 622	75	Injured
Injured Passenger #2	U.S.	F	Passenger – Cabin 624	61	Injured
Injured Passenger #3	U.S.	F	Passenger – Cabin 616	60	Injured
Injured Passenger #4	British	F	Passenger – Cabin 523	30	Injured
Injured Crewmember #1	Australian	M	Vessel Operator	59	Injured
Injured Crewmember #2	British	M	Ornithologist	33	Injured

4. Findings of Fact

4.1. Incident:

- 4.1.1. On November 7, 2022, The Portuguese-flagged polar class cruise ship WORLD EXPLORER (IMO: 9871531) departed Ushuaia, Argentina, with 69 passengers and 108 crew for a cruise in the Antarctic region. The ship was chartered by the US-based company Quark Expeditions to conduct Antarctic passenger excursions and was carrying Zodiac MILPRO MK 5 HD inflatable boats.
- 4.1.2. On November 15, 2022, the ship initially stopped on the north side of Elephant Island, but due to high winds and seas, Quark staff and ship crew decided not to conduct excursions with outboard inflatable boats, Zodiacs.
- 4.1.3. At approximately 1730, the WORLD EXPLORER transited to the south side of Elephant Island where the ship anchored, and the crew commenced Zodiac operations.
- 4.1.4. The observed weather conditions were clear with wind at approximately 6 knots, 0.5 meters swell, daylight, good visibility. The sea temperature was measured at -1°C (30.2°F), and the air temperature was measured at 9°C (48.2°F).



Figure 3- Satellite view of Elephant Island and location of WORLD EXPLORER (taken from Google)

4.1.5. The WORLD EXPLORER crew prepared and lowered eight excursion Zodiacs into the water to conduct wildlife sightseeing excursions away from the shoreline without any planned landings. Prior to boarding the Zodiacs, all passengers were wearing the Quark-issued waterproof outerwear and inflatable PFDs. No passengers were wearing immersion PPE (i.e., dry suits or immersion suits).



Figure 4 - Quark provided standard PPE for excursion operations (taken by USCG on 30Nov2022)

4.1.6. At approximately 1815, Zodiac #4 was loaded with eight persons:

- One Zodiac operator (Quark team lead), who was in charge of the excursion and the safety of the vessel,
- One ornithologist (Quark staff) who was there as an operator trainee and to help spot wildlife,
- And six passengers.
- Three of the passengers were seated on port side buoyancy tube, and the other three passengers along with the ornithologist were sitting on the starboard buoyancy tube. The operator was standing in the stern of the Zodiac manning the tiller with his left hand. See figure 5 below.

