02-208-FP

JOINT

MARITIME INVESTIGATOR, OSLO, NORWAY

UNITED STATES COAST GUARD

REPORT OF INVESTIGATION INTO THE CIRCUMSTANCES SURROUNDING THE GROUNDING OF THE

MONARCH OF THE SEAS

ON PROSELYTE REEF IN GREAT BAY, PHILIPSBURG, ST. MAARTEN, NETHERLANDS ANTILLES ON DECEMBER 15, 1998

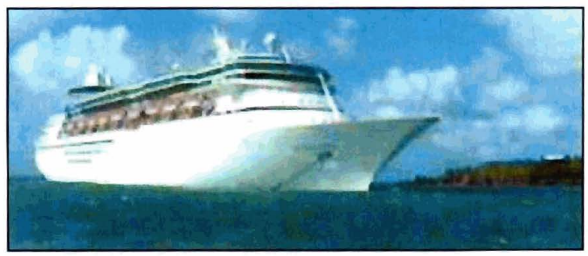
RESULTING IN MAJOR VESSEL DAMAGE, NO LOSS OF LIFE AND MINOR POLLUTION

MARINE CASUALTY REPORT

MONARCH OF THE SEAS - LAMU4 - grounding on 15 December 1998

The present report contains the following:

1. Information on the ship.
2. Information on the marine casualty.
3. The sequence of events.
4. Further investigation/information.
5. Facts established and comments.
6. Conclusions.
7. Lessons to be learned.
8. Recommended Safety Actions.



MONARCH aground in Philipsburg harbor.

This marine casualty report is a joint Norwegian/U.S. Coast Guard report prepared by the Maritime Investigator in Oslo and the United States Coast Guard, Office of Investigations and Analysis, Washington, D.C.

1. INFORMATION ON THE SHIP

Name of ship	: *MONARCH OF THE SEAS*
Home port	: Oslo, Norway
IMO no.	: 8819500
Signal letters	: LAMU4
Type of ship	: Passenger ship
Year of build (keel laid)	: 31 July 1989
Compartments	: Two-compartment ship
Tonnage	: 73,937 grt
Propulsion power	: 20,490 kW
Crew	: 831
Passengers	: 2,557
Owner	: Monarch of the Seas, Inc., 80 Broad Street, Monrovia, Liberia.
Norwegian company under the NIS Act	: Anders Wilhelmsen & Co., P.O. Box 1583 Vika, N-0118 Oslo, Norway.
Managing company	: Royal Caribbean International, 1050 Caribbean Way, Miami, Florida 33132-2096
Classification society	: Det Norske Veritas

MONARCH OF THE SEAS has a Passenger Ship Safety Certificate for International Voyages issued by the Norwegian Ship Control in Oslo on 9 November 1998 and valid until 31 October 1999. The ship is permitted to carry a total of 2,766 passengers and provided with life-saving appliances for a total of 3,600 persons.

The main propulsion machinery of *MONARCH OF THE SEAS* consists of four Wärtsila - Pielstick engines of 7,425 horsepower each. There are two KaMeWa propellers and two KaMeWa bow thrusters. Full speed is approximately 19.5 knots. At full speed the crash stop distance is 1,050 m. At half speed the crash stop distance is 930 m.

MONARCH OF THE SEAS is equipped with; *inter alia*, the following primary navigation equipment:

- Two radars, Sperry Marine Rascar 3,400 m, one of 10 cm and one of 3 cm, all with ARPA equipment.
- One gyrocompass, Sperry Marine.
- One magnet compass, Marine Data Ltd.
- One course plotter, ToKimec.
- One echo sounder, Skipper ED 162.
- Two GPS units, Navigator Mx 200 Professional and Trimble Navigator NT 200.
- One Loran, North Star GPS Loran 800.

Chart room navigational equipment

2. INFORMATION ON THE MARINE CASUALTY

Executive Summary

At approximately 0030 hours on the night of 15 December 1998, the passenger vessel MONARCH OF THE SEAS arrived outside of Great Bay, St. Maarten in order to evacuate a sick passenger to a shore side medical facility. At 0125 the vessel's crew completed the passenger evacuation evolution and the MONARCH OF THE SEAS departed St. Maarten, taking a South-Southeasterly departure route with the intention of safely passing to the east of the Proselyte reef obstruction. At approximately 0130 hours the *MONARCH OF THE SEAS* raked the Proselyte Reef at an approximate speed of about 12 knots without becoming permanently stranded. Almost immediately emergency and abandon ship signals were sounded and the crew and passengers were mustered at their abandon ship stations. At 0235 the vessel was intentionally grounded on a sandbar in Great Bay, St. Maarten. By 0515 hours all 2,557 passengers were safely evacuated ashore by shore based tender vessels.

The nature of the casualty	: Grounding
Place of accident	: East side of Proselyte Reef (south of Philipsburg, St. Maarten, the Netherlands Antilles)
Time of accident	: 15 December 1998 at 0130 hours LT
Vessel's draught	: Fwd: 7.65 meters / Aft: 7.50 meters
Extent of damage	: Great damage to the bottom and water ingress
Measures taken to stop water ingress	: The ship was grounded on a sandbank in Great Bay, St. Maarten
Evacuation	: All 2,557 passengers were evacuated from the ship by tenderboats from St. Maarten
Lives lost	: None
Pollution	: Slight oil pollution

View of lifeboats from the starboard bridge wing looking aft. Note oil spill.

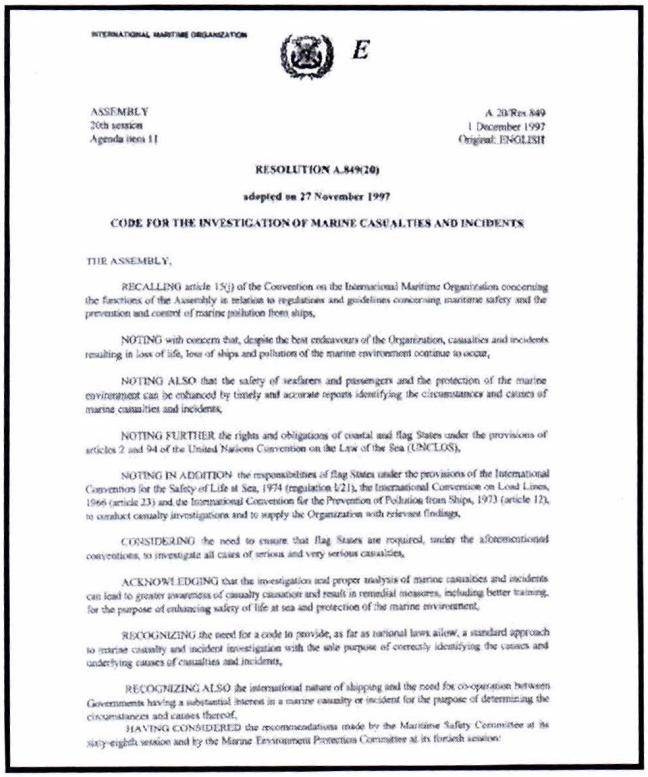
2.1 Information on the investigation of the marine casualty

A maritime inquiry was held by consular court on board the ship *MONARCH OF THE SEAS* and at the Great Bay Hotel, St. Maarten on 18 and 19 December 1998. The president of the court was Consul General Expert court Investigators were Mr. [redacted] and Mr. [redacted].

The following representatives were present at the maritime inquiry and had the opportunity to ask the witnesses questions:

[redacted], RCCL/Keller & Houck
[redacted], RCCL
[redacted], Maritime Investigator, Oslo
[redacted], Norwegian Maritime Directorate
[redacted], Nautical Expert, Neth. Antilles
[redacted] St. Maarten Port Authority NV
[redacted] St. Maarten Port Authority NV
Lt. [redacted], U.S. Coast Guard MSD, Miami, Florida
Lt. [redacted], U.S. Coast Guard MSD, St. Thomas, USVI
Timothy J. Farley, U.S. Coast Guard, Office of Investigations & Analysis, Washington DC

The above representatives were in agreement on using the recommended IMO Code for the Investigation of Marine Casualties and Incidents (A849(20)) as a guideline for the investigation.



INTERNATIONAL MARITIME ORGANIZATION

E

ASSEMBLY
20th session
Agenda item 11

A 20/Res.849
1 December 1997
Original: ENGLISH

RESOLUTION A.849(20)

adopted on 27 November 1997

CODE FOR THE INVESTIGATION OF MARINE CASUALTIES AND INCIDENTS

THE ASSEMBLY,

RECALLING article 15(j) of the Convention on the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety and the prevention and control of marine pollution from ships,

NOTING with concern that, despite the best endeavours of the Organization, casualties and incidents resulting in loss of life, loss of ships and pollution of the marine environment continue to occur,

NOTING ALSO that the safety of seafarers and passengers and the protection of the marine environment can be enhanced by timely and accurate reports identifying the circumstances and causes of marine casualties and incidents,

NOTING FURTHER the rights and obligations of coastal and flag States under the provisions of articles 2 and 94 of the United Nations Convention on the Law of the Sea (UNCLOS),

NOTING IN ADDITION the responsibilities of flag States under the provisions of the International Convention for the Safety of Life at Sea, 1974 (regulation I/21), the International Convention on Load Lines, 1966 (article 23) and the International Convention for the Prevention of Pollution from Ships, 1973 (article 12), to conduct casualty investigations and to supply the Organization with relevant findings,

CONSIDERING the need to ensure that flag States are required, under the aforementioned conventions, to investigate all cases of serious and very serious casualties,

ACKNOWLEDGING that the investigation and proper analysis of marine casualties and incidents can lead to greater awareness of casualty causation and result in remedial measures, including better training, for the purpose of enhancing safety of life at sea and protection of the marine environment,

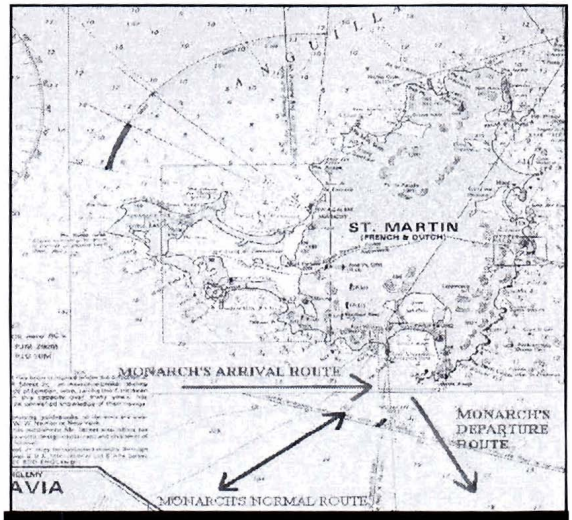
RECOGNIZING the need for a code to provide, as far as national laws allow, a standard approach to marine casualty and incident investigation with the sole purpose of correctly identifying the causes and underlying causes of casualties and incidents,

RECOGNIZING ALSO the international nature of shipping and the need for co-operation between Governments having a substantial interest in a marine casualty or incident for the purpose of determining the circumstances and causes thereof,

HAVING CONSIDERED the recommendations made by the Maritime Safety Committee at its sixty-eighth session and by the Marine Environment Protection Committee at its fortieth session,

3. THE SEQUENCE OF EVENTS

3.1 Chronology



MONARCH's approximate route.

At about 0030 hours on the night of 15 December 1998, the MONARCH OF THE SEAS arrived outside Great Bay, St. Maarten. The ship, which was initially enroute from St. Thomas, U.S. Virgin Islands to Martinique, had deviated from its intended course in order to sail into St. Maarten to disembark a sick passenger who needed immediate shore side medical treatment. After the MONARCH OF THE SEAS arrived at the prearranged meeting point the passenger, together with the ship's doctor and nurse, was transported ashore via a shore side launch. While the vessel awaited the return of the vessel's crew, the ship drifted freely on an easterly heading in a position about four cable lengths (0.4 nm) south of Fort Amsterdam.

At about 0125 hours the doctor and nurse returned to the vessel. The ship's master himself then piloted the ship to starboard from an easterly course heading, steadied the vessel up and set a departure course of 160 degrees true to pass east of the Proselyte reef. This course was based largely on the master's mariner eye as well as on the Officer of the Watch's (hereinafter the OOW) feedback that the Automatic Radar Plotting Aid's (ARPA's) calculated Closest Point of Approach (CPA) to the Proselyte reef lighted buoy on the 160 degree course was three (3) cables off (0.3 nm). The master felt that this course provided the vessel a safe passage to the east of Proselyte reef as well as would allow a safe passage astern of an outbound sailboat that was just to the south and ahead of the MONARCH OF THE SEAS in the vicinity of the Proselyte Reef lighted buoy. The course of 160 degrees was established without first sufficiently determining the initial position of the vessel. Further, no track line for the 160 degree course was laid down or marked on the navigational chart in use at the time nor was the 160 degree course part of the voyage plan from St. Maarten to Martinique. Additionally, the ship's chart used at the time of the grounding, U.S. no. 25613, was not updated in accordance with *Notices to Mariners* no. 32/98 with respect to an updated position of the lighted buoy on Proselyte Reef.

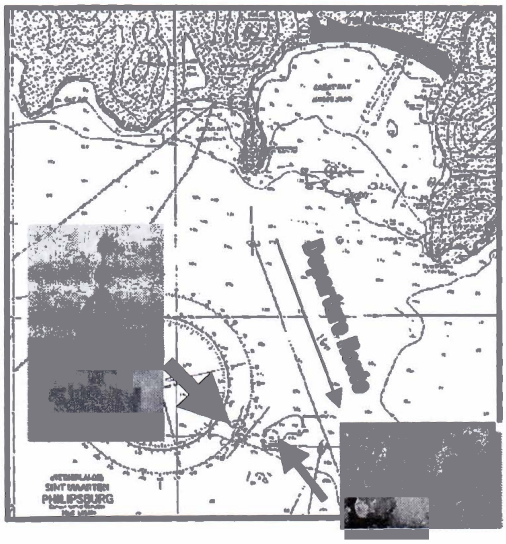


Chart of Great Bay

At the time of the vessel's departure from St. Maarten, the persons present on the bridge were the master, the staff captain, the OOW who was the ship's second officer, the helmsman (an experienced off-duty helmsmen asked to stand in for the less duty helmsman), and the duty helmsman who served as the lookout. At about 0128 hours and, after steadying the vessel on a course of 160 degrees true, the master handed over the navigational watch to the OOW but not before asking the question, "How are we doing with clearance to buoy?" To this the OOW replied, "Closest point would be three cables off and safe." This verbal exchange was accomplished while visually observing the Proselyte Reef lighted buoy 60-70 degrees on the starboard bow but without first checking the vessel's actual position on the navigational chart.

MONARCH's bridge, view from centerline forward to starboard. Hooded equipment on middle-left of photo is the ARPA in use by the OOW at the time of casualty.

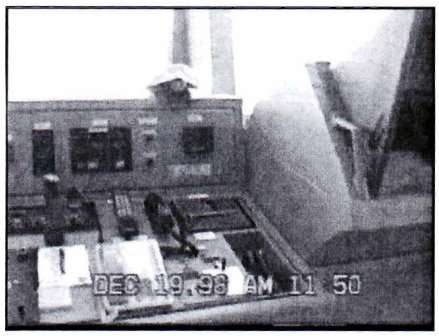
Satisfied that all was well, the master immediately left the bridge, returning shortly thereafter to briefly ask the navigational watch if they had forgotten anything because it seemed so quiet. After receiving a positive confirmation that all was well the master left the bridge and retired below to his stateroom. Upon the master's departure, the ship was on a true course of 160 degrees and had reached a speed of 5-6 knots. The staff captain, who was monitoring the propulsion machinery console and bringing the ship's engines up to speed, did not take part in the navigation although he was surprised that the course was set to pass east of the Proselyte Reef lighted buoy which was not the customary departure route. Weather conditions were fine and clear, with a moderate easterly breeze and good visibility.

The OOW, who had roughly seven (7) months' seagoing experience as a navigator and who had not previously transited the area during night-time hours nor had ever sailed to the east side of Proselyte Reef, checked the ship's position merely by plotting the Proselyte Reef lighted buoy on radar by means of the ARPA. The ARPA computer calculated that, on the course heading of 160 degrees true, the closest point of approach (CPA) to the Proselyte reef lighted buoy would be 3 cable lengths (approximately 555 meters or 0.3 nm), a distance that both the master and OOW thought was safe. Once abeam of the lighted buoy a course change to 190 degrees true could be made in order to come to the intended 180 degree course to Martinique. The resultant set and drift due to an easterly wind and current moving the ship westwards was not taken into consideration while transiting to the east of the Reef. Further, the OOW failed

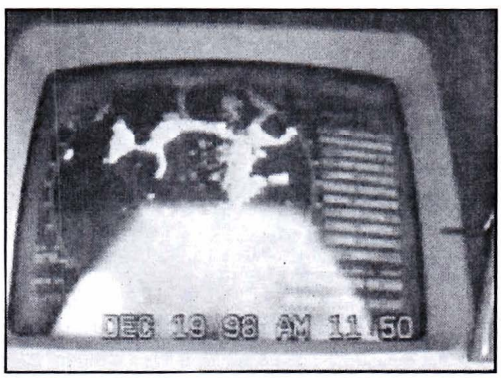
Starboard side of bridge looking toward steering station and starboard ARPA.

to input, either manually or automatically, set/drift calculations into the ARPA nor did he ground lock the ARPA.