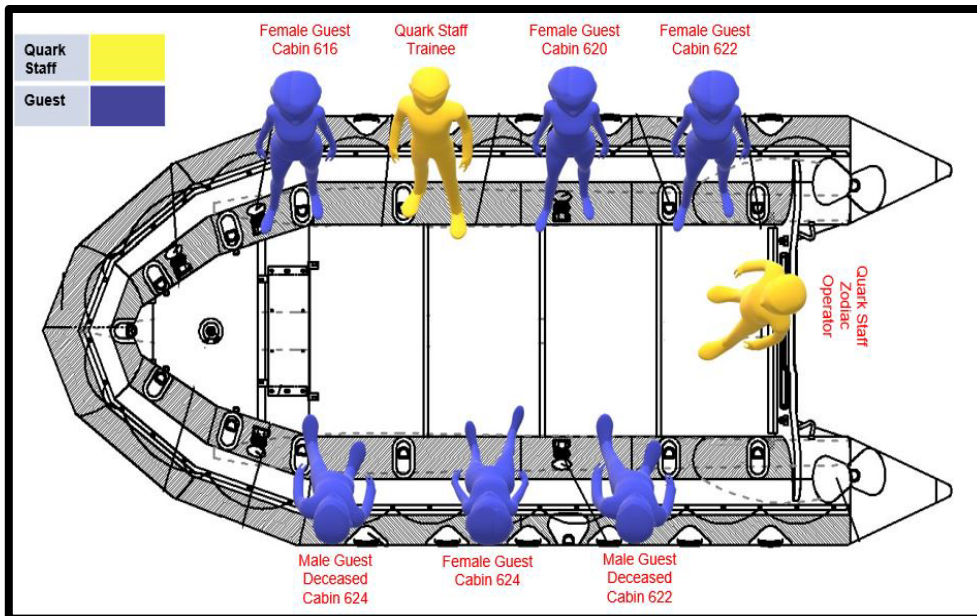


Figure 5 - Depiction of the location of the Quark staff and passengers on Zodiac #4 (created by USCG)

- 4.1.7. Two of the passengers in Zodiac #4 had pre-existing medical conditions. Passenger from cabin 622: Age-74, he experienced a stroke in 2018, and had stenosis of carotid arteries, hypertension, and other medical conditions. He was taking cholesterol and other medications. Passenger from cabin 624: Age-80, he had aortic valve surgery in 2000, and had a mechanical aortic valve and Implantable Cardioverter Defibrillator (ICD) installed. He was taking an anticoagulant along with other medications. Both passenger received a complete health screening within 90 days prior to the cruise.
- 4.1.8. At approximately 1830, Zodiac #4 was away from the ship and travelling west in the direction of Cape Lookout. As required by Quark policy, Zodiac #4 was travelling with another Zodiac, “buddy boat”, who was approximately 50 to 70 meters away. The Zodiac #4 was parallel to the shoreline and approximately 50 meters from the observed surf zone (see figure 6 below). The speed of the Zodiac was approximately 2 knots.
- 4.1.9. The operator of Zodiac #4 turned the bow of the vessel to face the shoreline so the passengers could observe wildlife. A few minutes later, the operator then began to turn the vessel port to continue along the shoreline. He was not watching sea conditions aft of the vessel and was focusing his attention on passenger engagement and the surf zone off the bow of the Zodiac.
- 4.1.10. At approximately 1834, one passenger seated on the starboard side alerted the operator that a breaking wave was approaching in the immediate proximity of the Zodiac.
- 4.1.11. Moments later, the operator of Zodiac #4 turned the bow of the vessel to port towards the direction of the wave, which was approximately two meters in height and already cresting.
- 4.1.12. The breaking wave hit the port bow and capsized Zodiac #4, causing the vessel to flip upside down with the port side rolling over the starboard side. All persons from Zodiac #4 entered the water. The Zodiac operator and three passengers were thrown clear of the Zodiac, while the ornithologist and three other passengers were trapped under the overturned Zodiac. All persons’ PFDs inflated upon entry into the water.



Figure 6 – Picture provided by passenger showing the shoreline during excursion (taken by passenger on 15Nov2022)

- 4.1.13. At 1835, the Quark staff in Zodiac #4 used their VHF radio to broadcast a broken mayday call.
- 4.1.14. At approximately 1835, the Quark staff in the buddy boat for Zodiac #4 heard the broken mayday call from Zodiac #4 and called “MOB” over VHF. The broadcast was received by the bridge team of the WORLD EXPLORER. The buddy boat stated that one Zodiac capsized and that people were in the water. The caller identified the location as the west side of the location known as “Penguin Colony.” The boat number of the capsized Zodiac was not reported.
- 4.1.15. The wave that capsized Zodiac #4 did not occur in the observed surf zone and was not part of a wave set or pattern. The wave was not observed by the buddy boat, which was approximately 50 meters from Zodiac #4 at the time of the capsize.
- 4.1.16. The location of the capsize was approximately 100 meters from the shore and near the mouth of a glacial bay (see figure 7 below). Due to the location of the capsize, emergency response Zodiacs could not directly approach Zodiac #4 and had to transit through the mouth of the glacial bay to a separate landing point. This extended the length of time for rescue personnel to reach the Zodiac to provide emergency medical attention.

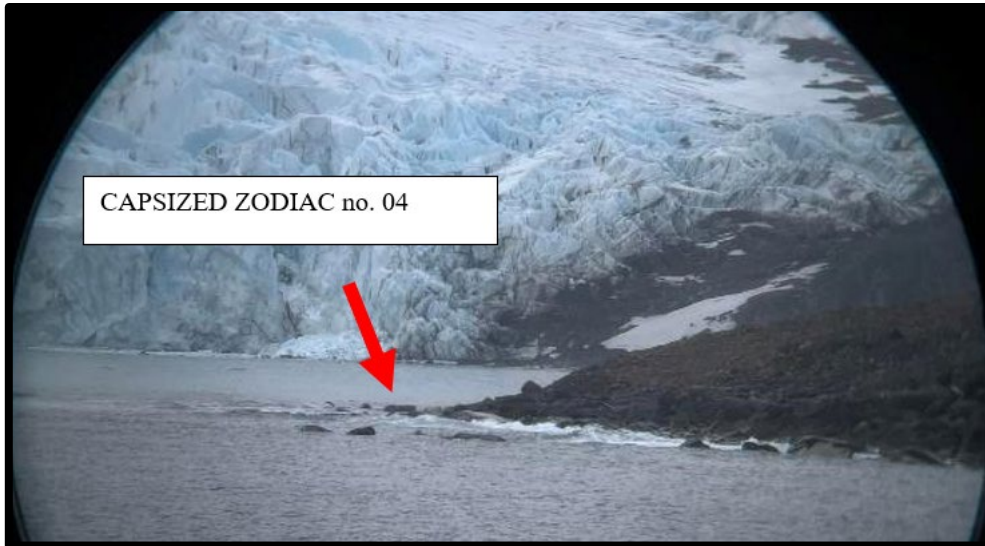


Figure 7 – Area where Zodiac #4 capsized showing glacial bay (provided by Quark Expeditions)

- 4.1.17. At approximately 1836, the WORLD EXPLORER’s Master, Staff Captain, Safety Officer, and doctor were informed of the incident. Quark Expedition’s doctor, on board one of the Zodiacs, called the bridge to inform the ship’s doctor of the situation and to be on standby.
- 4.1.18. At approximately 1837, the persons from Zodiac #4 that were not trapped underneath the Zodiac were struck by several breaking waves as the group floated closer to shore. The trapped ornithologist and passengers exited one at a time from underneath Zodiac #4.
- 4.1.19. At approximately 1845, the overturned Zodiac and all persons drifted into shallow water near the shoreline.
- 4.1.20. At approximately 1848, 10 to 15 minutes from capsizing, the Zodiac carrying the Quark doctor and other staff beached near the scene of the capsizing and began rendering assistance. The Quark doctor pulled the male passenger from cabin 624 from the water up onto shore and began CPR. The Quark ornithologist brought the male passenger from cabin 622 ashore, and CPR was also immediately initiated by Quark staff.
- 4.1.21. The remaining passengers and Quark staff were diagnosed with varying degrees of hypothermia due to their cold-water immersion and began receiving treatment from Quark staff.
- 4.1.22. At 1851, the on-scene Quark doctor called the bridge, via VHF, and informed them that the crew and passengers from the Zodiac carrying the doctor were ashore and that two passengers were receiving CPR. The doctor requested medical equipment, including an AED (defibrillator), and for the WORLD EXPLORER doctor to go ashore.
- 4.1.23. At approximately 1852, the capsized Zodiac beached in the upside-down position in a rocky area of the shoreline.
- 4.1.24. At approximately 1854, the WORLD EXPLORER prepared and launched an additional Zodiac to render assistance. Zodiac #7 proceeded to the scene of the capsizing with the WORLD EXPLORER doctor to assist with AED and blankets.