The OOW planned to change course to 190 degrees true when the vessel was abeam of the Proselyte Reef lighted buoy. Immediately before the intended course change and while he was monitoring the vessel's progress on the ARPA, the OOW received a telephone call from the purser's desk concerning a passenger who had complained of noise near his cabin. The OOW promised to dispatch someone to look into the matter. At about the same time, an automatic smoke detector alarm also sounded on the bridge. The lookout responded to this alarm, found all was well and then silenced the alarm



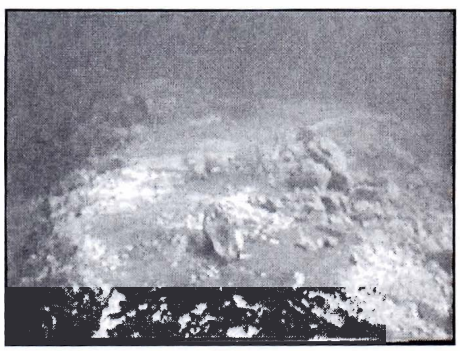
OOW's approximate location when taking the telephone call from the purser's office. Starboard APRA is to the right in photo.



ARPA display showing Great Bay

Almost immediately after hanging up the telephone with the pursers' desk the OOW observed the Proselyte Reef lighted buoy abeam to starboard both visually and on the radar. He also observed on the ARPA that the ship was three cable lengths off (0.3 nm) the buoy. At that moment he ordered the helmsman to change the course to starboard and to steady up on a true course of 190 degrees. No visual bearings were taken nor were any other navigational instruments used. The only instrument used to determine the ship's position in relation to the aforementioned lighted-buoy was the ARPA.

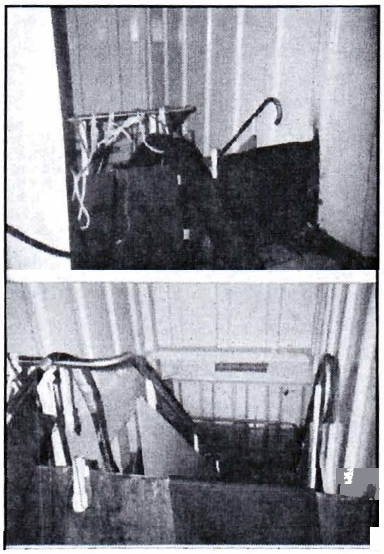
At about 0130 hours, at the point where the ship had started turning to starboard and had reached a course of approximately 163-164 degrees, the *MONARCH OF THE SEAS* raked the Proselyte Reef at an approximate speed of 12 knots without becoming permanently stranded.



Reef Damage

Diver surveying a crack in bottom shell plate

After sensing the resultant vibration from the grounding, the master immediately returned to the bridge and took over the command of the ship. There was considerable water ingress in several tanks and watertight compartments and the vessel settled in the water down by the head.

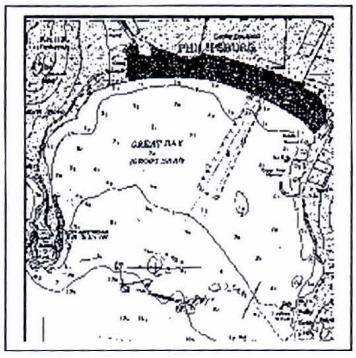


Resultant flooding of stairwell on main deck, port side, forward passageway. Note the welded steel plate across opening to prevent further progressive flooding.

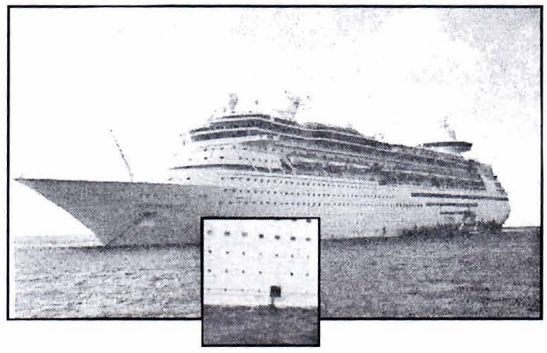
At about 0135 hours and owing to the water ingress, all watertight doors were closed from the bridge with the exception of watertight door number ten (10) which was discovered later in an opened position by the ship's safety officer and was subsequently closed. After consulting with the senior officers on board and others, the master decided the most appropriate course of action was to return to St. Maarten and intentionally ground the ship on a sandbank in Great Bay.

At 0147 hours the general emergency signal, seven short blasts and one long blast, was given and all passengers and crew were told to report to their respective emergency and abandon ship stations. Frequent updates on the situation were given to the passengers and crew over the public address system in English, Spanish, French and German languages. The lifeboats on the port and starboard sides were readied for embarkation from the promenade deck at 0210 hours and 0215 hours respectively. All passenger and crew cabins were reported to be evacuated by 0220 hours.

At 0235 hours the master intentionally grounded the ship on a sandbar in Great Bay, St. Maarten without further damage. All 2,557 passengers were safely evacuated from the ship with no serious injuries or loss of life. The evacuation was carried out by shore based tenderboats from St. Maarten in the period from about 0245 hours to about 0515 hours on 15 December 1998.



Charted position of MONARCH's grounded position



Grounded MONARCH showing a view of a side shell port used in the evacuation of the vessel.

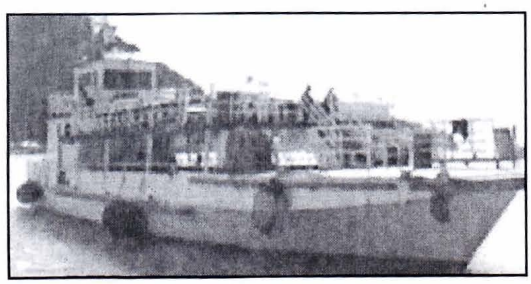


Photo of a tender vessel used in the evacuation.

3.2 Excerpts from the ship's deck log (entries on 15 December 1998)

DATE: DECEMBER 15, 1998

TIME:

0000	ALL M.E. RUNNING 1-2-3-4 AFT STABBS OUT ACTIVATED
0000	WTD 9-11 23-25 CLOSED.
0010	CAPTAIN [redacted] IN COMMAND.
0030	1 BOWTH. RUNNING.
0040	TENDER ALONGSIDE - SANTA MARIA.
0049	TENDER OFF WITH PATIENT, DOCTOR AND NURSE TO HOSPITAL - ST. MAARTEN.
0125	TENDER ALONGSIDE WITH DOCTOR AND NURSE.
0127	TENDER OFF SHIPSIDE.
0128	1 BOWTH. OUT.
0128	CHANGE OF COMMAND.
0221	LET GO STERN ANCHOR.
0226	LET GO STERN ANCHOR.
0233	STB. ANCHOR AWAY
0300	LET GO STB ANCHOR.
0316	LET GO PORT ANCHOR.

LIST OF TIMES RECREATED BY THE VESSEL' S CREW JUST FOLLOWING THE GROUNDING

DATE: DECEMBER 15, 1998
LOCATION: PROSE LYTE REEF

TIME	
0130	GROUNDED AT PROSELYTE REEF.
0130	2ND OFFICER [redacted] IN COMMAND AND STAFF CAPTAIN [redacted] ALSO ON THE BRIDGE WITH QM [redacted] AND QM [redacted]
0132	CAPTAIN [redacted] ON THE BRIDGE.
0133	CHIEF ENGINEER JR. AND SAFETY OFFICER REPORTED THAT THE WATER IN PUMP ROOMS 1 & 2 WAS TOO MUCH FOR THEM TO CONTAIN SO SAFETY OFFICER REPORTED TO THE BRIDGE THAT HE WAS CLOSING WATERTIGHT DOORS 1 & 2 AND CONCENTRATED ON THE LEAKS IN PUMP ROOMS 3 & 4.
0135	GENERAL CLOSING OF ALL WATERTIGHT DOORS FROM THE BRIDGE.
0136	CAPTAIN ANNOUNCED "BRAVO, BRAVO, BRAVO" ON THE P.A. SYSTEM.
0140	CAPTAIN INFORMED MARINE OPERATIONS IN MIAMI OF SITUATIONS AND SPOKE TO [redacted].

0145	CAPTAIN INFORMED PORT AGENT AND ST. MAARTEN PORT AUTHORITIES OF SITUATION.
0147	GENERAL EMERGENCY: 7 SHORT & 1 LONG BLAST.
0148	CAPTAIN [redacted] INFORMED ALL GUESTS AND CREW OF THE SITUATION; HE ORDERED EVERYONE TO GET DRESSED, PUT ON THEIR LIFE JACKETS AND PROCEED TO THEIR EMERGENCY STATIONS ON THE PROMENADE DECK. THIS ANNOUNCEMENT WAS TRANSLATED IN SPANISH, FRENCH AND GERMAN BY THE INTERNATIONAL HOSTESSES.
0155	MUSTERING OF MOBILE FIRE/DAMAGE CONTROL GROUPS, MEDICAL AND STRETCHER TEAMS.
0157	DEPLOYMENT OF MOBILE FIRE/DAMAGE CONTROL GROUPS.
0159	SHIP'S POSITION: North 17 degrees 57.7 min. West 63 degrees 3.5 min.
0159	BROADCAST ROOM MANNED.
0201	DOCTOR REPORTED ON "STAND-BY".
0207	CAPTAIN ANNOUNCED ON THE P.A. SYSTEM THAT WE HAD COME INTO CONTACT WITH THE GROUND AND THE SHIP WAS TAKING IN WATER. HE STATED THAT EVERYTHING WAS UNDER CONTROL BUT IT WAS NECESSARY FOR EVERYONE TO REMAIN CALM AND LISTEN CAREFULLY TO THEIR LIFEBOAT COMMANDER'S ORDERS. HE ALSO STATED THAT WE WOULD BE RETURNING TO ST. MAARTEN TO GROUND THE SHIP ON THE SAND AND RECEIVE ASSISTANCE FROM THE PORT AUTHORITY. THIS ANNOUNCEMENT WAS TRANSLATED IN SPANISH, FRENCH AND GERMAN.
0210	ALL PORT SIDE BOATS LOWERED TO PROMENADE DECK READY FOR EMBARKATION.
0213	SAFETY OFFICER REPORTED THERE WAS NO POWER IN THE SHELL GATES HYDRAULICS PUMP TO OPEN THE PASSENGER GATES ON STB & PORT SIDE (Shell gates # 3 & 4).
0215	ALL STB SIDE LIFE BOATS LOWERED TO PROMENADE DECK READY FOR EMBARKATION.
0218	CAPTAIN EXPLAINED AGAIN THE SITUATION ON THE P.A. SYSTEM; THAT IT WAS NECESSARY TO PLACE THE SHIP IN SAFETY; THAT THE PORT AUTHORITIES WERE ASSISTING IN DIRECTIONS TO A SAND BANK; AND, THAT THE PASSENGERS SHOULD PREPARE THEMSELVES FOR MOVEMENT. THIS ANNOUNCEMENT WAS TRANSLATED IN SPANISH, FRENCH AND GERMAN.
0220	HOTEL MANAGER REPORTED ALL PASSENGER AND CREW CABINS HAVE BEEN CLEARED.
0221	LET GO STERN ANCHOR.
0222	SAFETY OFFICER REPORTED THERE IS WATER COMING IN THROUGH HATCH FROM EMERGENCY ESCAPE FROM PUMP ROOM # 1. HE REQUESTED WOOD TO PUT MORE PRESSURE ON IT. CHIEF OFFICER ORDERED WOOD.
0226	LET GO STB ANCHOR.
0231	SECURITY OFFICER REPORTED THAT DOOR # 0.010 WAS AT KNEE-HIGH LEVEL
0233	STB ANCHOR WAS AWAY.

0235	SHIP GROUNDED IN GREAT BAY, ST. MAARTEN.
0236	CREW GATE PORT SIDE OPEN.
0237	MEDICAL EMERGENCY WAS REPORTED 1 PASSENGER FAINTED ON DECK 7 AFT.
0239	STAFF CAPTAIN ORDERED SECURITY OFFICER TO ASSIST PASSENGERS AND EVACUATE THEM RIGHT AWAY THROUGH THE PORT CREW GATE.
0240	CAPTAIN WENT ON P.A. SYSTEM AND ANNOUNCED TO EVERYONE THAT THE SHIP WAS SAFE, HIGH AND DRY AND UNDER CONTROL; BUT, AS A PRECAUTION IT WAS NECESSARY FOR THE GUESTS TO DISEMBARK. HE ADDED THAT IT WAS NOT NECESSARY TO USE THE LIFEBOATS AND THAT TENDERS WOULD BE TRANSPORTING THEM ASHORE. THIS ANNOUNCEMENT WAS TRANSLATED IN SPANISH, FRENCH AND GERMAN.
0241	NURSE ON DUTY ORDERED A STRETCHER TEAM ON DECK 7, STB SIDE, MUSTER STATION # 7.
0242	CAPTAIN ORDERED (SAFETY OFFICER) TO DISEMBARK GUESTS IN THE FOLLOWING ORDER: STATIONS 3&4, 1&2, 7&8, 9&10, 11&12.
0243	PILOT TIM ROMAIN ONBOARD.
0245	FIRST TENDER CAME TO DISEMBARK GUESTS ON PORT SIDE AT BUNKER AND CREW GATES.
0249	PETTY OFFICER VanEs FROM THE CURACAO COAST GUARD CONTACTED US BY RADIO, HE SPOKE TO THE CAPTAIN AND OFFERED ANY ASSISTANCE BY CONTACTING HIM AT TEL. 4637911.
0300	DROPPED STB ANCHOR.
0302	STAFF CAPT. REPORTED THAT THERE WAS 1-1/2 METERS OF WATER ALREADY ABOVE DECK 0 FWD. AND IT CONTINUES TO COME IN.
0305	SAFETY OFFICER REPORTED THAT WATER CONTINUES TO COME IN THROUGH THE ELEVATOR SHAFT.
0307	LIFE BOAT COMMANDER STATION # 11 CALLED THE BRIDGE TO STATE THAT A GUEST IN HIS STATION WAS "HYPER" AND NEEDED TO GO TO THEIR CABIN TO GET HER MEDICATION. HE WANTED TO KNOW IF IT WAS O.K. TO ALLOW THE GUEST TO GO TO HER CABIN. I ASKED 1ST OFFICER VASSBOTN IF IT WAS O.K. FOR THE GUEST TO GET THE MEDICATION; THE ANSWER WAS YES.
0309	CAPTAIN MADE AN ANNOUNCEMENT ON THE P.A. SYSTEM REASSURING GUESTS THAT EVERYTHING WAS UNDER CONTROL AND GUESTS WILL CONTINUE TO DISEMBARK; BE TRANSFERRED TO SHORE BY TENDERS; THEN, BY BUSES TO THE BEST POSSIBLE HOTELS. THIS ANNOUNCEMENT WAS TRANSLATED IN SPANISH, FRENCH AND GERMAN.
0326	THE "LA NIÑA" WAS THE FIRST TENDER TO REPORT 300 PEOPLE ONBOARD THEIR TENDER.
0330	CAPTAIN ORDERED AN ALCOHOL TEST FOR ALL OFFICERS AND CREW ON THE BRIDGE.

0334	THE HOTEL MANAGER REPORTED 850 PEOPLE ACCOUNTED FOR THAT HAD DISEMBARKED.
0338	HOTEL MANAGER REPORTED, VIA RADIO, THAT SOFT DRINKS AND WATER WOULD BE PROVIDED IN THE PROMENADE DECK.
0348	AGENT IN ST. MAARTEN (AT THE PIER) REPORTED THAT THE SITUATION SHORESIDE FOR THE GUESTS WAS UNDER CONTROL AND THEY WERE BEING WELL TAKEN CARE OF. HE ALSO STATED THAT THE HOTELS HAD BEEN CONTACTED TO ACCOMMODATE THE GUESTS.
0354	SAFETY OFFICER REPORTED TO STAFF CAPTAIN THAT THE HOTEL STORE-ROOM AND THE LAUNDRY WERE AT STANDARD WATER LEVEL. THE STAFF CAPTAIN REPORTED THIS AS GOOD NEWS.
0400	PHONE CENTRAL WENT OUT.
0402	CHIEF ENGINEER JR. REPORTED THAT THE WATER COMING IN PUMP ROOM # 3 WAS STABILIZED AND LESS WATER WAS COMING IN.
0404	CHIEF ENGINEER JR. REPORTED THAT WATER WAS STILL COMING INTO PUMP ROOM # 1 & 2 BUT # 3 WAS UNDER CONTROL.
0407	HOTEL MANAGER REPORTED HEAD COUNT OF 1400 PEOPLE HAD LEFT THE SHIP. HE ALSO SAID THAT 8 STATIONS HAD DISEMBARKED AND 4 MORE WERE WAITING TO GO.
0412	THE "SANTA MARIA" REPORTED 300 PASSENGERS ONBOARD READY TO GO ASHORE.
0415	CHIEF PURSER REPORTED 1600 GUESTS ASHORE.
0428	HOTEL MANAGER REPORTED THAT CRUISE STAFF WERE SHORESIDE COORDINATING THINGS SO THAT FAMIILIES WITH CHILDREN AND HANDICAP WERE TAKEN CARE OF FIRST.
0441	SAFETY OFFICER REPORTED OFFICIAL COUNT OF 1860 GUESTS AND APPROX. 20 CREW MEMBERS TO ASSIST GUESTS ASHORE.
0510	SAFETY OFFICER REPORTED 2400 GUESTS ALREADY ASHORE.
0514	PHONE SYSTEM BACK IN OPERATION.
0515	HOTEL MANAGER REPORTED THAT ALL GUESTS WERE ACCOUNTED FOR AND LEFT MONARCH TO GO ASHORE.
0519	HOTEL MANAGER CONFIRMED THERE WERE NO PASSENGERS ON THE PROMENADE DECK.
0530	CAPTAIN WENT ON P.A. SYSTEM AND ANNOUNCED THAT ALL CREW WAS DISMISSED FROM THEIR MUSTER STATIONS. HE THANKED EVERYONE AND SAID HE WAS VERY PROUD FOR THEIR FULL COOPERATION.

3.3 Evidence given and documentation produced by the bridge crew, etc.

3.3.1 Master's statement/documentation

The ship's master, a [redacted]-year-old Norwegian citizen, started his seagoing career in 1969. He received his Deck Officer Class 1 certificate (Master Mariner) in February 1986 from the Norwegian maritime agency. He had approximately 24 years experience as a deck officer, including two years and eight months as a master. He had been master of the *MONARCH OF THE SEAS* for eight months and was very familiar with the ship. He had ship handling training from the Star Center in Miami, Florida and had training in the use of ARPA's.

On 14 December 1998 the master rested from midnight until 0530 hours and he had approximately three hours of rest in the afternoon.

MONARCH OF THE SEAS departed from St. Thomas, U.S. Virgin Islands in the afternoon of Monday, 14 December 1998 bound for Martinique. The same day at about 2000 hours the master was informed that they had a sick passenger on board. The ship's doctor informed the master that the passenger had suffered a heart attack and had to be taken ashore as soon as possible. The master decided to deviate from the intended voyage plan and proceed at fastest speed to St. Maarten in order to land the sick passenger at Philipsburg, where the ship would arrive around midnight. The master was very familiar with that port as this was a regular port of call for the vessel. The master also chose Philipsburg because he was aware that they had good tender service, the tender service was familiar with the needs of evacuating sick passengers and the port was along the transit path to Martinique so it presented the least disruption for the voyage.

During the passage to St. Maarten the master informed the staff captain and the OOW that he would stop the ship approximately four cable lengths (0.4 nm) straight south of Fort Amsterdam. Before arriving at St. Maarten, the master instructed the OOW to inform him about the distances/bearings to Fort Amsterdam.

The master went to the bridge at midnight and took over the command of the navigational watch at 0010 hours on 15 December 1998. He reduced the speed and approached Philipsburg, St. Maarten from the west. The ship was manually steered. In attendance on the bridge along with the master were the staff captain, the OOW, the lookout and the helmsman. All relevant navigational instruments were in good working condition. The ship had on board all necessary charts, *Notices to Mariners*, list of lights, tide tables, description of waters and other material appropriate to the area in which the ship operated.

The prevailing wind was easterly; force 6-8 knots, with a sea of approximately 1 meters high, darkness, good visibility, no precipitation and an air temperature of 28 degrees C.

At 0040 hours the master stopped the ship four cables (0.4 nm) south of Fort Amsterdam and a shore based tenderboat from St. Maarten came alongside and picked up the sick passenger. The tenderboat departed the ship at 0049 hours with the passenger, the ship's doctor and nurse on board.

While the ship was awaiting the return of the doctor and nurse with the tenderboat, the master maintained the drifting ship on an easterly heading in an area just to the south of Fort Amsterdam, at a distance of approximately four cables off (0.4 nm).

The OOW determined the ship's position visually by use of radar ranges and bearings. The OOW on the 0000-0400 watch was a navigator the master trusted and he had approved of the officer's assignment to the 1200-1600, 0000-0400 navigational watch rotation.

According to the deck log, the ship's position, recorded in the logbook by the OOW at 0100 hours on 15 December 1998, was, "Fort Amsterdam bearing 000 degrees, 4.0 cable lengths off."

At 0125 hours when the doctor and nurse returned to the vessel, the master was still in command. As the ship was drifting on an easterly course the master decided to depart St. Maarten to the east side of Proselyte Reef. He ordered an increase in ship's speed, turned the ship to starboard and steadied up on a true course of 160 degrees.

The master's intention was to steer 160 degrees true until the Proselyte Reef lighted buoy was abeam to starboard. Once the lighted buoy was abeam then he planned to alter course to starboard to 190 degrees true. There was no approved departure voyage plan from St. Maarten to Martinique. The revised voyage plan that had been verbally agreed to by the master but not formally signed off or approved, listed the desired course for the first leg of the voyage from St. Maarten to Martinique as 180 degrees (notation being "1 leg, 180 degrees, 30 nm"). The master did not consult the navigational chart prior to departure and based the 160 degree departure course on his mariner's eye and the CPA feedback by the OOW computed for the Proselyte reef light-buoy. Further, he failed to ensure that a departure position and the intended 160-degree departure track line was plotted on the navigational chart in use.

The master asked the OOW, "How are we doing with clearance to buoy?" The OOW reported back that, "The closest point will be three (3) cables off and safe." The master himself nor any other member of the navigational watch did not verify if the clearance to the Proselyte Reef lighted buoy was indeed safe, nor did the master ask anyone else to verify the maneuver. In hindsight the master remarked that he would have preferred five (5) cables clearance from any know hazard.

At 0128 hours the master handed over the command of the vessel to the OOW and ordered him to, "Go fast but safe." At 0128 hours the ship was steady on a true course of 160 degrees and the speed was approximately 5-6 knots.

When the master left the bridge he visually observed the Proselyte Reef lighted buoy bearing 60-70 degrees on the starboard bow. On his way out from the bridge he said to the staff captain and the OOW that they should, "Keep safe well off buoy, go fast and safe." The master left the bridge, but returned shortly thereafter and asked, "It's so quiet here, have we forgotten anything?" Both the OOW and the staff captain reassured him by replying, "No, everything under control."

The master recalled that the staff captain was in the forward part of the wheelhouse when he left and he expected him to remain on the bridge for five to ten minutes more as was customary. The OOW was at the starboard radar, a helmsman was at the wheel, and there was also a lookout on the bridge. The wind was easterly 6-8 knots, sea less than a half meter, no swell and normal current.

When the master left the bridge he went straight to the toilet, as he desperately needed to use the facilities. He had been suffering from a strong cold and diarrhea for two-three days. The ship's doctor had given him over the counter medicine for both the cold and the diarrhea symptoms and he had been taking the medications for two-three days.

Monday evenings are normally busy due to a cocktail party with the ship's passengers and the master felt slightly fatigued on the evening of 14 December. He stated that he did not feel tired from the medicines he took. The master had a valid health certificate for employees on board ship.

After the visit to the toilet, the master went to the pantry for a sandwich and, at 0130 hours, he suddenly heard and felt that the ship had struck something on what he felt was the starboard side. Just before he departed the bridge the master had observed a sailboat just ahead of and on the MONARCH's port side so he initially thought the ship had hit it.

The master immediately returned to the bridge and took over command of the navigational watch. He steadied the ship on a southwesterly course and ordered the engines stopped. He asked the navigational watch, "Where are we and what has happened?" He saw the lighted buoy on starboard side and determined the vessel's position. Everyone on the bridge was in a state of shock and could not immediately speak.

The safety officer, chief engineer and junior chief engineer informed the master by radio that the ship was taking on water and the situation was quickly worsening. The safety officer reported that the watertight doors had to be closed and this was done at 0135 hours.

The master informed the company in Miami, the port authorities and the St. Maarten agent of the vessel's grounding and notified them that the ship was taking on water.

At 0147 hours the general emergency signal, seven short blasts and one long blast, was given on board and all passenger were informed over the public address system about the emergency. The announcement was subsequently made in Spanish, French and German languages.

The master decided to take the ship to shallow water in Great Bay, Phillipsburg harbor and ordered full speed ahead. The ship was difficult to handle because it was down by the head and he realized how serious the situation had become. All lifeboats were lowered to the promenade deck and were ready for embarkation at 0215 hours.

At approximately 0235 hours, the master, with the assistance and consultation of the local port authorities, grounded the ship on a sandbar in Great Bay, St. Maarten. The grounding was a "smooth landing" at a reduced speed of 6-7 knots.

From approximately 0245 hours to approximately 0515 hours on 15 December 1998 all 2,557 passengers were evacuated using tenderboats from the shore. The passengers were taken ashore at Philipsburg, St. Maarten.

During the questioning of the witness in Oslo on 5 March 1999, the master explained himself to the Maritime Investigator by making, *inter alia*, the following statement:

The witness explained that at no time during the planning of the voyage from St. Maarten to Martinique did he consider sailing on the west side of Proselyte Reef. The ship steered an easterly course outside Great Bay, St. Maarten when it went in to disembark a sick passenger and he therefore considered it natural to sail out on the east side of Proselyte Reef. The witness therefore put the ship on true course 160 degrees. The helmsman confirmed before the witness that the ship was steering true course 160 degrees. The witness explained that the 160- degree course was a maneuvering course out of Great Bay towards the first waypoint east of Proselyte Reef. Neither the first waypoint nor the 160-degree course was written in any voyage plan. The witness acknowledges that the voyage plan for the passage St. Maarten-Martinique had not been signed by himself or any other officer.

The witness explained that he did not check the distance to the Proselyte Reef lighted buoy at any point during the navigation out of St. Maarten. He gave the following order to the watchkeeping mate (OOW): "How are we doing with clearance to buoy?". The OOW's reply was, "Closest point would be three cables off and safe." The witness therefore considered the navigation to be completely under control. He handed over the command to the OOW after giving him all information about the navigation and left the bridge shortly after. Before leaving he bridge he gave the following order to the OOW: "Keep safe well off buoy, go fast and safe." The witness did not check the ship's position before going down from the bridge, but he checked the course - 160 degrees - and he visually observed Proselyte Reef buoy, whose position was bearing 50-60 degrees on starboard bow. The reason why the witness left the bridge before the ship's passing Proselyte Reef was that he desperately needed to go to the toilet.

Before the witness went down from the bridge he also asked the following question to the OOW and the staff captain: "It's so quiet here, have we forgotten anything?". Both officers replied: "No, everything under control." In the evening of 14 December, the witness wrote, among other things, the following in the night orders book, which the OOW read and signed: "If any doubt and irregularities, call me right away." The witness did not specifically order the OOW or the staff captain to check the ship's position, as he took their action in this respect for granted.

3.3.2 Second officer's statement/documentation

The second officer (OOW), a[redacted]-year-old Norwegian citizen, started his seagoing career in 1988 as a radio operator in the Norwegian navy. He began working for Royal Caribbean International in September 1994 and worked his way up, starting as a deck cadet, later serving as ordinary seaman, quartermaster and second officer trainee until he was promoted to second officer. He received his Deck Officer Class 4 certificate from the Norwegian Maritime Directorate in June 1996. On 15 December 1998 he had altogether 27 weeks of experience as a second officer. He had attended a course in the use of automatic radar plotting aid (ARPA) in 1994. His health certificate for employees on board ship was valid. He was familiar with the company's procedures and instructions for officers in charge of a navigational watch.

The second officer arrived in San Juan, Puerto Rico from Norway on the evening of 12 December 1998 after an eight (8) week holiday. He had had approximately seven and a half hours (7 ½) of sleep that night at a hotel and embarked the *MONARCH OF THE SEAS* at

approximately 1130 hours on 13 December, starting his 1200-1600, 0000-0400 watch rotation shortly after arriving on board.

On the evening of 14 December 1998 he had been resting from 2000 hours to 2300 hours and felt fit for watch when he came on the bridge at approximately 2330 hours. He had been asked to come on the bridge at 2330 hours in order to get a better picture of the situation as the ship had deviated from its course to evacuate a sick passenger at Philipsburg, St. Maarten. When he arrived on duty the ship was on an easterly course approaching St. Maarten at full speed, 19.5 knots. He relieved the officer in charge of the 2000-2400 watch at midnight after checking the charts and getting information from the officer in charge about the new courses from Philipsburg, St. Maarten to Martinique, which had been entered into the GPS by the latter.

On 15 December 1998 the master took over the command of the navigational watch at 0010 hours and the vessel's speed was reduced for the approach to Philipsburg. The OOW was taking distances and bearings as well as monitoring the radar for the approach to the bay. He was also watching for other traffic. At 0024 hours the said OOW recorded the following in the deck log: "The Corner, bearing 000 degrees, 1.2 nautical miles off."

At 0040 the ship was drifting on an easterly heading in position 0.4 nautical miles south of Fort Amsterdam. The OOW recorded the following in the deck log at 0100 hours: "Fort Amsterdam, bearing 000 degrees, 0.4 nautical miles off." The tenderboat came alongside for the sick passenger, doctor and nurse. The ship maintained a true course 070-075 degrees to make a lee for the tenderboat. The OOW monitored the position, which was basically the same all the time from when the tenderboat departed until it returned to the ship at 0125 hours with the doctor and the nurse.

The master was in command of the navigational watch on the bridge during this evolution and as soon as the tenderboat departed the ship's side he gave orders to turn the ship to starboard. He then steadied the ship on a true course of 160 degrees to pass east of the Proselyte Reef, the speed then having been increased to approximately 7-8 knots. The pitch on the variable pitch propellers was set at ten on the controls but a computer program in the engine control room ensured that the pitch, and thus the speed, increased slowly. The course of 160 degrees surprised the OOW as he expected the vessel to depart port on a more customary, westerly course, passing to the west of the Proselyte Reef and leaving the lighted buoy to port.

At 0128 hours, as the ship was on true course 160 degrees and outbound from the drifting position south of Fort Amsterdam, the master handed over the navigation of the ship to the OOW with the following order: "We are going fast and we are going safe and we have good clearance off the buoy. Good watch." The OOW took over the navigation of the ship and the master left the bridge very quickly. The OOW was operating the starboard radar, its scale fixed at 1.5 nautical miles. The radar is equipped with an ARPA computer getting its input automatically from the speed log. The Proselyte Reef lighted buoy had been designated as a target on the ARPA when the ship was inbound to St. Maarten. As the ship proceeded outbound from the drifting position off of Fort Amsterdam, on a true course 160 degrees, the OOW watched the ARPA and observed that the closest point of approach (CPA) to the Proselyte Reef lighted buoy was calculated to be 0.3 nautical miles, which he had reported to the master. He did not provide the ARPA computer with input for set and drift nor did he ground lock the ARPA. All the time the OOW visually observed the flashings from the

Proselyte Reef lighted buoy and he felt safe with a 0.3 nautical mile CPA clearance to the lighted buoy.

During the departure he received a phone call from the purser's desk concerning some noise near cabin 1549. While he was still on the phone and at the same time monitoring the radar, he saw the lighted buoy come abeam on the starboard side. Then the lighted buoy disappeared from view and he could not visually observe it from his position by the radar. He put away the phone and ordered the helmsman to alter course to 190 degrees. At 0130 hours, just as the ship had started a slow turn to starboard and had reached a course of about 163-164 degrees, the grounding on Proselyte Reef occurred. When the ship hit bottom it was traveling at an approximate speed of 12-13 knots and there was a sound similar to that produced by a really hard maneuvering. The ship came off the reef on the south side. Weather conditions were: wind easterly force 3, gentle breeze, partly cloudy, sea approximately 1.25 meters, bar. 1015, air temperature 28 degrees C.

The master immediately returned to the bridge, conferred with the senior officers on board and initiated emergency evacuation procedures informing all passengers that the ship had grounded. He told the passengers to get dressed, don their lifejackets and proceed to their lifeboat stations.

Reports came in to the bridge that the ship was taking on water on deck zero, at the photo lab and the laundry area, and that the watertight doors were closed.

The ship was turned around and navigated on the west side of Proselyte Reef towards Philipsburg, St. Maarten with the intention of deliberately grounding the vessel. The port authorities had been informed and a boat was sent out to guide the ship into Great Bay to ensure the best approach to the sandbank off of Philipsburg harbor.

At 0235 the ship was grounded at Great Bay, St. Maarten.

According to the OOW, the main factor contributing to the grounding is that the ship sailed on the east side of Proselyte Reef. The chart used on board had not been corrected in accordance with *Notices to Mariners* no. 32/98 in respect of the relocation of the Proselyte Reef lighted buoy. After the grounding the OOW observed by GPS that the position of the said lighted buoy was even further west than the position given in *Notices to Mariners* no. 32/98.

3.3.3 Staff captain's statement/documentation

The staff captain, a [redacted]-year-old Norwegian citizen, has approximately 20 years of seagoing experience and has been with the company for about 16 years. He received his Deck Officer Class 1 certificate (Master Mariner) from the Norwegian maritime agency in 1985. He has been sailing as a staff captain for approximately 30 months, including 31 weeks on board the *MONARCH OF THE SEAS*. His health certificate for employees on board ship was valid.

As staff captain he is next in command to the master and is the master's assistant. Among his duties and responsibilities are safety, security and the discipline of the crew. He has regular meetings with the deck officers and other officers. He is not considered to be in command on the bridge until the master hands over the command to him.

He has ARPA training from the time he finished his master mariner education but he has no training in ship handling (maneuvering).

On 14 December 1998 the staff captain went up to the bridge at approximately 2330 hours and remained on the bridge until arrival at St. Maarten.

At 0010 hours on 15 December 1998 the master took over the command of the vessel. One bow thruster was started at 0030 hours as the master navigated the ship into a position five cable lengths south of Fort Amsterdam. The ship was maneuvered and kept in the aforementioned position on an easterly heading. The tenderboat came alongside at 0040 hours and departed with the patient, doctor and nurse at 0049 hours.

At 0125 hours the tenderboat was back alongside the ship with the doctor and the nurse. The tender departed the ship's side at 0127 hours and the side shell gate was closed.

While the tenderboat was leaving, the master was in the process of maneuvering the vessel out from the harbor. The staff captain was standing by the pitch controllers as was his customary duty when entering or departing port. There was no twisting on the pitch controllers. The speed was slow, with pitch on the controls set at 2 or 3. The speed was then increased as soon as a sailboat located ahead of the ship was past and clear.

The staff captain noticed that the master turned the ship to starboard and steadied it on true course of 160 degrees. He was not aware that the master intended to stop the starboard turn and steady up on the 160 degree course. The staff captain was surprise at the course chosen by the master as he had expected him to continue the turn the vessel to put the Proselyte Reef lighted buoy on the ship's port side and depart to the west of the reef as was customary. Had the staff captain chosen a departure course for St. Maarten he would have chosen to go to the west of Proselyte Reef to allow for the prevailing easterly wind and westerly set of the current. At no time did the staff captain check the vessel's position nor the progress of the vessel as it departed St. Maarten. He also indicated that he did not see the OOW consult or plot a position on the navigational chart in use at the time and that was located on the chart table.

The master inquired with the OOW about what would be the distance off when passing the lighted buoy. The OOW answered: "0.3 nautical miles off, safe distance." As the staff captain heard this statement he trusted the master's and the OOW's judgment where the planned navigation was concerned. The staff captain had so much respect for the master that he would trust his decisions. The staff captain remarked that he would have advised the master of any situation he felt was dangerous although, when he had previously done this in the past, the master had not received the information in a positive manner.