- 4.1.25. At 1855, the bridge crew of the WORLD EXPLORER called the assisting Quark staff members to ask for a situation report, and was informed that four of the passengers were fine and two were still receiving CPR. WORLD EXPLORER began to heave the anchor to proceed closer to the accident location.
- 4.1.26. At approximately 1905, the Quark doctor declared the male passenger from cabin 622 dead. A later autopsy found that the cause of death was asphyxiation by submersion.
- 4.1.27. At 1910, the WORLD EXPLORER doctor called the bridge and informed them they were able to get ashore but needed more medical equipment at the accident location. On-scene staff also called back to say that one person was still receiving active CPR, three passengers would be returning to WORLD EXPLORER, and that two staff needed rewarming.
- 4.1.28. At approximately 1945, the Quark doctor declared the male passenger from cabin 624 dead. A later autopsy found that the cause of death was asphyxiation by submersion.
- 4.1.29. At approximately 1954, WORLD EXPLORER arrived closer to the location of the capsized, and the assisting staff members brought the injured and deceased passengers from Zodiac #4 back to the ship for further medical attention.
- 4.1.30. At approximately 2155, the capsized Zodiac #4 was towed off the rocks and brought back on board the WORLD EXPLORER. During that evolution, the Zodiac sustained extensive damage to the skeg, propeller, and engine body.



Figure 8 – Photos of damaged Zodiac #4 showing broken antenna and tiller (provided by Quark Expeditions)



Figure 9 – Photos of damaged propeller on Zodiac #4 (provided by Quark Expeditions)

- 4.1.31. At approximately 0735 on November 16, 2022, the Master of the WORLD EXPLORER directed an alcohol test for the capsized Zodiac operator. The results of the test were negative.
- 4.1.32. On November 17, 2022, Portugal Flag State provided a Substantially Interested State (SIS) notification to U.S. Coast Guard regarding the deaths of the two U.S. citizens.

4.2. Additional/Supporting Information

- 4.2.1. The WORLD EXPLORER was owned and operated by the Portuguese company Mystic Cruises, S.A. and chartered by the US-based company Quark Expeditions to conduct Antarctic passenger excursions. As part of that agreement, Mystic Cruises provided all crew for the WORLD EXPLORER, and conducted all shipboard operations. Quark Expeditions was responsible for all off-ship passenger excursions including Zodiac tours.
- 4.2.2. The Zodiacs provided by Quark Expeditions were model MILPRO MK 5 HD inflatable boats. The vessels were rated with a maximum persons count of 15 and were not self-righting.
- 4.2.3. Existing international regulations do not govern Zodiac excursion operations from passenger vessels. IMO MSC.1/Circ.1417 outlines guidelines for tender vessels, but specifically excluded excursion operations from inflatable boats and placed the responsibility on Coastal States to regulate. Multiple nations (i.e., Norway) have established Coastal State regulations for inflatable vessel excursion operations in polar regions. However, the Antarctic region is governed by the Antarctic Treaty System (ATS), which has not established any excursion vessel regulations.
- 4.2.4. Quark Expeditions maintained an extensive set of operating policies regarding excursion operations, safety, and other topics. One of these requirements was for the Zodiac excursion vessels to travel in pairs (or “buddy boats”) for safety purposes. However, Quark did not require Zodiac operators to be licensed or credentialed mariners or have small boat-specific international certifications.
- 4.2.5. There was no Quark Expeditions Zodiac operating requirement for separating the roles of tour guide, lookout, and Zodiac operator. The company standard practice was for one person to assume responsibility for all three roles simultaneously. Quark

Expeditions maintained an in-house five-day training program designed to provide Antarctic specific instruction to new Zodiac operators.

- 4.2.6. Quark Expeditions had limited requirements in the Small Vessel Operations manual for passenger PPE. The company provided waterproof outerwear for all persons but did not mandate or voluntarily offer immersion PPE (i.e., dry suits or immersion suits) to wear on the excursions. In addition to the provided safety equipment, a safety briefing was given during each passenger's first Zodiac excursion.
- 4.2.7. The operator of Zodiac #4 was the Quark Expedition Leader for the entire cruise and had 19 years of experience operating Zodiacs in Polar regions. The operator was Quark's most experienced Zodiac operator. However, he did not have a national license or credential or Flag State endorsement for small passenger vessel operations.
- 4.2.8. The Antarctic region had limited near shore charts indicating bottom contours and potentially hazardous areas. Zodiac operators conducting excursions at Elephant Island relied on local knowledge of excursion areas. The operator of the capsized Zodiac had no specific hydrographic data for the area the capsized occurred.

5. Analysis

5.1. Failure of Zodiac operator to maintain situational awareness while navigating the Zodiac.

- 5.1.1. Quark Expeditions assigned one staff member to act as the Zodiac operator, lookout, and tour guide on each excursion vessel. The Zodiac operator was responsible for operating the Zodiac engine, engaging with passengers throughout the trip, and maintaining a lookout for navigational hazards such as ice, shoals, or other obstacles. Immediately prior to the capsizing, the Zodiac operator pointed the bow of the zodiac towards shore and was engaging with passengers regarding the wildlife in front of the vessel. Due to his position in the Zodiac, he was facing ahead towards the shoreline. He was also watching the shore break in front of the vessel to avoid entering the surf zone. Since he was engaging with passengers and watching the shoreline while also operating the outboard engine, he was unable to maintain situational awareness and observe any potential hazards approaching from the stern of the Zodiac. Of note, the operator for Zodiac #4 was the most experienced Quark employee on the entire Antarctic voyage. Thus, his failure to maintain situation awareness did not appear to be caused by a lack of experience or skill. Moreover, there is a reasonable probability that any of the other Quark staff would have experienced a similar loss of situational awareness based on their relative experience and skill levels in conducting Zodiac excursions for Quark Expeditions.

5.2. Lack/inadequacy of international regulations or industry standards for cruise ship excursion vessels in the Antarctic.

- 5.2.1. The Zodiacs that operated excursions from WORLD EXPLORER did not carry dedicated lookouts or nationally licensed/credentialed operators. Neither a dedicated lookout nor a nationally licensed operator was required by governing regulatory bodies or identified as industry standards. STCW Code Chapter VIII Part 4-1.14 required, "a proper look-out shall be maintained at all times...and shall serve the purpose of maintaining a continuous state of vigilance by sight and hearing...with regard to any significant change in the operating environment." However, SOLAS did not contain international regulations governing cruise ship excursion vessels and did not extend the STCW watchkeeping requirements to these vessels. Furthermore,

there are no excursion operation regulations in the IMO Polar Code, Resolution MSC.385(94), that are applicable to the waters around Antarctica. While IMO MSC.1/Circ.1417 established guidelines for tender vessels, it specifically excluded excursion operations from inflatable boats (i.e., Zodiacs) and placed the responsibility on Coastal States to regulate. The Antarctic region is governed by the ATS, which cannot establish binding Coastal State regulations for all vessels in Antarctic waters. Even if the ATS established inflatable excursion vessel regulations, they would only be applicable to ATS signatory countries. Moreover, International Association of Antarctica Tour Operators (IAATO) did not identify any industry best practices for excursion vessel crew sizes or license requirements while operating Zodiacs in and around Antarctica. General IAATO standards are voluntary, but there is no guidance or best practices in this area that could have influenced Quark's operating policies.

5.2.2. In addition to operating standards, there also appears to be a gap in reporting requirements due to varying Flag State reporting thresholds. Several casualties were found through an online search that were not covered by any type of official Flag State investigation. Approximately one month after the WORLD EXPLORER Zodiac #4 capsized, it is reported a similar Zodiac carrying passengers from the foreign passenger vessel SILVER WIND capsized in Antarctica due to a slab of snow falling into the water. Preliminary information indicates no passengers died, so an official investigation was not completed. The WORLD EXPLORER and SILVER WIND incidents indicate a potential trend in Zodiac casualties which have not yet been identified/reported for the purpose of implementing passenger safety regulations.

5.3. Lack of Quark Expeditions policy for lookouts to maintain situational awareness during excursions.

5.3.1. As previously identified, the operator of Zodiac #4 lost situational awareness immediately prior to the capsizing. Quark did not have a policy in place for a dedicated lookout, independent of the vessel operator or excursion guide, to maintain situational awareness during excursions. The addition of a second Quark employee to assume one of the three simultaneous roles onboard the Zodiac would have allowed the lookout to maintain focus on the operating environment and mitigate surprise hazards from reaching the boat.