At 0128 hours the master handed over command of the navigational watch to the OOW and ordered full speed. The master also added: "Drive fast but safe, safe distance to the lighted buoy." Before the master left the bridge he informed the OOW, "You are in charge, the course is 160 degrees, controllers are about to increase the speed." The staff captain felt that the OOW had the navigation of the vessel under control at that time.

At this stage the staff captain did not feel worried about anything and was in the process of calling the engine-room asking for a load program. The pitch controllers were set at six. The chief engineer confirmed that the load program was running and the pitch controllers were put

on the full speed setting by the staff captain. He was there monitoring the speed, the pitch controllers and the instruments in front of him to see that everything was normal. He had felt a pressure from the master to depart St. Maarten as fast as possible so that the ship would reach Martinique around 1400 that afternoon.

The master exited the bridge but returned shortly to ask if something had been forgotten. The time was still 0128 hours. Both the staff captain and the OOW replied that all was normal, and so the master left the bridge again.

From the staff captain's point of view, the reason for the master's return was related to the general procedures at departure, in respect to such things as stabilizers, thrusters, etc, and not based on the navigation layout. The master often asked a question like that during arrivals and departures.

At 0130 hours, as the staff captain was still monitoring the instruments; he also visually observed that the lighted buoy was abeam on the ship's starboard side.

The OOW, who was standing by the starboard radar, gave orders to change course to starboard and steady on a true course of 180 degrees. The ship had reached approximately 163 degrees when the grounding occurred. The speed at that time was approximately 12-13 knots and there was an enormous shaking at the time of the impact. The staff captain realized that the ship had hit the bank and he took the pitch controllers back to 7 or 8, just by reflex action. He also realized then that the ship had come over the bank (reef). The msater immediately returned to the bridge and assumed command of the vessel commencing at 0131 hours. The staff captain gave him as much information as he could following the grounding.

The staff captain remarked that he did not always get positive feedback from the master when he gave the master advice. The staff captain felt that the communication between himself and the master could have been better.

3.3.4 Helmsman's statement/documentation

The quartermaster, a [redacted]-year-old Norwegian citizen, was helmsman after midnight on 15 December 1998. He had started his seagoing career in 1993 and was the holder of a Deck Officer Class 4 certificate from the Norwegian maritime agency. He had been on board *MONARCH OF THE SEA* for approximately 14 weeks. Although he was originally on the 20-24 navigational watch he was asked to stay on the helm during the vessel's departure from St. Maarten as he was more experienced than the normal 00-04 helmsman.

As helmsman on the aforementioned night he executed the orders given by the master and the OOW. He had worked with the latter for 4 weeks.

After the patient had been taken ashore and the tenderboat had returned, the master ordered him to steer 160 degrees on the gyrocompass. The order was loud and clear. While he was steering 160 degrees he visually observed the buoy but does not recall the angle on the bow.

He heard the master leave the bridge saying, "Good watch", and he heard the sound of the door being closed. After the master left the bridge the remaining personnel on the bridge were the staff captain, the OOW, the lookout and himself.

At a later time he received an order from the OOW to steer 190 degrees. He turned the rudder five degrees to starboard, equivalent to a turn rate of eight degrees per minute. The staff captain gave him no orders.

After the ship had turned 3-4 degrees, the ship began shaking violently. He turned the rudder amidships and straightened out. No order was given to do this. He looked out to starboard and could see the buoy at an angle of about 90 degrees, but he did not know how far off the buoy was.

Immediately after the vessel shook the master returned to the bridge and ordered a turn to starboard.

3.3.5 Lookout's statement/documentation

The lookout, a [redacted]-year-old Norwegian citizen, was originally posted on the bridge for the 00-04 navigational watch on 15 December 1998 as the helmsman but was asked if he had steered the vessel before. After answering that he had not steered the vessel before he was relieved at the helm by the more experienced 20-24 helmsman who remained on the bridge for the departure of St. Maarten. He then served as a lookout more or less. He received his Deck Officer Class 4 certificate from the Norwegian maritime agency in February 1997.

When the tenderboat left the ship's side, the lookout believed that the ship turned to starboard. He was standing/walking by the port radar. The OOW was mainly operating the starboard radar, which is located close to the starboard bridge wing.

He visually observed the flashing light from the buoy. He also saw the buoy on the radar, with CPA 0.3 nautical miles. It was a clear night. It was very difficult to judge the distance to the buoy visually.

He believes the order to change from 160 to 190 degrees came at the point where the buoy was approximately 90 degrees on starboard. When he heard that order, he believes the master may have been gone for "maybe three minutes". At about the same time he heard and responded to an automatic smoke detector alarm, finding everything was okay.

The staff captain was standing at the pitch controllers before the grounding and he was also moving around. The lookout did not hear the staff captain give any commands.

After the grounding the lookout was ordered to help with the anchors.

3.3.6 Safety officer's statement/documentation

The safety officer, born [redacted] June [redacted], **closed and** locked the shell gates after the tenderboat left the ship's side on the night of 15 December 1998.

At 0130 hours he felt the ship vibrate "differently". He ran to the engine control room, where the chief engineer, junior chief engineer, and second engineer were dealing with many different alarms.

The safety officer went forward, only to find that there was water up to the deck plates in pump room number 1. He also found water coming into pump room number 2. The safety

officer closed watertight doors numbered one (1) and two (2). Afterwards he contacted the bridge and suggested that all watertight doors be closed. Together with the third engineer he closed the escape hatches to pump rooms numbered one (1) and two (2). The laundry room filled up very quickly with water and water also came into the lobby by the central store area in the vicinity of watertight door number ten (10), which he found in the opened position. This was in violation of standard operating procedures that required watertight door number ten (10) to be closed and secured at 2300 every evening. He felt that the ship would have been lost without blanking off watertight door number ten (10) as the vessel was a two-compartment ship.

The safety officer judged that the ship would have been lost if the master had not deliberately grounded it on the sandbank. Where the safety of the ship is concerned, his opinion is that the ship's personnel were exemplary on the day in question. During the evacuation of the vessel there were no language problems. Regarding why the lifeboats were not used, the safety officer remarked that using lifeboats would have taken key personnel away from their functions. The training program on board is in accordance with the STCW Convention. The ship is in compliance with SOLAS requirements for passengers with special needs.

4. FURTHER INVESTIGATION / INFORMATION

4.1 Safety Management System, etc.

The Norwegian Maritime Directorate has audited the Safety Management System of *MONARCH OF THE SEAS* and used this audit as a basis for issuing, on 8 June 1994, a Safety Management Certificate valid until 15 April 1999.

The company has designated a responsible ISM person. The ISM Code Safety Management System is periodically audited and was last audited on 17 September 1997.

The company, Royal Caribbean Cruises Ltd. conducted, in accordance with procedures set out in the ISM manual, an Internal Safety and Quality Management Audit on board the *MONARCH OF THE SEAS* in the period 1-7 June 1997.

Det Norske Veritas conducted an SEP annual audit on board *MONARCH OF THE SEAS* in November 1997.

The ISM Code Safety Management System includes, *inter alia*, the following instructions:

1. Instruction 1.1 : Royal Caribbean Cruises Ltd. Policy for Safe Bridge Operation.
2. Instruction 1.2 : The Human Factor in the Navigational Operation.
3. Instruction 4.1 : Position descriptions, Master.
4. Instruction 4.2 : Position descriptions, Staff Captain.
5. Instruction 4.5 : Position descriptions, Watchkeeping Officers.
6. Instruction 5.1 : Processes, Standard Operational Procedures.

4.1.2 Concerning the ship's ISM manual: text of instruction 1.1 (Royal Caribbean Cruises Ltd. Policy for Safe Bridge Operation)

To retain a safe navigational watch, according to Regulation VIII/1 of the 1995 STCW Convention and to maintain a safe comprehensive surveillance of the ship.

Besides navigational duties and collision avoidance responsibilities, the Watchkeeping Officer is in control of the ship during his watch. He shall exercise general surveillance, and he shall take all possible precautions to avoid pollution of the marine environment. This surveillance includes, and is not limited to, the investigation of potential fire, or unusual noises. The general safety of passengers and crew, the watertight integrity of the ship and response to a man overboard emergency.

The bridge watch shall consist of at least one licensed officer, qualified to take charge of a navigational watch, and at least one qualified and experienced seaman.
A three watch system shall be adopted.

When a watch consists of one officer and one seaman, further assistance shall be available at any time if the Watchkeeping Officer requires additional help. Such person shall be available and fit for duty according to Regulation 19 in Chapter V of the SOLAS Convention.

The Officer of the Watch being in command of the ship shall ensure that the bridge personnel conduct professionally always.

The Master may decide to alternate the command on the bridge with the Staff Captain under special circumstances, such as dense fog, even in close waters, provided that the Staff Captain can take control and maneuver the vessel under these conditions.

All deck officers shall read and understand the contents of this manual. The Standard Operational Procedures in chapter 5 are of special importance. The Master shall, at least once every contract period ensure that the officers are familiar with the Standard Operational Procedures and review these procedures annually.

4.1.3 Concerning the ship's ISM manual: text of instruction 1.2 (The Human Factor in the Navigational Operation)

The most common cause of accidents is human error. The risk of human error can be reduced by proper operating procedures on the bridge, combined with training and teamwork. For example, the Staff Captain's lack of training in maneuvering and piloting can impair his ability to advise the Master to a sudden change of conditions.

It is the Master's responsibility to train the Staff Captain in pilotage and maneuvering. The aim of the training is that the Staff Captain reaches the same level of skill as the Master's. A log indicating this training should be retained by each Staff Captain as part of his personal file. Sample of this log is provided in the appendices.

Safety is potentially jeopardized in poor visibility, if the team lacks a vital member, if there is an untrained member in the team, if operators are unfamiliar with new equipment, if there are technical malfunctions, a change of the ship's route or if an unfamiliar port has to be entered.

The Officer of the Watch often observes the radar when the vessel enters or leaves a port, if so, he shall be instructed to follow the progress of piloting by comparing radar observations with the passage plan.

Proficient, effective communication is utmost important to keep all involved always informed of decisions made. Lack of information is a common cause of human error.

Human error is accepted because it is not intentional, but negligence is not. Mistakes must never be hidden. They must be reported, discussed and corrected so we can learn from them. Errors must be detected quickly, and the bridge team must then agree methods that will avoid these errors in the future.

The print out from the maneuvering recorder (where applicable) and the course recorder shall be stored on the bridge for three years and then destroyed, unless if a case is pending.

4.1.4 Concerning the ship's ISM manual: text of instruction 4.1 (Positions descriptions, Master)

REPORTS TO: *VP, Fleet Captain*
Routine every day matters and telephone communications will be handled by the Director, Marine, Nautical.

BASIC FUNCTION: *The Master is the ultimate authority on board. He is charged to carry out the company policies and to comply with all applicable national and international laws and regulations. This authority vested to the Master by the government of the Flag State of each ship.*

The Staff Captain shall be the Master's deputy. The Master shall keep the Staff Captain acquainted with all aspects of his command, and he shall keep all other officers advised as required by their duties and responsibilities. In this respect, the Master shall ensure that the Staff Captain receive practice in maneuvering the ship, in particular approaching and leaving port, as well as docking and undocking. He shall hold meetings with all department heads, his marine officers and other members of the crew as described in Chapter 7 in this manual.

QUALIFICATIONS:
The Master's qualifications and licenses shall conform to all International and National conventions and regulations and he shall have an unlimited Master's License.

RESPONSIBILITIES:
The Master's primary responsibility is the safety and care of all persons on board, the ship's seaworthiness, navigation and operation, and the prevention of pollution. In the event the ship becomes endangered, the Master, shall use all resources available to minimize the effects of an incident to persons, property and the environment and to successfully guide an evacuation and rescue should the situation so require. He shall do his utmost to protect and preserve the ship's documents and valuables.

4.1.5 Concerning the ship's ISM manual: text of instruction 4.2 (Position descriptions, Staff Captain)

REPORTS TO: *Master*

BASIC FUNCTION: *The Staff Captain is the Master's Deputy and second in command of the ship. The Chief Officer shall be the Staff Captain's deputy.*

QUALIFICATIONS:
The Staff Captain's qualifications and licenses shall conform to all International and National conventions and regulations and he shall have an unlimited Master's License.

RESPONSIBILITIES:
The Staff Captain shall have a full understanding of the Safety and Quality Management Program including his responsibilities in the Safety Organization according to the Emergency Plan and Station Bill.

The Staff Captain shall be familiar with the Master's duties, responsibilities and authorities and shall be prepared to take command without notice. The Staff Captain shall assist the Master in all service matters and keep him informed of significant events and trends pertaining to the welfare of the ship, passengers and crew.
He is in charge of the Deck Department.

4.1.6 Concerning the ship's ISM manual: text of instruction 4.5 (Position description watchkeeping officers)

REPORTS TO: *Master*

BASIC FUNCTION: *The Watchkeeping Officer is, on behalf of the Master, in command during his watch. In all questions relative to this, the Watchkeeping Officer receives orders from and is directly subordinate to the Master. In questions pertaining to safety, security, sea readiness, and pollution prevention the Watchkeeping Officer is also subordinate to the Staff Captain.*

QUALIFICATIONS:
The Watchkeeping Officer's qualifications shall conform with all international and national conventions and regulations.

RESPONSIBILITIES:
All Watchkeeping Officers shall have an understanding of the Safety and Quality Management Program including their responsibilities in the Safety Organization according to the Emergency Plan and Station Bill.

The Watchkeeping Officer shall perform in accordance with the Master's standing instructions and the specific orders for the watch. Under no circumstances shall the Watchkeeping Officer occupy himself with anything that will distract his attention during the watch.

Navigation
The Watchkeeping Officer to whom this task is delegated shall assist the Master with the navigation of the ship acting directly subordinate to the Master. His duties shall include operating the ship's navigational instruments, plotting gear, charts and nautical publications and entries in the ship's log on behalf of the Master.

4.1.7 Concerning the ship's ISM manual: text of instruction 5.1 (Standard Operational Procedures)

All nautical deck officers shall keep themselves familiar with these instructions. These are part of the Nautical Officer's Familiarization.

The Watchkeeping Officers are the Master's representative and responsible to him for the safe navigation of the vessel, the strict compliance of navigational rules, the applicable laws and regulations as well as the Master's orders.

THERE MUST ALWAYS BE A LOOKOUT ON THE BRIDGE WHEN THE SHIP IS AT SEA

When automatic pilot is in use, the helmsman may be released to attend other duties, subject to the provisions of Regulation 19, Chapter V of the SOLAS Convention.

The Watchkeeping Officer to whom the navigation equipment is assigned, shall ensure that all charts and documents for the voyage are updated and corrected. ***All corrections shall be signed and dated.*** *An updated library of publications and charts for the sailing area shall always be maintained.*

1. FAMILIARIZATION OF STCW

*It is the responsibility of all nautical deck officers to familiarize themselves with the STCW 95 Convention. They shall also be familiar with the "****PRACTICAL GUIDE TO BRIDGE WATCH KEEPING.****"*

2. RESPONSIBILITIES

All deck officers and crew shall carefully read and understand their specific responsibilities as described in the individual position descriptions, in chapter 4 of this manual.

3. FAMILIARIZATION OF BRIDGE EQUIPMENT

All nautical officers shall familiarize themselves with all bridge equipment and instruments. If an Officer has the slightest doubt about any equipment, he is responsible for consulting a colleague, the Staff Captain or the Master.

4. MASTER ON THE BRIDGE

The Watchkeeping Officer is in charge of the watch even if the Master is on the bridge. The Master will clearly state when he takes over or gives back the bridge responsibility to the Watchkeeping Officer. ***This procedure shall be logged in the Deck Log Book.***

5. OFFICER IN DOUBT

If the Watchkeeping Officer has the slightest doubt about orders being given, he shall ask the Master to clarify the orders.
Consequently, the Master or any officer of the bridge team, should be alert to the anticipated helm or engine control orders. This applies to all controlling factors, not pertinent to who is in control.

6. THE MASTER TO BE CALLED

The Master should be called under the following circumstances:

- *in poor visibility according to the Master's instructions*
- *if the traffic or the movement of other vessels causes concern*
- *if difficulty is experienced in maintainin course*
- *on failure to sight land, a navigational mark, or to obtain soundings by the expected time*
- *if a sight of land or navigational mark or a change in soundings occurs unexpectedly*
- *on the breakdown of engines, loss of electrical power, steering gear, or navigational equipment*

- *if any doubt exists in regard to the accuracy of information of such equipment*
- *upon reception of a distress call*
- *in any other situation where the Officer of the watch is in doubt or requires assistance*

Not withstanding the requirement to call the Master in the preceding circumstances, the Watchkeeping Officer must take immediate action to secure the safety of the vessel when so required.

9. NIGHT ORDER BOOK

The Watchkeeping Officer shall read and acknowledge with his signature, the Master's orders in the Night Order Book. The Night Order Book is an official document and English language should be used.

10. VOYAGE PLAN AND PORT PASSAGE PLAN

A voyage plan shall be laid out in the GPS/VMS and on the charts before departure. The voyage plan shall include times of departure and arrival, waypoints and courses between waypoints. Careful consideration shall be given to the various tracks in relation to the vessel's draft. The Master must confirm any deviation from this plan. Permanent course lines and waypoints with corresponding numbers shall be drawn on the chart, based on the itinerary and previous experience. The voyage plan may differ from these course lines, depending on the present situation such as weather, change of itinerary, etc. The Master shall verify in the departure checklist that he is informed of, and has approved the voyage plan.

It is also required that the Master and his nautical officers will create a port passage plan for the ports representing passage under ***normal conditions****. The plan must be based on experience from numerous arrival and departure operations and shall include:*

- Courses
- Parallel index distances to dangerous areas
- Speed and major propulsion commands
- Turning points
- Turn radius and/or rate of turn or rudder angle to execute the turn. (*Where applicable.)*

The passage into or out of a port shall be carefully plotted in the radar. Any observed deviation from the passage plan shall be immediately reported to the Master by any member of the bridge team.

11. CHECKLISTS

Check lists for arrival and departure shall always be used and be COMPLETED.

14. FIX POSITIONS

For the safest possible navigation, the nautical officers shall never rely on only one navigational aid for considerable time. Whenever possible, the radar and/or terrestrial navigation shall be used for fix positions and the GPS for continuous follow-ups.

15. FIX POSITION IN CHART

*When the vessel is **in the open sea**, but closer that 30 nautical miles, of any land or shallow water, the ship's position shall be plotted on the chart **at least** every one half hour and logged in the log book every hour, or any time when change course. When further out than 30 nautical miles from nearest land or shallow water, the ship's position shall be plotted on the chart and logged in the logbook every one-hour, or any time when change course.*

4.2 Voyage plan St. Maarten - Martinique

There was no approved voyage plan for the vessel's passage from St. Maarten to Martinique. The revised voyage plan developed by the navigation officer and verbally agreed to by the master (although not formally signed off or approved) did not include a plan for the actual 160 degree departure route from Great Bay to pass east of Proselyte Reef. Additionally, the 160 departure course track line was never actually laid down nor plotted on the navigational chart in use. The revised voyage plan listed the course for the first leg of the voyage from St. Maarten to Martinique as 180 degrees (notation being "1 leg, 180 degrees, 30 nm"). Based on the information from the informal voyage plan from St. Maarten to Martinique, leg one listed the course as 180 degrees, distance 30 nautical miles. The location of waypoint number one of the informal plan was 17 degree 29' N, 063 degrees 03'W. Therefore the "planned" departure point would have been 17 degrees 59' N, 063 degrees 03' W which is approximately 0.5 nm SE of Proselyte Reef.

It is clear that the OOW and other individuals on the navigational watch were unaware of any planned departure from St. Maarten and were surprised that the master did not alter course more south westerly to pass west of the Proselyte Reef lighted buoy as was the customary departure route. Further, prior to departing Great Bay the navigational team failed to take and plot out a departure position on the navigational chart. Additionally, they failed to lay out or plot an intended course track line from that position past the known hazard, Proselyte Reef. The master also failed to verify the adequacy of the 160 degree departure course and chose the course based on his mariner eye and the information provided by the OOW regarding the CPA to the Proselyte Reef lighted buoy.

4.3 Night Order Book for 14 and 15 December 1998

At the departure from St. Maarten in the night of 15 December 1998 the master did not revise the previous night orders or draft any new night orders for the watchkeeping mates (OOW's). On 14 December 1998, for the voyage St. Thomas to Martinique, the master had written the following order, *inter alia*, in the night order book: "Steer the actual courses plotted on the charts, corrected for drift and current. Keep a sharp lookout and "safe" dist. to all traffic. If any doubt or irregularities call me right away." This night order was signed by each of the OOW's.

4.4 What the ship's course recorder shows

The ship's course recorder for 15 December 1998 shows that the *MONARCH OF THE SEAS* steered a course of about 090 degrees at around 0114 hours Local Time (LT). In the period from about 0114 hours to about 0125 hours LT the ship changed course from approximately 090 degrees to approximately 160 degrees. The ship steered the latter course from about 0125 hours to about 0130 hours LT. At 0130/0131 hours LT the ship's course was changed to approximately 166-167 degrees. In the period between approximately 0131 hours and 0140 hours LT the ship steered courses varying between 174 and 160 degrees.

4.5 *Notices to Mariners no. 32 of 8 August 1998*

According to *Notices to Mariners* no. 32/98 of 8 August 1998, the buoy 25613 (the Proselyte Reef lighted buoy) had been moved from position 17 degrees 59'23'' N / 063 degrees 03'31'' W to a position of 17 degrees 59'18.6'' N / 063 degrees 03'36.0'' W. Reference is made therein to chart U.S. no. 25613 and *Notices to Mariners* no. 31/98. (The aforementioned moving of the Proselyte Reef lighted buoy changed the buoy's position to a position indicated to be approximately 125 meters further west.)

4.6 Failure to correct the ship's chart U.S. no. 25613 in accordance with *Notices to Mariners*

The ship's chart U.S. no. 25613, which was used at the time of the grounding, had not been corrected in accordance with *Notices to Mariners* no. 32/98 of 8 August 1998 before 15 December 1998 in respect of the new position of the Proselyte Reef lighted buoy, 17 degrees 59'18.6'' N and 063 degrees 03'36.0'' W. The latest correction made on the said chart was consequent on information found in *Notices to Mariners* no. 31/98.

4.7 Warning in the ship's chart U.S. no. 25613

In the margin of the above chart, the following warning is printed:
"WARNING. The prudent mariner will not rely solely on any single aid to navigation, particularly on floating aids."

4.8 Currents at Proselyte Reef

According to the pilot chart for the waters of the Caribbean Sea, the current at Proselyte Reef moves in a westerly direction at a daily average speed of 0.6-0.7 knots. Those familiar with the port entrance confirmed a customary westerly current near Proselyte Reef for that time of year.

4.9 Alcohol and drug tests of the crew after the grounding

On 15 December 1998, in the period between 0330 hours and 0400 hours, blood samples were taken of the following: the master, the staff captain, the second officer who was OOW on the 0000-0400 hours watch, the helmsman, the lookout, the second officer who was OOW on the 2000-2400 hours watch, and the navigation officer.

The blood samples taken of the above crews were analyzed by Toxicology Testing Service, Inc., Miami and all samples were found to be [redacted]

Alcohol use was permitted on board the vessel provided crewmembers only consumed alcoholic beverages with a maximum alcohol content of two and a half (2 ½) percent by volume. Crewmembers are prohibited from consuming alcoholic beverages within eight (8) hours of watch duty.

4.10 Information from the master on the cause of the grounding

On 18 December 1998, the master wrote the following in the Marine Casualty Report 97 in the space below line no. 86 ("conditions which contributed to the casualty"): "Navigated too close to Proselyte Reef."

4.11 Royal Caribbean International investigation report on grounding at Proselyte Reef, St. Maarten, on December 15, 1998, in accordance with IMO Res. 741(18), paragraph 9.

The company's own investigation of the casualty contained the following conclusions and recommendations:

1. The primary cause of this grounding was human error by the Master and his Bridge Resource Management Team in that they failed to:

a. Accurately determine the position of their ship in relation to a known reef area, and;
b. To navigate their ship in a manner which would give wide berth to such a hazard.

2. Contributing causes are:

a. The Master, Staff Captain and Bridge Watchkeeping Officer's failure to comply with SQM Deck Procedures, Section 5.1 Standard Operating Procedures, which requires that a Port Departure Plan be developed and shall include courses and parallel index distances to dangerous areas (in this case, Proselyte Reef);
b. The failure of the Master to verify the track line prepared by his Bridge Watchkeeping Officer;
c. Total reliance by the Master and Bridge Watchkeeping Officer on Proselyte Reef Lighted Buoy as the sole source to determine the ship's position when departing Philipsburg when terrestrial fixes were readily available. This action failed to comply with SQM Deck Procedures, Section 5.1 Standard Operating Procedures, Item 14, regarding fixing the ship's position;
d. Failure to correctly update the position of Proselyte Reef Lighted Buoy on the navigation chart;
e. Failure of the Master, Staff Captain and Bridge Watchkeeping Officer to perform as a coordinated, cohesive Bridge Resource Management Team in all aspects regarding the safe navigation of the ship, especially the planning and actual transit of a known, submerged hazard to navigation;
f. The actual position of Proselyte Reef Lighted Buoy being approximately 150 yards north-northwest of its position published in Notice to Mariners 32/98; and
g. The Master setting full speed prior to the ship safely passing known navigational hazards.

3. The Master failed to take adequate measures to safely navigate his ship.

4. *The Bridge Watchkeeping Officer failed to properly and accurately determine the position of the ship when departing St. Maarten.*
5. *The Staff Captain's failure to interject himself as an active participant of the Bridge Resource Management Team during the planning and execution of a transit near a known hazard may have contributed to this casualty.*
6. *Notice to Mariners 31/98 and 32/98 corrections were not properly made on Chart 25613.*
7. *There is no evidence which would indicate culpability on the part of the remaining personnel on the Bridge (the Helmsman and the Lookout) or the two off-Watch Bridge Watchkeeping Officers regarding their part in this accident.*
8. *Based on the negative findings of all Blood Chemistry specimens tested by the Toxicology Testing Service of Miami, FL, it is concluded that there is no evidence to indicate that either bensodiazepines, opiates, marijuana, amphetamines or ethyl alcohol contributed to this casualty.*
9. *The availability of additional automatically recorded data (e.g., operational Voyage Management System; more user friendly KIM Voyage Recorder; Bridge Voice Recorder) would have made reconstruction of the events resulting in this casualty more definitive.*
10. *Had a Port Departure Plan been developed which:*

    a. *Identified navigational hazards (Proselyte Reef) and a safe course to steer to clear it, and/or;*
    b. *Had danger bearing information set to warn of encroachment on Proselyte Reef;*

    This accident most likely would not have occurred.

11. *The Master's actions subsequent to the grounding, including his timely decision to return to St. Maarten and intentionally ground his ship on a sand bar, were instrumental in minimizing further potential damage to the ship and in ensuring the safety of all personnel embarked.*
12. *The performance of the officers, staff and crew of Monarch of the Seas subsequent to the grounding was exemplary.*

RECOMMENDATIONS (Royal Caribbean International)

1. *That the performance of the Master, Staff Captain and Bridge Watchkeeping Officer regarding their culpability for circumstances contributing to this accident be reviewed and personnel action, as deemed appropriate, be taken.*
2. *That the roles and responsibilities of Bridge Resource Management be reviewed and clarified.*
3. *That "Lessons Learned" be developed and disseminated to both fleets.*
4. *That this accident be used as a case study for the Bridge Resource Management Training Course for both fleets.*

4.12 Royal Caribbean International's policies regarding competence, training, manning, etc. on the Norwegian flagged ships, and the experience, certificate and training of the watchkeeping 2nd officer on duty at the time of the grounding

Officers must first meet the requirements established by the Norwegian Maritime Directorate certifying, under both Norwegian and international requirements (including STCW), that the individual is competent and able to perform the duties for which he or she is certified.

Training for these duties is an integral part of the certification process. On each ship, the master is responsible for the manning including the specific watches to which officers are assigned. In particular, it is the master's responsibility to assess the competence of the officers on the bridge and take corrective action if he or she has any doubts regarding the officer's competence.

In the case of the watchkeeping second officer on duty at the time of the grounding, the relevant facts are:

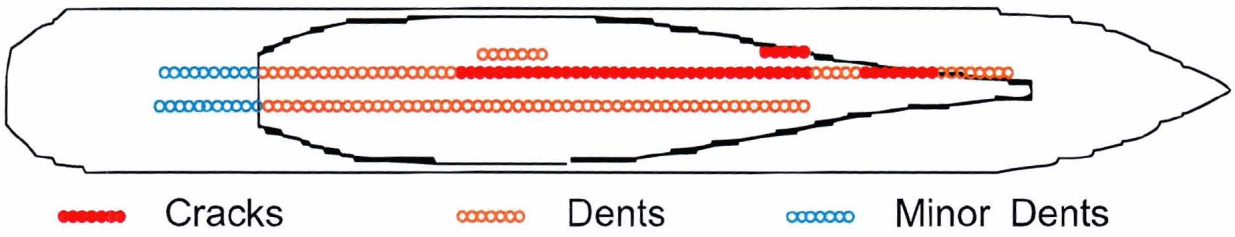
- He was certified to serve as a watchkeeping deck officer Class 4 by the Norwegian Maritime Directorate on June 26, 1996. His certificate was valid until June 26, 2001 and entitled him to serve as a navigational watch officer without limitations.
- He was not promoted to the position of second officer at Royal Caribbean until June 28, 1998, almost two years after he had been certified as fully qualified for this position by the Norwegian Maritime Directorate.
- In addition to his seven months of experience as a second officer, he also had three and a half months experience as a second officer trainee, a position specifically designed to help prepare someone for the position of second officer.
- Furthermore, the watchkeeping second officer had also served as a Deck Cadet, Ordinary Seamen and AB/Quartermaster. In all, he had more than two years of experience on board Royal Caribbean vessels. His performance was reviewed by several superiors over the course of his work with Royal Caribbean and was consistently rated positively.

4.13 The classification society found water ingress in the following tanks/spaces after the grounding:

Compartment
SW tank No. 1
Dry Tank No. 2
Dry Tank No. 3
Dry Tank No. 4
Dry Tank No. 5
Dry Tank No. 7
No. 1 Pump Room
No. 2 Pump Room
Laundry
Forward Staircase
(flooded to below
No. 1 Deck)
Dark Room, Stores
FO Overflow Tank
DO Tank No. 1
Laundry Tank,
Port

4.14 U.S. Coast Guard Marine Safety Center's Stability Analysis of the *MONARCH OF THE SEAS (information, graphics and photos in this section courtesy of the U.S. Coast Guard Marine Safety Center, Hull Division)*

Approximate Limits of Damage to the Ship's Bottom

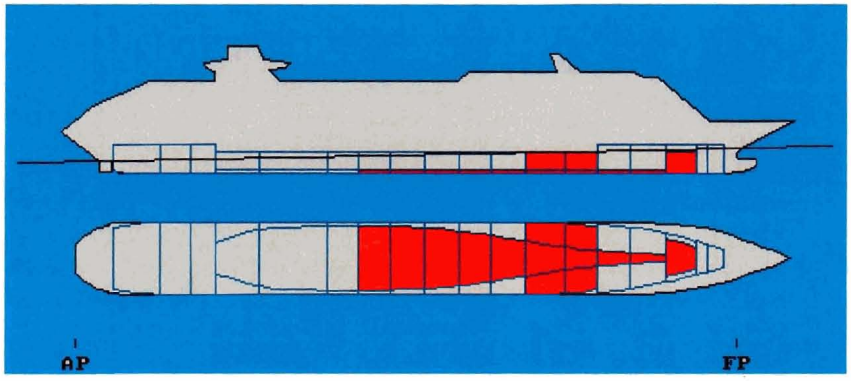


Summary of damage to the ship's bottom:

Double Bottom Damage	Inner Hull Damage
9 ballast tanks	Laundry area
5 voids	Photo labs
2 fuel tanks	2 pump rooms

Damage to the bottom, port side.

Flooded Areas of the Vessel



Conclusions:

- The Coast Guard's stability analysis concluded that *MONARCH OF THE SEAS* would have stayed afloat in open water **provided** that there was no progressive flooding due to additional structural failures such as watertight subdivision boundaries.
- The vessel would have remained afloat at least 12 hours during which the vessel would have remained stable enough to launch its lifeboats and liferafts.
- The presence of double bottoms greatly contributed to the vessel's ability to survive.
- SOLAS damage requirements ensured adequate reserve buoyancy.

Note: The "stepped bulkheads" forward of pump room no. 1 were a primary reason why the ship stayed afloat.

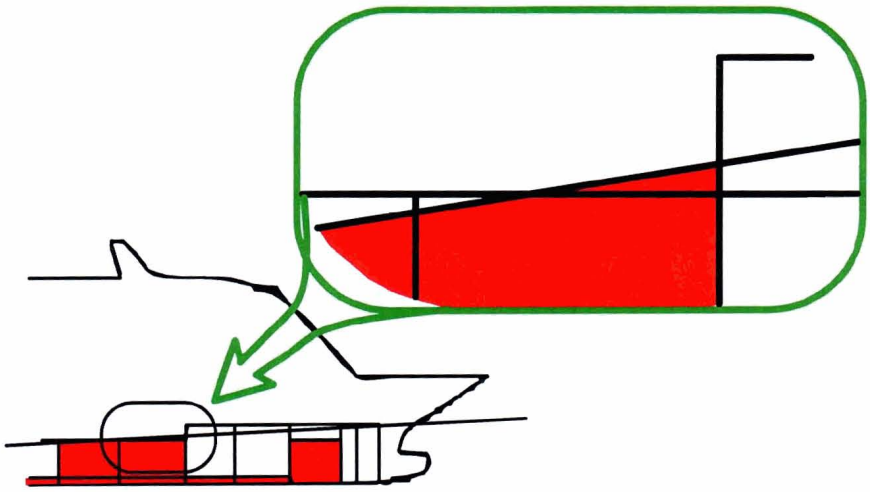
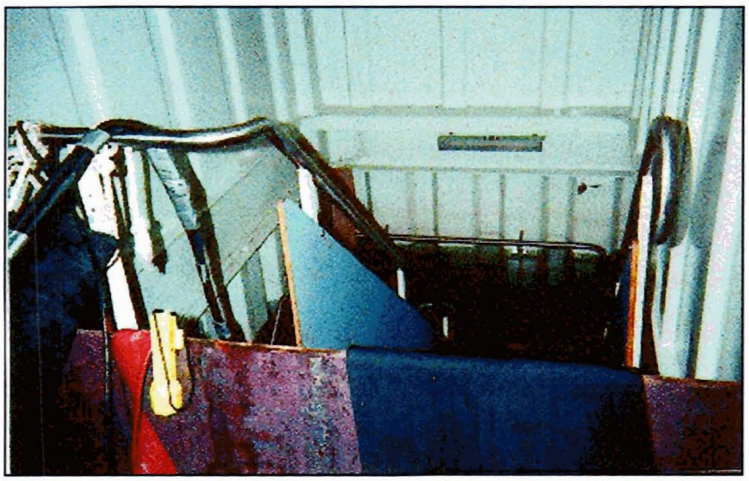


Diagram indicating the stepped bulkheads.

Progressive Flooding



Deck 1, port side passageway. Note welded plate across stairwell put in place to limit the chance of progressive flooding.

Flooded storage room with paper waste slurry.