5.4. Lack/inadequacy of hydrographic data via navigational charts to identify potential navigation hazards.

5.4.1. The Antarctic region had limited and outdated near-shore charts for identifying bottom contours and potentially hazardous areas. Additionally, bottom contours and hazardous areas shift over time based on glacial activity and prevailing currents. The area where Zodiac #4 capsized had an uncharted underwater feature that caused a breaking wave to occur away from the prevailing surf zone at Elephant Island. Quark's Zodiac operators had to rely on experience-based knowledge of excursion areas for safe operations. However, the wave that caused Zodiac #4 to capsize was not part of a wave set or normally reoccurring pattern, so experience-based knowledge was insufficient to identify the hazard. If the area in which Zodiac #4 had been recently charted, it is possible that the Zodiac operators could have identified the potential hazard before the wave occurred. This would have allowed all the Zodiacs to avoid the immediate area and keep the excursions in safer water.

5.5. Inadequate PPE to protect against cold water immersion.

5.5.1. All passengers onboard Zodiac #4 were wearing waterproof outerwear to protect against atmospheric elements. None of the passengers wore protective outerwear to insulate against cold water immersion (i.e., dry suits or immersion suits). The recorded water temperature on the day of the incident was -1 degree Celsius (30.2°F), which can dramatically reduce the survival time of persons in the water. This is because immersion into cold water causes rapid hypothermia and reduces the ability to hold breath, increasing the chance of aspiration and drowning.

5.6. Inability to provide immediate rescue response due to the location of the capsized.

5.6.1. A Quark Expedition policy regarding Zodiac excursion operations requires vessels to travel in pairs (or “buddy boats”) to render emergency assistance if necessary. During this incident, Zodiac #4 was traveling with a “buddy boat” approximately 50 meters away. Due to the location of the capsized, emergency response Zodiacs could not directly approach Zodiac #4 and had to transit through the mouth of the glacial bay to a separate landing point. This extended the length of time for rescue personnel to reach the Zodiac to provide emergency medical attention.

5.7. Potential complications due to the passengers’ age and pre-existing health conditions.

5.7.1. Pre-existing cardiac medical conditions have been documented as being predisposing factors for cold-water death occurrences. One of the passengers on Zodiac #4 had carotid artery stenosis and hypertension, and another passenger had aortic valve surgery in 2000, a mechanical aortic valve, and an Implantable Cardioverter Defibrillator (ICD). Although the autopsies did not correlate the pre-existing medical conditions to the causes of death, they could not be ruled out as predisposing factors that worsened the effects of cold-water immersion after the Zodiac capsized.

6. Conclusions

6.1. Determination of Cause:

6.1.1. The initiating event for this casualty was the wave impact and Zodiac capsized. The causal factors leading to this event were:

6.1.1.1 Failure of Zodiac operator to maintain situational awareness while navigating the Zodiac.

6.1.1.2 Lack/inadequacy of international regulations or industry standards for cruise ship excursion vessels in the Antarctic.