Top down view of a flooded elevator shaft and top of elevator.

Flooding of crew staterooms.

5. FACTS ESTABLISHED AND COMMENTS.

5.1 Facts established

5.1.1 In respect of the master, etc.

On the basis of the previous statements and investigation, as well as on documents relating to the case, the following is established:

- That the master holds a Deck Officer Class 1 certificate (Master Mariner) from the Norwegian Maritime Authority, has received ARPA training, and has served for two (2) years and eight (8) months as a master;
- The master deviated from the vessel's intended voyage to Martinique in order to disembark a critically ill passenger.
- That the master took over the navigation of the vessel at about 0010 hours on 15 December 1998, when the ship was approaching Philipsburg, St. Maarten on an easterly course
- That all navigational instruments on board the vessel at the time were in good working order, including the two radars (Sperry Marine Rascar 3400M 3 cm and 10 cm complete with ARPA) and the GPS equipment (one Navigator MX200 Professional and one Timble Navigator NT 200) that were in use;
- That the ship had a chart and nautical publications for the waters in which it sailed, but that U.S. chart No. 25613, Approaches to St. Maarten, had not been corrected in accordance with *Notices to Mariners* No. 32/98 concerning the new position of the Proselyte Reef lighted buoy;
- That the master, at about 0040 hours, stopped the ship approximately four (4) cable lengths south of Fort Amsterdam, as planned;
- That the master thereafter maintained the ship's position on an easterly course by using the engines, during which time a tenderboat from St. Maarten arrived/departed from the ship's side (with patient, doctor and nurse on board);
- That the ship's position at 0100 hours was south of Fort Amsterdam, bearing 000 degrees, 0.4 cable lengths off, and that this position was entered in the deck log by the watchkeeping second officer;
- That the master decided to sail out of St. Maarten on the east side of Proselyte Reef;
- That the master, at about 0125 hours, after the tenderboat had arrived and departed from the ship's side, gave speed ahead by using pitch 2-3, and turned the ship to starboard from an easterly course towards a course passing east of Proselyte Reef;
- That the master then maintained a true course of 160 degrees;
- That the true course 160 degrees was not mentioned in any voyage plan for the passage St. Maarten to Martinique;
- That the first course referred to in the voyage plan St. Maarten - Martinique was 180 degrees (1 leg 180 degrees 30 nm);
- That the voyage plan St. Maarten to Martinique was not signed or approved by the master or any other person;
- That at the time of departure from St. Maarten no departure checklist had been completed;
- That the master asked the watchkeeping second officer: "How are we doing with clearance to the buoy?" (the Proselyte Reef lighted buoy), whereupon the latter replied: "Closest point will be three cables off and safe";

- That the master did not ask the watchkeeping second officer if he had ever sailed on the east side of Proselyte Reef;
- That the master did not himself check the ship's closest point of approach to the Proselyte Reef lighted buoy;
- That the master, at 0128 hours, handed over the navigation to the watchkeeping second officer with all information about the navigation, and also ordered full speed;
- That the master did not write any orders in the night order book upon departure from St. Maarten;
- That the master, on 14 December 1998 for the voyage St. Thomas to Martinique had written, *inter alia*, the following night order: "If any doubt or irregularities call me right away";
- That the master gave the following order to the watchkeeping second officer before leaving the bridge: "Keep safe well off buoy, go fast and safe";
- That the master not check the ship's position before leaving the bridge;
- That the master, before leaving the bridge, checked that the ship steered true course 160 degrees, and that he visually observed the Proselyte Reef lighted buoy in bearing 50-60 degrees on starboard bow;
- That the master, before leaving the bridge, asked the following question to the watchkeeping second officer and the staff captain: "It is so quiet here, have we forgotten anything?", whereupon both officers replied: "No, everything under control";
- That after the master had left, the following remained on the bridge: the watchkeeping second officer, who among other things operated the starboard ARPA, the staff captain, who among other things monitored the pitch controller panels and speed, a helmsman steering manually, and a lookout who, among other things, was monitoring the port radar;
- That the reason why the master left the bridge before the ship had sailed past Proselyte Reef was that he desperately needed to go to the toilet;
- That the master, before leaving the bridge, did not give the watchkeeping second officer or the staff captain any order to check the ship's position, as he took for granted that they would do so;
- That at the time of the master's leaving the bridge visibility was good, wind was easterly, 3-5 meters, slight sea, dark, variable cloud, barometer 1015, and air temperature 28 degrees C;
- That the master, after leaving the bridge, went to the toilet and later to a pantry;
- That the master, after having heard and felt the grounding at 0130 hours, immediately returned to the bridge and took over the command of the vessel;
- That the master informed the passengers that the ship had grounded and that they were requested to get dressed, put on their lifejackets and go to their muster stations;
- That the master navigated the ship back to St. Maarten where he deliberately grounded the vessel in Great Bay at about 0235 hours;
- That the master ensured that all passengers were evacuated from the ship in the period from about 0245 hours to about 0515 hours on 15 December 1998, by means of the St. Maarten tenderboats;
- That the master at the time of departure from St. Maarten had "a strong cold and a diarrhea", a condition that had lasted for 2 to 3 days duration.

5.1.2 In respect of the watchkeeping second officer, etc.

On the basis of the above statements and investigations, as well as documents relating to the case, the following is established:

- That the watchkeeping second officer (hereinafter "OOW") holds a Deck Officer Class 4 certificate from the Norwegian Maritime Authority, has received ARPA training, and that he has served for 27 weeks as a second officer and is familiar with the company's procedures and instructions for mates who are assigned watchkeeping duties;
- That the OOW, who had been assigned the 0000-0400 and 1200-1600 watches, came on the bridge at about 2330 hours on 14 December 1998 after having rested from 2000 hours to 2300 hours;
- That the OOW relieved the watchkeeping mate on the 2000-2400 watch after having obtained navigational information, at a time when the ship was approaching Philipsburg, St. Maarten on an easterly course at a speed of 19.5 knots (to disembark a sick passenger);
- That the OOW was relieved by the master at 0010 hours;
- That the OOW thereafter, *inter alia*, monitored the radar, fixed bearings and distances, and looked out for other traffic as the ship was approaching Philipsburg;
- That the OOW entered the following position in the deck log at 0024 hours: "The Corner, bearing 000 degrees, 1.2 nautical miles off";
- That the OOW observed the ship's "drifting position" at 0040 hours as being: 0.4 nautical miles "due south of Fort Amsterdam";
- That the OOW entered the following position in the deck log at 0100 hours: "Fort Amsterdam, bearing 000 degrees, 0.4 nautical miles off";
- That the OOW was monitoring the position, which "was basically the same all the time until the tenderboat returned to the ship at 0125 hours";
- That the OOW, at 0128 hours, at a time when the ship steered true course 160 degrees at a speed of 6-7 knots and pitch 10 navigating out of "drifting position south of Fort Amsterdam", was handed over the command of the vessel from the master with the following order: "We are going fast and we are going safe and we have good clearance off the buoy" (the Proselyte Reef lighted buoy);
- That the OOW, *inter alia*, was operating the starboard radar with ARPA, its scale set at 1.5 nautical miles, where the Proselyte Reef lighted buoy had been plotted when the ship sailed into St. Maarten;
- That the OOW observed on the radar that the ship steering true course 160 degrees would get a CPA (closest point of approach) to the Proselyte Reef lighted buoy of 0.3 nautical miles, which he reported to the master;
- That the OOW entered no information as "input into the ARPA" in respect of the easterly wind and current moving the ship westwards;
- That the OOW was visually observing the flashes from the Proselyte Reef lighted buoy all the time and "felt safe with the clearance of 0.3 nautical miles to the lighted buoy" (0.3 nm CPA);
- That the OOW, as he was monitoring the radar and visually observing the Proselyte Reef lighted buoy abeam on starboard, received a telephone call from the purser's desk concerning noise near cabin number 1549;
- That the OOW, from his position at the radar, lost sight of the Proselyte Reef lighted buoy;

- That the OOW put down the telephone and ordered the helmsman to change course to a true course of 190 degrees (from true course 160 degrees);
- That at 0130 hours, as the ship had slowly begun to change its course to starboard and had reached approximately 163-164 degrees, the *MONARCH OF THE SEAS* ran aground on Proselyte Reef by raking the reef and did not become permanently stranded;
- That the ship was sailing at a speed at approximately 12-13 knots when it ran aground, and that it came off the reef on the south side;
- That the master immediately returned to the bridge and took over the command of the vessel.

5.1.3 In respect of the staff captain, etc.

On the basis of the above statements and investigations, as well as documents relating to the case, the following is established:

- That the staff captain holds a Deck Officer Class 1 certificate (Master Mariner) from the Norwegian Maritime Authority, has received ARPA training, has served for two (2) years and six (6) months as a staff captain and has been with the company for about 16 years;
- That the staff captain "shall be familiar with the master's duties, responsibilities and authorities and shall be prepared to take command without notice";
- That the staff captain knew that the master took over the navigation at 0010 hours on 15 December 1998 and that a bow thruster was started at 0030 hours;
- That the staff captain knew that the ship was navigated to a position 5 cable lengths south of Fort Amsterdam and that the ship was held in position there, on an easterly course, when the patient, doctor and nurse were disembarked by the tenderboat;
- That the staff captain knew that the master navigated the ship to starboard from the position south of Fort Amsterdam immediately after the tenderboat left the ship's side (when the doctor and nurse had returned);
- That the staff captain operated the pitch controllers on the master's orders while the ship was navigating out of St. Maarten;
- That the pitch controllers first were set steady at 2-3, with no twisting, and that the speed was then gradually increased (after a sailboat had passed safely ahead of the ship);
- That the staff captain noticed that the master steadied the ship on true course 160 degrees;
- That the staff captain did not know that the master had planned to steady the ship on true course 160 degrees;
- That the staff captain was surprised at the course chosen by the master (steering a course east of the Proselyte Reef lighted buoy) as he had expected that the ship would steer a course to the west of that buoy as was customary;
- That the staff captain heard the master ask the watchkeeping OOW a question about the closest point of approach to the lighted buoy, to which the OOW replied: "0.3 nautical miles off, safe distance";
- That when the staff captain heard this reply, he trusted the judgment of the master and the watchkeeping second officer with regard to the planned navigation;
- That the staff captain had such respect for the master that he trusted his decision (with regard to the navigation);

- That the staff captain knew that the master had handed over the navigation to the watchkeeping second officer (OOW) at about 0128 hours saying, "Drive fast, but safe, safe distance to the lighted buoy", and that the master ordered full speed;
- That the staff captain heard the master tell the OOW that, "You are in charge, the course is 160 degrees, controllers are about to increase the speed";
- That the staff captain felt that the OOW had the navigation of the vessel under control;
- That the staff captain set the pitch controllers at full speed and that he afterwards monitored the speed, pitch controllers and the instruments in front of him to see if all was normal;
- That the staff captain felt some pressure from the master to get out of St. Maarten as soon as possible to arrive at Martinique at about 1400 hours;
- That the staff captain and the OOW both answered the master that, "All is normal" when the latter, leaving the bridge, asked if something had been forgotten;
- That at 0130 hours the staff captain, while monitoring the instruments (pitch controllers and speed), also visually observed the Proselyte Reef lighted buoy abeam on the starboard side;
- That the staff captain knew that the OOW was at the starboard radar and that the latter gave orders to change course to a true course of 180 degrees;
- That the staff captain noticed a violent vibration of the ship when the grounding occurred and that he therefore, as a reflex action, moved the pitch controllers back to 7-8;
- That the staff captain noticed that the ship was steering a course of approximtely 163 degrees and sailing at a speed of 12-13 knots at the time of the grounding;
- That the staff captain noticed that the master was back on the bridge at 0131 hours and that he then gave the master as much information as he could;
- That the staff captain "felt that the communication between him and the master could have been better."

5.1.4 In respect of the helmsman, etc.

On the basis of the above statements and investigations, as well as documents relating to the case, the following is established:

- That the helmsman holds a Deck Officer Class 4 certificate from the Norwegian Maritime Authority and that he had been on board the vessel for about 14 weeks;
- That the helmsman, at the master's orders, was steering 160 degrees on the gyro-compass when the ship sailed out of St. Maarten and that he then visually observed the Proselyte Reef lighted buoy;
- That the helmsman heard the master say, "Good watch" before leaving the bridge ("the sound of the door being closed");
- That the helmsman then received orders from the watchkeeping second officer to steer 190 degrees, whereupon he turned 5 degrees to starboard, "Which gave a turn rate of 8 degrees per minute";
- That the helmsman did not receive any order from the staff captain;
- That the helmsman, after turning 3 to 4 degrees, felt a "big shaking";
- That the helmsman immediately changed the rudder's position to amidships on his own direction and that he then saw the lighted buoy approximately 90 degrees to starboard;
- That the helmsman shortly thereafter was ordered by the master to turn to starboard.

5.1.5 In respect of the lookout, etc.

On the basis of the above statements and investigations, as well as documents relating to the case, the following is established:

- That the lookout holds a Deck Officer Class 4 certificate from the Norwegian Maritime Authority;
- That the lookout, among other things, was standing by the port radar and that he noticed that the watchkeeping second officer was operating the starboard radar;
- That the lookout visually observed the flashes from the Proselyte Reef lighted buoy;
- That the lookout saw the Proselyte Reef lighted buoy on the radar, with a "CPA of 0.3 nautical miles";
- That the lookout believes the order to change course from true course 160 degrees to 190 degrees was given at the moment when the Proselyte Reef lighted buoy was approximately 90 degrees on starboard and that the master had then been away from the bridge for "maybe three minutes";
- That the lookout responded to and silenced an automatic smoke detector alarm that sounded on the bridge at about the same time as the course change was ordered;
- That the lookout noticed that the staff captain was operating the pitch controllers at the time of the grounding and that he did not hear the staff captain give any orders.

5.1.6 In respect of the safety officer, etc.

On the basis of the above statements and investigations, as well as documents relating to the case, the following is established:

- That the safety officer secured the side shell opening following the return of the ship's doctor and nurse
- That the safety officer felt vibrations of the ship at 0130 hours;
- That the safety officer ran forward and discovered that the ship was taking water in pump rooms number 1 and 2 and other spaces;
- That the safety officer closed watertight door number ten which was discovered to be in the opened position in violation of standard operating procedure.
- That the safety officer judged the situation to be of such seriousness that he felt that the ship would have been lost if the master had not grounded it;
- That the safety officer believes "the ship's personnel were exemplary with regard to their emergency response on the day in question".

5.1.7 Nonconformities relative to instructions and procedures laid down by the company Royal Caribbean Cruises Ltd.

On the basis of statements and investigations, as well as documents relating to the case, the following is established:

- That the company, Royal Caribbean Cruises Ltd., had instructions and procedures in accordance with the Safety Management System requirement (ISM manual), *inter alia*, as follows:
  - "Policy for Safe Bridge Operation",

- "The Human Factor in the Navigational Operation",
- "Position descriptions for Master, Staff Captain and watchkeeping officers",
- "Standard Operational Procedures".

- That nonconformities have been found for instructions and procedures for Standard Operational Procedures, items 10-11-14, Voyage Plan and Port Passage Plan - Checklists - Fix Position;
- That the master failed to use a checklist at the departure from St. Maarten and thus failed to "verify in the departure checklist (St. Maarten) that he is informed of, and approved the voyage plan St. Maarten to Martinique" (ref. ISM manual, prghs 10 and 11);
- That the master failed to "include true course 160 degrees in a port passage plan for departure St. Maarten" (ref. ISM manual, prgh 10);
- That the master failed to "parallel index distances to dangerous areas" (i.e. Proselyte Reef, ref. ISM manual, prgh 10);
- That the master "relied on only one navigation aid, i.e. ARPA radar for fixing position on departure St. Maarten" and failed to use "terrestrial navigation and GPS for continuous follow-ups of fixing the ship's position" (ref. ISM manual, prgh 14);
- That the watchkeeping OOW failed to "parallel index distances to dangerous areas", i.e. Proselyte Reef (ref. ISM manual, prgh 10);
- That the OOW "relied on only one navigation aid, i.e. radar for fixing position on departure St. Maarten" and failed to use "terrestrial navigation and GPS for continuous follow-ups of fixing the ship's position" (ref. ISM manual, prgh 14).

5.1.8 Nonconformities relative to provisions of the 1974 SOLAS Convention concerning the updating of charts

On the basis of statements and investigations, as well as documents relating to the case, the following is established:

- That the master did not ensure that U.S. chart no. 25613, used for the navigation out of St. Maarten, was updated in accordance with *Notices to Mariners* no. 32/98 of 8 August 1998, in violation of the 1974 SOLAS Convention, Chapter V, Regulation 20.

5.1.9 Additional facts and circumstances established

It is also established:

- That the distance from the ship's position 4 cable lengths (0.4 nm) south of Fort Amsterdam to the position where the grounding occurred on the east side of Proselyte Reef is approximately 0.98 nautical miles or about 1,815 meters;
- That the ship covered that distance of approximately 0.98 nautical miles in approximately five (5) minutes spanning the time from around 0125 hours to around 0130 hours, the time of the grounding. This gives an average speed for the vessel of 11.76 knots;
- That the master navigated the ship until about 0128 hours and thus steered true course 160 degrees for about three minutes, a distance of approximately 0.588 nautical miles (approximately 1,090 meters);
- That the watchkeeping second officer (OOW) navigated the ship from about 0128 hours until the time of the grounding, at 0130 hours, and thus steered a true course of

160-164 degrees for about two minutes, a distance of approximately 0.392 nautical miles (approximately 725 meters);

- That the chart used by the ship, U.S. no. 25613, shows depths of 6.7 to 6.9 meters on the east side of Proselyte Reef;
- That the Proselyte Reef lighted buoy on 15 December 1998 was located in a position approximately 125 meters west of the position indicated on the ship's chart U.S. no 25613;
- That the ship's draught on 15 December 1998 was 7.65 meters forward and 7.5 meters aft.

5.2 Investigator Analysis

The U.S Coast Guard and the Marine Investigator's analysis and comments are as follows:

Instructions and procedures prescribed by the ISM Code

At the time of the grounding the company Royal Caribbean Cruises Ltd. had developed instructions and procedures for a Safety Management System in accordance with the International Safety Management (ISM) Code including, *inter alia*, Standard Operational Instructions and The Human Factor in the Navigational Operation.

The grounding would not have occurred if the master and the watchkeeping OOW had followed the above instructions and procedures.

Planning phase of the navigation out of St. Maarten

During the planning phase of the vessel's navigation, before maneuvering out of St. Maarten, the master decided to sail to the east side of Proselyte Reef as was contrary to the customary southwesterly departure passage. The east side of the reef is the most "dangerous" side to sail close to for the following reasons:

- The lighted buoy that shows the location of the Proselyte Reef is located on the west side of the reef, which extends approximately 0.2 nautical miles in an east-west direction;
- The current moves in a westerly direction;
- The wind is normally easterly (which was also the case on the night the casualty occurred);
- The lighted buoy may be out of the indicated position due to bad weather, current, damage, etc.

There was no officially approved voyage plan from St. Maarten to Martinique.

The 160 degree departure course from St. Maarten was not part of the "unofficial" voyage plan from St. Maarten to Martinique.

The 160 degree course track-line was not laid down or plotted on the navigational chart in use at the time of transit.

Initial phase of the navigation out of St. Maarten

In the initial phase of the vessel's departure, the master established the 160 degree true course to pass east of the Proselyte Reef based largely on his mariner eye as well as on the OOW's

feedback that the ARPA's calculated CPA to the Proselyte Reef buoy on the 160 degree course was three (3) cables off (0.3 nm). The master did not ask the OOW about the distance to Proselyte Reef itself. Nor did he orally, or in writing, give any order about a specific CPA to be observed when sailing past the reef hazard. The master failed to give consideration to the following warning, printed in the ship's chart U.S. no. 25613: *"The prudent mariner will not rely solely on any single aid to navigation, particularly on floating aids."*

The OOW used the starboard radar with ARPA equipment soley to determine the CPA to the Proselyte Reef lighted buoy and reported back to the master that, "The closest point will be three cables off and safe." The OOW thus considered, based on his experience as a navigator, that the CPA to the reef would be "safe". The master did not express any doubt in his communication with the OOW as to the quality of the latter's judgement. Nor did the master check on the chart or otherwise to verify if a CPA of three cable lengths (0.3 nm) to the lighted buoy was a "safe" distance from the reef. The master did not give the staff captain or any other member of the navigational watch any order to verify the safety of the intended passage, plot the vessel's position or plot out the 160 degree track line on the navigational chart.

During the initial phase of the navigation out of St. Maarten, the master chose, in spite of the above warning printed in the ship's chart and his maritime training and experience, to use the Proselyte Reef lighted buoy as the primary navigational aid on which to base all of his navigational decisions while piloting the vessel out of St. Maarten. The Proselyte Reef light-buoy was the most uncertain navigational aid in the area. On the ship's port side when navigating out of St. Maarten lies Point Blanche, an excellent point for taking good and safe bearings by means of radar. No bearing and distance from Point Blanche was taken.

The course of 160 degrees was established without first sufficiently determining the initial position of the vessel. Further, no dead reaconing track-line for the 160 degree course was laid down or marked on the navigational chart in use at the time.

The navigation out of St. Maarten and checking the ship's position

After the OOW had taken over the navigational watch, he continued to check the ship's position by means of ARPA bearings and distances to the Proselyte Reef lighted buoy, relying solely on the ARPA radar. He did not provide any "input information into the ARPA" concerning the easterly wind and current moving the ship westwards or ground lock the ARPA. Nor did he give consideration to the following warning, printed in the ship's chart U.S. no. 25613: *"The prudent mariner will not rely solely on any single aid to navigation, particularly on floating aids."*

The master did not check or fix the ship's position on the navigational chart himself before leaving the bridge.

During the navigation out of St. Maarten, the navigational watch failed to use any "terrestrial navigation for fixing positions and GPS for continuous follow-ups", as prescribed by the company's own ISM manual instructions ("Fix Positions").

The staff captain, who was on the bridge when the ship sailed out of St. Maarten, did not receive any order from the master relating to position checks. Nor did the staff captain check the ship's position on his own initiative.

True course 160 degrees shown on the ship's chart, etc.

The departure course of 160 degrees was established without first sufficiently determining the initial position of the vessel. Further, no track line for the 160 degree course was actually laid down or marked on the navigational chart used by the navigation team prior to the vessel's departure. When the true course of 160 degrees is actually plotted on the ship's chart (U.S. no. 25613, scale 1:75,000, used at the time of the grounding) from the drifting position of four cable lengths (0.4 nm) south of Fort Amsterdam, it is seen that the course touches the eastern part of Proselyte Reef, where the depth is indicated to be 6.7 meters (the ship's draught forward was 7.65 meters).

The master was the individual who decided the ship should steer true course 160 degrees, a course which would lead the ship across the eastern edge of the reef. The master was also the person who requested the watchkeeping OOW to base the determination of the CPA on an uncertain mark, i.e. the Proselyte Reef lighted buoy, instead of for instance Point Blanche. In addition, the ship's chart U.S. 25613 had not been updated in accordance with *Notices to Mariners* no. 32/98 before the grounding, which was the master's responsibility (the position of Proselyte Reef lighted buoy was approximately 125 meters west of the position indicated in the ship's chart U.S. no 25613);

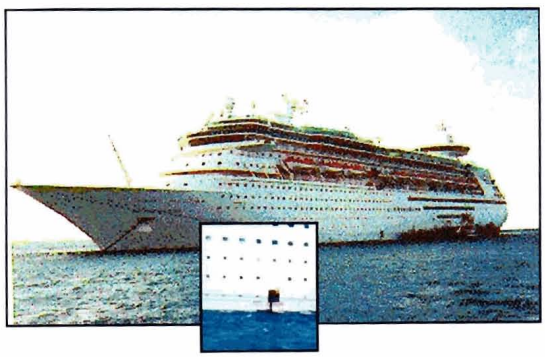
Ways to check the ship's position on the east side of Proselyte Reef

When a ship sails out of St. Maarten, there is high land on the port side. Good seamanship would imply that the ship's position had to be checked by means of radar, by means of taking bearings and distances to Point Blanche, St. Maarten, keeping a safe distance from Proselyte Reef, and complying with the provisions of the company's ISM manual concerning "Fix Positions".

Behaviour of the master and crew after the grounding

From the moment it was clear that a grounding had occurred, the master and other crew members acted correctly, quickly and efficiently and in accordance with the ship's muster list and good seamanship.

The master's decision to ground the ship in Great Bay was an entirely correct decision under the circumstances and he should be commended for taking swift action in this regard. Likewise, the information given to the passengers was good, a factor which contributed to the absence of panic on board. The use of tenderboats from the shore for the evacuation of passengers was also the most appropriate decision.



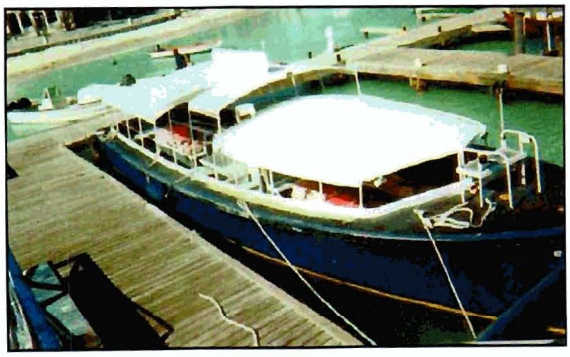
Grounded MONARCH showing a view of a side shell port used in the evacuation of the vessel.

Interior passageway used in the passenger evacuation

View from just inside side shell port used in the evacuation of the vessel. Note overhead obstructions

View of the other side shell port used in the evacuation of the passengers

Port side shell port used in evacuation



Small tender vessel used in evacuation

Tender vessel used in the evacuation

6. CONCLUSIONS

6.1 The conclusion of the U.S. Coast Guard and the Maritime Investigator is that the grounding of *MONARCH OF THE SEAS* on Proselyte Reef on 15 December 1998 was due to a myriad of human performance deficiencies.

6.2 In the opinion of the U.S Coast Guard and the Maritime Investigator, the grounding is primarily due to the following causal factors:

6.2.1 Violations of the ISM Code Safety Management System

The master and crew violated the prescribed ISM Code Safety Management System (SMS) guidance regarding the following Standard Operational Procedures:

- Paragraph 10, "Voyage Plan and Port Passage Plan", requiring voyage and port passage plans.
- Paragraph 11, "Checklists", requiring checklist be completed to ensure voyage and port passage plans were complete and thorough.
- Paragraph 14, "Fix Positions", requiring terrestrial navigational fixes as well as continuous GPS follow-up position checks.

The investigation revealed the primary reason for the master and crew's decision not to adhere to SMS procedures centered on the master's disregard for and lack of "by-in" to the formalized requirements of the ISM Code SMS. He voiced his displeasure for the sort of company oversight, bureaucracy and micromanagement that the SMS procedures represented. Without the master's expressed support of the ISM procedures the crew unsurprisingly failed to embrace the newly established SMS and disregarded the established procedures, guidelines and job aids made easily accessible to them on the vessel's bridge.

This violation significantly contributed to the casualty because the intended benefits of the ISM Code SMS went unrealized and the defenses established by the guidelines to prevent this sort of casualty, voyage passage planning, port entry and exit procedure checklists and vessel position fixing and navigation requirements, were not employed by the master and crew.

RECOMMENDED SAFETY ACTIONS

- RCCL should establish a check and balance system whereby a designated officer, such as the safety officer or staff captain, shall independently verify and document compliance with ISM SMS guidelines, procedures and job aids.
- RCCL should require ISM training for all ship's officers in their fleet.
- RCCL should market and promote the benefits of the SMS to all vessel crewmembers.

6.2.2 Initial Company Support of ISM Safety Management System

RCCL provided little by the way of a change management or marketing strategy when they initially implemented the ISM program. A more aggressive marketing approach may have permitted greater buy-in among vessel crewmembers to the vessel's SMS.

RECOMMENDED SAFETY ACTIONS

- RCCL should develop a marketing strategy and designate a responsible person who routinely visits each vessel in the RCCL fleet to promote the benefits of the SMS and conduct initial implementation audits.

6.2.3 Master's supervision of the navigational watch

The master was unsuccessful and lackadaisical in the supervision of the navigational watch as demonstrated by the following:

- Failing to ensure a proper voyage plan was developed for the deviation to St. Maarten.
- Failing to communicate with the navigational watch team regarding all intended vessel maneuvers related to the vessel's departure route.
- Failing to plot out or ensure the navigational team plotted the intended departure course track-line on the navigational chart past a know hazard, Proselyte Reef.
- Failing to or ensuring that established margins of error or "no go" areas were marked on the navigational chart.
- Failing to give due consideration to the wind and current while navigating outbound from St. Maarten resulting in setting the vessel to the west toward Proselyte Reef.
- Failing to properly monitor the vessel's progress along the intended track-line.
- Failing to ensure that another qualified officer independently checked all navigation decisions.
- Failing to ensure positions were crosschecked on the navigational chart by comparing one means of navigation with another.
- Failing to ensure visual or electronic position fixing was taken by the navigational watchstanders.
- Failing to verify that vessel positions were taken and plotted on the navigational chart by the navigational watchstanders.
- Failing to ensure the navigational chart used for the approach and departure of St. Maarten (U.S. no. 25613) was updated as per the most recent Notice to Mariners (NM 32/98, 8 August 1998).

The master's behavior can best be explained by his familiarity with the port leading to overconfidence and ultimately inattention. Additionally, while he denied that any pressure was brought to bear on him from RCCL or any others in order to meet the vessel's next scheduled port of call in Martinique, credible testimony revealed that the repercussions for not meeting the schedule were well understood among the navigational watchstanders and it would have negatively impacted the vessel's passengers by possibly causing the port call to be missed prompting the cancellation of a port visit and the scheduled passenger island tours. Further influencing the master's behavior at the time of the casualty were the physiological effects of diarrhea, a head cold and an urgent need to use the toilet. These factors may explain in part why the master took the shortcuts he did and failed to properly supervise the navigational watch.

RECOMMENDED SAFETY ACTIONS

- RCCL should disseminate this report to all vessels in its fleet and make it required reading for all watch standers.
- RCCL should establish a system whereby established onboard SMS procedures are independently verified and documented.

6.2.4 Psychological factors - Master

The master possessed the personality traits so historically valued in the maritime community such as confidence, self-reliance and strong leadership. Unfortunately, those qualities served to promote the evolution of this casualty by undermining the principles of good Bridge Resource Management such as open communications, planning and teamwork, which caused ambiguity among the navigational watch standing team members.

The investigation revealed that the master's strong personality, confidence and familiarity with the port, combined with traditional maritime customs and values embraced by the ship's crew whereby the master's decisions were seen as unquestionable, established an unsafe condition that significantly contributed to this casualty. While the OOW and staff captain expressed their confidence in the master's abilities and command, they also testified that he was unapproachable and expressed discomfort at making suggestions to him or questioning his decisions.

RECOMMENDED SAFETY ACTIONS

- RCCL's Human Resources personnel should develop and implement a personnel-screening program to ensure that ship master's and watch standing personnel hired or employ are suitable for the positions they intend to hold bearing in mind the importance of teamwork and open communications.
- RCCL should provide Bridge Resource Management training for all navigational watch standing personnel.
- RCCL should implements a team building training program for all watch standing personnel.
- RCCL should design and implement a training program specifically targeting senior officers regarding effective communications and effective teamwork with subordinates.

6.2.5 Poor Team Work of the Navigational Watch

The investigation revealed that the navigation watch was ineffective as a team and the crew's participation in the watch keeping evolution became passive. They failed to effectively work together, communicate and, during the departure of Great Bay, casually performed specific individual tasks and watch functions only as directed by the master.

The lack of teamwork arose due to the master's failure to involve the watch standers in the decision making process regarding the St. Maarten departure route as well as the ambiguity created by the master's confidence and overbearing presence. The senior members of the navigational team, the OOW and the staff captain, both expressed their surprise at the unusual and more dangerous departure course chosen by the msater that took the vessel to the east of the Proselyte Reef but failed to express their concern because they did not feel empowered to voice doubt in the master's decisions.

RECOMMENDED SAFETY ACTIONS

- RCCL should provide Bridge Resource Management training for all navigational watch standing personnel.
- RCCL should implements a team building training program for all watch standing personnel.
  RCCL should design and implement a training program specifically targeting senior officers regarding effective communications and teamwork with subordinates.

6.2.6 Ineffective Bridge Resource Management

The principles of good Bridge Resource Management were not evident in this casualty. There was no predeparture meeting between the navigational watch and the master. The navigational watch was unaware, albeit quite surprised, at the master's choice of departure routes from St. Maarten although they failed to express their concern regarding the maneuver. In hindsight the crew could not recall why the master chose the route taken, transiting to the east of Proselyte Reef.

There was no clear understanding of the duties of the navigational watch while the vessel was keeping station off of Philipsburg. Further, a laissez-faire attitude seemed to exist among the navigational watch standers as to their duties. Contributing to this lackadaisical attitude would be the crew's familiarity with the port of Philipsburg due to the vessel's weekly visits, the weather was relatively benign and there was no significant vessel traffic to contend with other than a few small sailboats. These conditions would all serve to reduce the stress level below a desired state and served to lull the navigational watch into a feeling of well being and security, reducing their level of vigilance with regard to their particular duties and the safe navigation of the vessel.

RECOMMNDED SAFETY ACTION

- RCCL should establish a system whereby established SMS procedures are independently verified and documented.
- RCCL should provide Bridge Resource Management training for all navigational watch standing personnel.
- RCCL should implements a team building training program for all watch standing personnel.

6.2.7. Navigation of the vessel

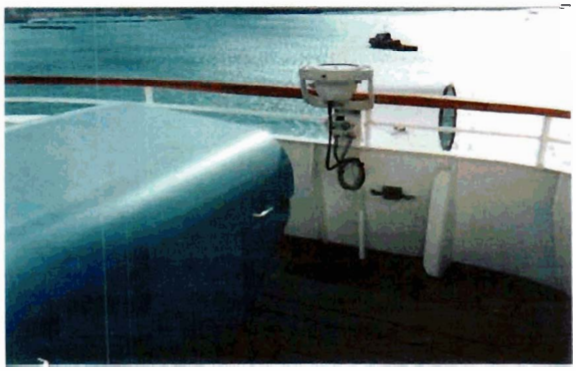
6.2.7.a. OOW Human Performance & Ergonomic issues

Starboard side of bridge looking toward centerline. ARPA used by OOW is to the right in photo.

The OOW's decision to use the ARPA to plot Proselyte Reef lighted buoy as the **sole** navigational instrument and reference point was contrary to the rules of good seamanship, his training as a navigational officer and the vessel's established standard operating procedure. This routine violation can be attributed to a human tendency to take the path of least resistance and accomplish the easiest job function deemed appropriate at the time in order to get the job done.

The ARPA unit was located on the forward, starboard side of the bridge, which provides a navigator the optimal location to view radar information as well as any vessel traffic on the starboard or burdened side of the vessel. Further, the ARPA display provides the navigator with a myriad of critical radar information. For these reasons it is reasonable that a watch officer would take up station near or at the starboard ARPA. However, the layout of navigational equipment on the bridge failed to allow easy access to the chart table or the output information of other electronic navigational instruments such as the GPS receiver and thus would serve to hamper a navigator's efforts to verify and plot the vessels position by other navigational means. All navigational charts and navigational instruments were located to the rear of the bridge and required a navigational watch officer to physically step around the vast chart table and move to the aft end or rear of the bridge away from the ARPA; a valuable and easy to use navigation aid.

Chart table with electronic navigation instruments.



Starboard bridgewing gyro repeater. Note the obstruction in the left foreground.