6.1.1.3 Lack of Quark Expeditions policy for lookouts to maintain situational awareness during excursions.

6.1.1.4 Lack/inadequacy of hydrographic data via navigational charts to identify potential navigation hazards.

6.1.2. The subsequent event after the Zodiac capsized was the discharge of all persons entering the water.

- 6.1.3. The next unwanted event after the discharge of all persons into the water was the hypothermia of four Zodiac passengers and two Quark staff. The causal factor leading to this event was:
 - 6.1.3.1. Inadequate PPE to protect against cold water immersion.
- 6.1.4. The next unwanted event was the death of the passenger from cabin 622 due to asphyxiation by submersion (i.e., drowning). The causal factors leading to this event were:
 - 6.1.4.1. Inadequate PPE to protect against cold water immersion.
 - 6.1.4.2. Inability to provide immediate rescue response due to location of the capsized.
 - 6.1.4.3. Potential complications due to the passenger's age and pre-existing health conditions.
- 6.1.5. The next unwanted event was the death of the passenger from cabin 624 due to asphyxiation by submersion (i.e., drowning). The causal factors leading to this event was:
 - 6.1.5.1. Inadequate PPE to protect against cold water immersion.
 - 6.1.5.2. Inability to provide immediate rescue response due to location of the capsized.
 - 6.1.5.3. Potential complications due to the passenger's age and pre-existing health conditions.
- 6.2. Evidence of Act(s) or Violation(s) of Law by Any Coast Guard Credentialed Mariner Subject to Action Under 46 USC Chapter 77: None.
- 6.3. Evidence of Act(s) or Violation(s) of Law by U.S. Coast Guard Personnel, or any other person: None.
- 6.4. Evidence of Act(s) Subject to Civil Penalty: None.
- 6.5. Evidence of Criminal Act(s): None.
- 6.6. Need for New or Amended U.S. Law or Regulation: The need for new regulations exists for IMO, as discussed in section 8.1.
- 6.7. Unsafe Actions or Conditions that Were Not Causal Factors: None.

7 Actions Taken Since the Incident

7.1. Portuguese Investigative Final Report:

- 7.1.1. On May 2, 2023, Portuguese Maritime Accident Investigation office released their final investigative report.

7.2. Mystic Cruises, S.A., and Quark Expeditions Action Taken:

- 7.2.1. Mystic Cruises, S.A., and Quark Expeditions conducted an internal investigation into the incident, and a review of their operating procedures. No official statement was provided for this report.

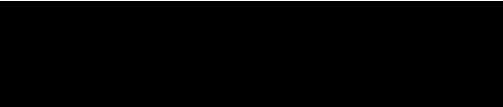
8 Recommendations

8.1. Safety Recommendations:

- 8.1.1. It is recommended that the Commandant engage with the International Maritime Organization (IMO) to create excursion vessel regulations for all SOLAS signatory cruise ships operating in the Polar regions. The new IMO regulations should consider crew competency by requiring a national license for operators of these types of vessels and should consider covering minimum manning to account for the STCW requirement of maintaining a proper lookout at all times during excursion operations. In addition, these regulatory requirements should consider minimum PPE requirements to protect against cold water immersion.
- 8.1.2. It is recommended that the Commandant engage with the IMO to conduct a study to identify the prevailing risk of inflatable excursion vessel operations and availability/criteria of casualty information and reporting, with emphasis on Polar regions. Accidents and near-misses that do not result in passenger deaths are not reported to the IMO and may be unreported or overlooked by cruise ship Flag State investigators.

8.2. Administrative Recommendations:

- 8.2.1. It is recommended that IAATO and IHO focus hydrographic efforts on commonly visited cruise ship locations to better identify potential hazard areas and provide operators with amplifying subsurface information. Experience-based knowledge can be an effective tool to determine potential waterway hazards in excursion routes. However, the weather and sea conditions in the Antarctic region are highly variable, and it is impossible to experience every excursion route under all possible operating conditions. Thus, amplifying hydrographic information is needed so Zodiac operators can increase their knowledge and awareness of potential hazards in commonly visited excursion routes.
- 8.2.2. It is highly recommended that Quark Expeditions and all other IAATO members consider amending their current operating procedures to separate the role of vessel operator (operator and lookout) and tour guide until international regulations are established to capture excursion operations in the Polar regions. In this incident, Quark Expeditions' most senior and experienced operator was not able to maintain complete situational awareness while fulfilling both roles. It is also recommended that these same parties consider the use of additional PPE to protect against cold-water immersion while on Zodiac excursions.
- 8.2.3. Recommend that the Commandant of the Coast Guard provide a copy of this report to the next-of-kin of the deceased.
- 8.2.4. Recommend this investigation be closed.


Chief Warrant Officer, U.S. Coast Guard
Investigating Officer