The investigation revealed an over reliance by the navigational watch officers on electronic navigation instruments and a reluctance on their part to take manual terrestrial navigation fixes. Taking a terrestrial navigation fix involves physically breaking out the azimuth bearing circles, placing them on the gyro repeaters, taking several bearings and then plotting them on the chart. This is a time consuming evolution but, onboard the MONARCH OF THE SEAS, it is further

complicated by the physical layout of the exterior bridge wings. Each bridge wing has large equipment cowlings that block accessibility to the gyro repeaters and only allows minimal physical clearance. This makes taking a bearing difficult or, at least, more difficult than normal. Aside from the effort involved with taking terrestrial navigation fixes in general, the inaccessibility of the bridge wing gyro repeaters would further deter a watch officer from taking terrestrial fixes.

The OOW also failed to recognize the limitations of the ARPA in this particular pilotage situation. He also failed to either manually input the set and drift calculation to allow for the current and wind or ground lock the ARPA radar, either of which would have allowed the ARPA's computer to correctly calculate critical navigational data considering the vessel's set and drift. The OOW was also not fully familiar with all of the ARPA functions although he had undergone ARPA training in 1994.

RECOMMENDED SAFETY ACTION

- RCCL should require all navigational watch officers attend ARPA certification and periodic refresher training.
- RCCL should develop a brief, in-house ARPA training refresher course or training aids that navigational watch officers must successfully complete on an annual basis or when first assigned to a particular vessel.
- For each vessel owned and operated by RCCL, they should examine the physical bridge layout and work with the vessel's navigational watch officers to modify the design to permit the most effective, efficient and safe navigation of the vessel. This should consider locating navigation charts and plotting tools as well as electronic navigational instrument readout in close proximity to the primary navigating station.

6.2.7.b Master's early departure from the bridge

The master's decision to depart the bridge prior to the vessel passing a known navigational hazard was primarily physiological, as he urgently needed to use the toilet. Because of his confidence in the abilities of the navigational watch he felt comfortable leaving the bridge and attending to his needs in his own stateroom although he could have easily used the toilet facilities on the bridge.

Further, the master had been suffering slightly from a head cold and diarrhea for several days and was taking over the counter medications as directed by the ship's doctor. He also testified that he was somewhat tired from his required social engagements with the passengers that commenced on the first night of the voyage.

Although the master testified that the medications did not affect his judgment, he passed all post casualty drug and alcohol testing and all evidence suggests that he was alert and capable of commanding the vessel, the combined deleterious effects of not feeling well, being tired and having to urgently relieve himself would all serve to negatively influence his performance and hinder his decision making process.

RECOMMENDED SAFETY ACTION

- RCCL should implement a two-man pilot/co-pilot arrangement during vessel navigation in critical pilotage waters. A co-pilot arrangement - the term borrowed from aviation where this type of arrangement is a common means of enhancing safety - can be used on most ships to substantially improve control of the ship navigation.

Under this type of arrangement, the navigation bridge is manned by two navigators, the pilot (charged with the navigation and control of the ship) and the co-pilot (assisting in the pilot's tasks and often actively controlling proposed actions to be able to take over command of the vessel's control at all times). The master decides if and when a co-pilot arrangement is to be used, e.g. when approaching or navigating out of a port, in narrow waters, at times of reduced visibility, and in congested waters. The pilot is the navigator in charge of the actual navigation of the ship and responsible for keeping the co-pilot well informed about actions to be taken. The pilot should be the one who communicates by VHF with approaching vessels and for other reasons of navigational safety. The co-pilot should assist the pilot only and have no other tasks to attend to but be ready to assume vessel control in cases the pilot becomes debilitated or needs to be relieved for some unexpected reason.

6.2.7.c. Vessel departure route

The investigation failed to find a clear indication of why the master chose the departure route he did, passing just 0.3 nm east of the Proselyte Reef lighted buoy with the prevailing easterly wind and current setting the vessel to the west, when his past experience and the rules of good seamanship dictated otherwise. In hindsight, he remarked that he would have more likely preferred to be at least 0.5 nm off the reef hazard. That comment provides insight into the master's comfort with maneuvers and clearances to hazards that other experienced mariners would consider otherwise hazardous. There was ample sea room to both the east and west of the Proselyte Reef that provided a much greater margin of error and presented a relatively insignificant delay in reaching the vessel's ultimate goal of safely arriving in Martinique as safe and quickly as possible.

While the master testified that there was no pressure to arrive in Martinique at any particular time, the crew understood the implications of being late or missing the Martinique port call. It was stated that one of the primary reasons St. Maarten was chosen for disembarking the sick passenger was that it was situated along the vessel's route to Martinique and presented the least likely disruption to the voyage.

RECOMMENDED SAFETY ACTION

- RCCL should widely disseminate this report to all vessels in its fleet and make it required reading for all officers.

6.2.7.d. Chart Corrections

The investigation failed to reveal why the ship's chart used at the time of the grounding, U.S. no. 25613, was not updated in accordance with Notices to Mariners no. 32/98 (the most recent Notice) with respect to the new position of the Proselyte Reef lighted buoy which placed the buoy 125 meters west of the position indicated on the navigational chart in use during the transit. This is of particularly concern to the investigators as this was a routine port call for the vessel and the buoy in question marked a major hazard to navigation that was routinely passed in close proximity. This is further evidence of the navigational watch officer's lax attitude and propensity for taking shortcuts.

RECOMMENDED SAFETY ACTION

- RCCL should establish a check and balance system whereby a designated officer, such as the safety officer or staff captain, shall independently verify and document all chart corrections in a timely fashion.
- RCCL should disseminate this report to all vessels in its fleet and make it required reading for all navigational watch standers.

6.2.7.e. Chart usage

The crew failed to adequately explain why the vessel's departure track line was not plotted on the navigational chart in use as well as why no predeparture position fix was made on the chart as per the ISM manual, "Standard Operating Procedures". This shortcoming is also indicative of the navigational watch officer's lax attitude and disregard of the vessel's SMS.

RECOMMENDED SAFETY ACTION

- RCCL should disseminate this report to all vessels in its fleet and make it required reading for all navigational watch standers.
- RCCL should explore ways to better incorporate SMS guidance into a mariner's routine job function.

6.2.8 Staff Captain's function

The staff captain's function on the Bridge Team was of little value and failed to enhance to the safety of the vessel. The staff captain's contribution to the navigational watch appeared to be limited solely to operating the engine controls during the vessel maneuvers. He did not participate in any other phase of the vessel's navigation such as ensuring the vessel's position was plotted or verifying that the planned course past a know navigational hazard was safe.

RECOMMENDED SAFETY ACTION

- RCCL should clearly define and indicate what a staff captain's function is when attending the vessel's bridge. The staff captain should be regarded as the vessel's co-pilot and be ready to assume vessel control in the event that the master may become incapacitated for some unexpected reason.

6.2.9 OOW's function

The OOW had arrived in San Juan, Puerto Rico after traveling from Norway on the evening of December 12th following an eight-week holiday. He reported to the vessel on December 13th at 1130 hours and immediately assumed the 12/4 navigational watch.

He had transited the approaches to St. Maarten on many occasions but the night of the casualty was his first nighttime transit of the area and the very first time he had witnessed a departure from St. Maarten to the east of Proselyte Reef. Every other time he had transited the area it had been during the daylight hours and the vessel had always arrived and departed St. Maarten to the west of Proselyte Reef as was the routine.

Although the OOW testified he was fit for work, licensed and qualified to assume the navigational watch on the night of the casualty, it's questionable that the OOW was operating at optimal performance due to the following reasons:

- Expected jet lag from his airplane trip from Norway to Puerto Rico.
- He had only three navigational watches to reacquaint himself with the 12/4 navigational watch procedures and associated navigational equipment after an eight-week vacation.
- He was unaccustomed to a nighttime transit of St. Maarten.

RECOMMENDED SAFETY ACTION

- RCCL should require all navigational watch officers to transit critical navigation areas such as a port approach or confined shipping channel a predetermined number of times with appropriate supervision in both daylight and nighttime conditions prior to allowing the watch officers to assume full operational control of a vessel in those areas.
- RCCL should consider establishing an overlap period between watch officers that are newly hired, newly assigned to the vessel or those returning from extended periods away from the vessel with those mariners currently standing the navigational watch. This will permit the oncoming watch officers to become familiar with SMS procedures as well as with all navigational equipment before they assume full navigational watch responsibilities.

6.2.10 Interruption of the OOW

The OOW's attention was interrupted during a critical vessel navigation and maneuvering evolution by a telephone call from the vessel's hotel staff regarding a disturbance in a passenger's stateroom. The policy of allowing calls to the bridge regarding hotel type services in unacceptable and may have contributed to this casualty by distracting the OOW from his navigational duties.

RECOMMENDED SAFETY ACTION

- RCCL should completely segregate hotel type responsibilities from the safe navigation of the vessel. All hotel complaints should be dealt with entirely by the hotel staff or by the designated ship safety or security personnel and never interfere with the safe navigation of the vessel.

6.2.11 Watertight doors

After the vessel grounded all watertight doors (WTD's) were immediately closed remotely from the vessel's bridge. However, during a check of the resultant flooding, the vessel's safety officer found WTD number 10 in an opened position allowing water to leak into the lobby by the central store area. This was in violation of RCCL policy as WTD number 10 should have been closed and secured at 2300 hours every night. The vessel safety officer felt that the ship would have been lost without blanking off WTD number 10 as the vessel was a two-compartment ship.

RECOMMENDED SAFETY ACTION

- RCCL should reiterate to all crewmembers the critical importance of following SMS procedures and, in particular, stress the significance and function of such critical safety items as WTD's.

6.2.12 Contingency plans – emergency port calls

Although the vessel's crew reacted in an exemplary fashion to the unique emergency situation they faced and successfully coordinated a large-scale vessel evacuation, there were no prearranged procedures for the vessel's crew regarding emergency situations like this and no advance consideration given to a large scale evacuation of the vessel through the side shell ports.

Further, there were no prearranged large-scale evacuation plans made with the officials in St. Maarten. It was very fortunate that the port of Philipsburg had several large tender vessels on hand that were quickly able to deploy and evacuate the passengers without major injury or death. Had the passengers abandoned ship by use of the lifeboats, it is likely that more injuries would have resulted.
Due to the high volume of cruise ship traffic in and out of St. Maarten as well as other Caribbean ports of call, RCCL as well as all other cruise shipping companies should work with the officials of each port of call to develop contingency plans for large-scale vessel evacuation and other envisioned emergency situations.

RECOMMENDED SAFETY ACTION

- RCCL should develop vessel evacuation contingency plans for non-routine vessel evacuations such as experienced in this casualty.
- RCCL and other cruise ship companies should develop contingency plans for large-scale vessel evacuations and other emergency situations with the officials and response authorities of each port of call.
- All cruise ships should promulgate emergency evacuation contingency plans.

6.2.13 St. Maarten – Moving of the Proselyte Reef Lighted Buoy

Due to the prevailing threat of hurricanes during the hurricane season, the St. Maarten port authority routinely removed the Proselyte Reef lighted buoy so it won't be damaged or swept away. Due to the high traffic volume of passenger vessels in and out of the port of Philipsburg, the extreme hazard the Proselyte Reef presents to deep draft vessels as evidenced by recent groundings in the same vicinity by another cruise ship and a naval vessel, St. Maarten should consider replacing the lighted buoy with a more permanent navigational aid.

RECOMMENDED SAFETY ACTION

- The port of Philipsburg and port authorities of St. Maarten should consider replacing the Proselyte Reef lighted buoy with a more permanent navigational aid.

7. LESSONS TO BE LEARNED

7.1 To prevent similar groundings (due to human error) in the future, the following lessons are to be learned:

1. The importance of adequate voyage planning, cf., inter alia, the standards prescribed by the 1995 STCW Convention (revised edition 1998), Chapter VIII, section A-VIII/2, Part 2, Voyage Planning;

2. The importance of adequate control of the ship's position, cf., inter alia, the standards prescribed by the 1995 STCW Convention (revised edition 1998), Chapter VIII, section A-VIII/2, Part 3, Performing the navigational watch, prghs 23 to 51; and

3. The importance of implementing the principles of effective Bridge Resource Management such as voyage planning, open and effective communication, and teamwork.

4. Instructions and procedures for adequate voyage planning and control of the ship's position must be implemented in the ships' ISM manuals, and such manuals must be used daily by the ship's personnel, like any other "tool".

5. The value of the recommended co-pilot arrangement during vessel navigation. A co-pilot arrangement - the term borrowed from aviation where this type of arrangement is a common means of enhancing safety - can be used to substantially improve control of ship navigation.

6. The value of establishing an overlap period between watch officers that are newly hired, newly assigned to the vessel or those returning from extended periods away from the vessel with those mariners currently standing the navigational watch. This will permit the oncoming watch officers to become familiar with SMS procedures as well as with all navigational equipment before they assume full navigational watch responsibilities.

7. The importance of a well designed bridge layout.

8. The dangers of over reliance on electronic navigational aids.

9. The value of using prescribed port entry/exit checkoff job aids.

10. The value of updating charts.

11. The importance of not interrupting the navigational watch for non vessel operational issues during critical vessel maneuvering evolutions.

12. The value of laying down intended track lines on the navigation chart.

13. The value of plotting out "no-go" danger areas on the navigation chart.

14. The dangers of being overconfident and complacent with regard to navigation.

15. The danger of relying on a single source of navigational information and/or not cross checking position by other navigational means.

16. The value of giving known hazards a wide berth.

17. The danger of passing a known navigational hazard up-wind and up-current.

18. The danger of not allowing for set and drift when navigating near a known navigational hazard.

19. The value of using parallel indexing when piloting a vessel near shore.

20. The value of clearly communicating the intended course of action among the navigation team when making emergency or not-routine port calls.

8. RECOMMENDED SAFETY ACTIONS

8.1 The company Royal Caribbean Cruises Ltd. has investigated and analyzed the grounding of MONARCH OF THE SEAS in relation to IMO Res. 741(18), paragraph 9. With a view to enhancing safety, the said company has made, inter alia, the following recommendation:

"That the roles and responsibilities of the Bridge Resource Management be reviewed and clarified." (Refer to paragraph 4.11 of the present report.)

The U.S. Coast Guard and the Maritime Investigator supports the above recommendation by the Royal Caribbean Cruises Ltd. and requests the company to include corrective action (instructions and procedures), as prescribed, in the ships' ISM manuals, in accordance with IMO Res. A.714(18), paragraph 9. " (Refer to, inter alia, the standards prescribed by the 1995 STCW Convention (revised edition 1998), chapter I, section B-I/12, paragraph 37, Navigation and watchkeeping simulation.)

8.2 Summary of Recommended Safety Actions:

1. RCCL should disseminate this report to all vessels in its fleet and make it required reading for all watch standers.
2. RCCL should establish a check and balance system whereby a designated officer, such as the safety officer or staff captain, shall independently verify and document compliance with ISM SMS guidelines, procedures and job aids.
3. RCCL should require ISM training for all ship's officers in their fleet.
4. RCCL should develop a marketing strategy and designate a responsible person who routinely visits each vessel in the RCCL fleet to promote the benefits of the SMS to all crewmembers.
5. RCCL should explore ways to better incorporate SMS guidance into a mariners routine job function.
6. RCCL's Human Resources personnel should develop and implement a personnel-screening program to ensure that ship master's and watch standing personnel hired or employed are suitable for the positions they intend to hold bearing in mind the importance of teamwork and open communications.
7. RCCL should provide Bridge Resource Management training for all navigational watch standing personnel.
8. RCCL should implement a team building training program for all watch standing personnel.
9. RCCL should require all navigational watch officers to transit critical navigation areas such as a port approach or confined shipping channel a predetermined number of times with appropriate supervision in both daylight and nighttime conditions prior to allowing the watch officers to assume full operational control of a vessel in those areas.
10. RCCL should design and implement a training program specifically targeting senior officers regarding effective communications and effective teamwork with subordinates.
11. RCCL should require all navigational watch officers to attend ARPA certification and periodic refresher training.

12. RCCL should develop a brief, in-house ARPA training refresher course or training aids that navigational watch officers must successfully complete on an annual basis, when first assigned to a particular vessel, or when the vessel changes to a new route.
13. RCCL should examine the physical bridge layout of each vessel that it owns and operates and work with the vessel's navigational watch officers to modify the design to permit the most effective, efficient and safe navigation of the vessel. This should consider locating navigation charts and plotting tools as well as electronic navigational instrument readout in close proximity to the primary navigating station.
14. RCCL should implement a two-man pilot/co-pilot arrangement during vessel navigation in critical pilotage waters. A co-pilot arrangement - the term borrowed from aviation where this type of arrangement is a common means of enhancing safety - can be used on most ships to substantially improve control of ship navigation.
15. RCCL should establish a check and balance system whereby a designated officer, such as the safety officer or staff captain, shall independently verify and document all chart corrections.
16. RCCL should establish an overlap period between watch officers that are newly hired, newly assigned to the vessel or those returning from extended periods away from the vessel with those mariners currently standing the navigational watch. This will permit the oncoming watch officers to become familiar with SMS procedures as well as with all navigational equipment before they assume full navigational watch responsibilities.
17. RCCL should develop vessel evacuation contingency plans for non-routine vessel evacuations such as experienced in this casualty.
18. RCCL and other cruise ship companies should develop contingency plans for large-scale vessel evacuations and other emergency situations with the officials and response authorities of each port of call.
19. The port of Philipsburg and port authorities of St. Maarten should consider replacing the Proselyte Reef lighted buoy with a more permanent navigational aid.
20. Recommend a copy of the report be provided to the International Maritime Organization, Royal Caribbean International, St. Maarten Port Authority, International Council of Cruise Lines and the International Association of Classification Societies.

[redacted]
Maritime Investigator in Oslo

[redacted]

Timothy J. Farley
U.S. Coast Guard, Office of
Investigations and Analysis

[redacted]

10 APRIL 2003