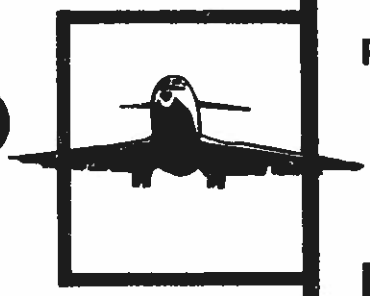

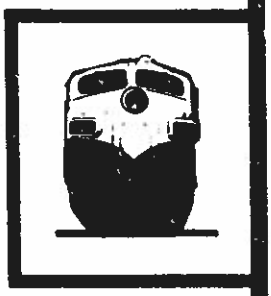

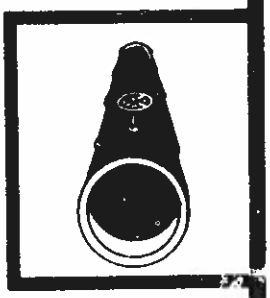

PB85-916403

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

MARINE ACCIDENT REPORT

FIRE ABOARD
THE BAHAMIAN PASSENGER VESSEL
M/V SCANDINAVIAN SEA
CAPE CANAVERAL, FLORIDA
MARCH 9, 1984

NTSB/MAR-85/03

UNITED STATES GOVERNMENT

TECHNICAL REPORT DOCUMENTATION PAGE

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15. Supplementary Notes

16. Abstract

A few minutes before 1920, on March 9, 1984, a fire was discovered in a room occupied by two crewmen aboard the Bahamian registered cruise ship SCANDINAVIAN SEA. The vessel, which was on a daily 11-hour cruise out of Port Canaveral, Florida, with 744 passengers and 202 crewmembers aboard, had been anchored about 7 miles off the coast of Florida, near Cape Canaveral and had just gotten underway. It proceeded to its berth at the Port Canaveral Cruise Terminal while the vessel's firefighting team proceeded to fight the fire. After the vessel berthed at 2057, the passengers were disembarked, and Coast Guard and local firefighters boarded the vessel to fight the fire. Meanwhile the fire, although it was contained within the forward vertical fire zone, spread through the upper decks. The fire was extinguished on March 11, 1984. There were no injuries or loss of life. The vessel was declared a constructive total loss. It was valued at $16 million.

The National Transportation Safety Board determines that the probable cause of the fire aboard the SCANDINAVIAN SEA was the deliberate or accidental ignition of an accelerant on the carpet in room 414. Contributing to the fire damage was the failure of ship's firefighters to follow up and investigate any possible further heat source after extinguishing the flames in room 414. Contributing to the uncontrolled propagation of the fire was the failure of the master to exercise his authority over the firefighting efforts of shoreside firefighters.

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

MARINE ACCIDENT REPORT

Adopted: March 26, 1985

FIRE ABOARD THE BAHAMIAN PASSENGER SHIP M/V SCANDINAVIAN SEA ATLANTIC OCEAN, OFF THE FLORIDA COAST MARCH 9, 1984

INTRODUCTION

This accident was investigated jointly by the National Transportation Safety Board and the U.S. Coast Guard. Public hearings were held in Cape Canaveral, Florida, from March 14, 1984, through March 30, 1984. This report is based on the evidence developed by the investigation. The Safety Board has considered all the facts in the investigative record that are pertinent to the Safety Board's statutory responsibility to determine the cause or probable cause of the accident and to make recommendations.

The Safety Board's analyses and recommendations are made independently of the Coast Guard. To inform the public of all Safety Board recommendations and the response to the recommendations, notices regarding the recommendations and the responses are published in the Federal Register.

SYNOPSIS

A few minutes before 1920, on March 9, 1984, a fire was discovered in a room occupied by two crewmen aboard the Bahamian registered cruise ship SCANDINAVIAN SEA. The vessel, which was on a daily 11-hour cruise out of Port Canaveral, Florida, with 744 passengers and 202 crewmembers aboard, had been anchored about 7 miles off the coast of Florida, near Cape Canaveral and had just gotten underway. It proceeded to its berth at the Port Canaveral Cruise Terminal while the vessel's firefighting team proceeded to fight the fire. After the vessel berthed at 2057, the passengers were disembarked, and Coast Guard and local firefighters boarded the vessel to fight the fire. Meanwhile the fire, although it was contained within the forward vertical fire zone, spread through the upper decks. The fire was extinguished on March 11, 1984. There were no injuries or loss of life. The vessel was declared a constructive total loss. It was valued at $16 million.

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INVESTIGATION

The Accident

On March 9, 1984, the Bahamian cruise ship SCANDINAVIAN SEA (see figure 1) departed the Port Canaveral Cruise Terminal about 1110 1/ for an 11-hour trip off the coast of Florida. The vessel proceeded to a position approximately 9 miles southeast of the harbor entrance and anchored for the day. (See figure 2.) At 1918, the anchor was aweigh, and preparations were being made to swing ship in order to calibrate the radio direction finder (RDF). The master, the chief officer, and the radio operator were on the bridge. The first officer was on the foredeck supervising the anchor handling party.

The Fire.--The ship's plumber who was passing through the forward "A" deck area at about this time smelled smoke and then saw smoke issuing from room 414. (Room 414 was assigned as crew quarters to two members of the catering staff.) The occupant of room 417 (opposite 414) said that he heard someone in the passageway and that when he opened the door he saw the plumber standing in the passageway and smoke emitting from around the door of room 414. Upon being informed of the fire by the plumber, room 417's occupant left the area and went to the crew messroom. The plumber then opened the door to room 414 with his master key. He said that he saw a circle of flame on the carpet near the settee and that the room was full of smoke which then spread into the passageway. The plumber said that he did not take the time to look for a manual fire alarm box in the smoke filled passageway but that he went directly to a telephone located on "B" deck near the storerooms.

At 1920, the ship's plumber reached the chief officer via telephone and informed him that there was smoke below on the "A" deck forward. (See figure 3.) About the same time, the ship's fire detection alarm sounded, indicating a source of heat in zone 32, (the number indicating "A" deck forward), and the fire doors in the forward main vertical zone closed automatically. The chief officer took a "walkie-talkie" (portable radio) and immediately proceeded down to the "A" deck area to assess the situation. He then informed the master by radio that there was a considerable amount of smoke in the area and asked him to call out the ship's crew. The master ordered the radio operator to ring the fire alarm only in the crew areas to alert the crew and to order the vessel's firefighting groups to report to the area of the smoke. The ventilation systems were secured and the fire dampers 2/ were closed. The master then headed the vessel toward Cape Canaveral to return to the terminal.

At 1932, the emergency alarm was sounded throughout the vessel, followed by another announcement over the public address (P.A.) system that ordered the mobile fire groups to proceed to the "A" deck forward. The plumber had already returned to the "A" deck area with another crewmember, a bar waiter, and found a fire station where both water and dry chemical fire extinguishers were kept. He selected a water extinguisher and then he and the bar waiter proceeded to room 414 and attempted to extinguish the fire. The plumber stated that at this time the passageway was filled with "white" smoke which made it difficult to see. He left the bar waiter at room 414 and went aft on "A" deck where the firefighting group under the direction of the chief officer was beginning to assemble. The chief officer put a fresh-air breathing apparatus (air-pac) on the plumber, gave him a dry-chemical fire extinguisher, and told him to continue fighting the fire.

1/ All times are eastern standard time based on a 24-hour clock.
2/ A device to stop the flow of air within a ventilation duct.

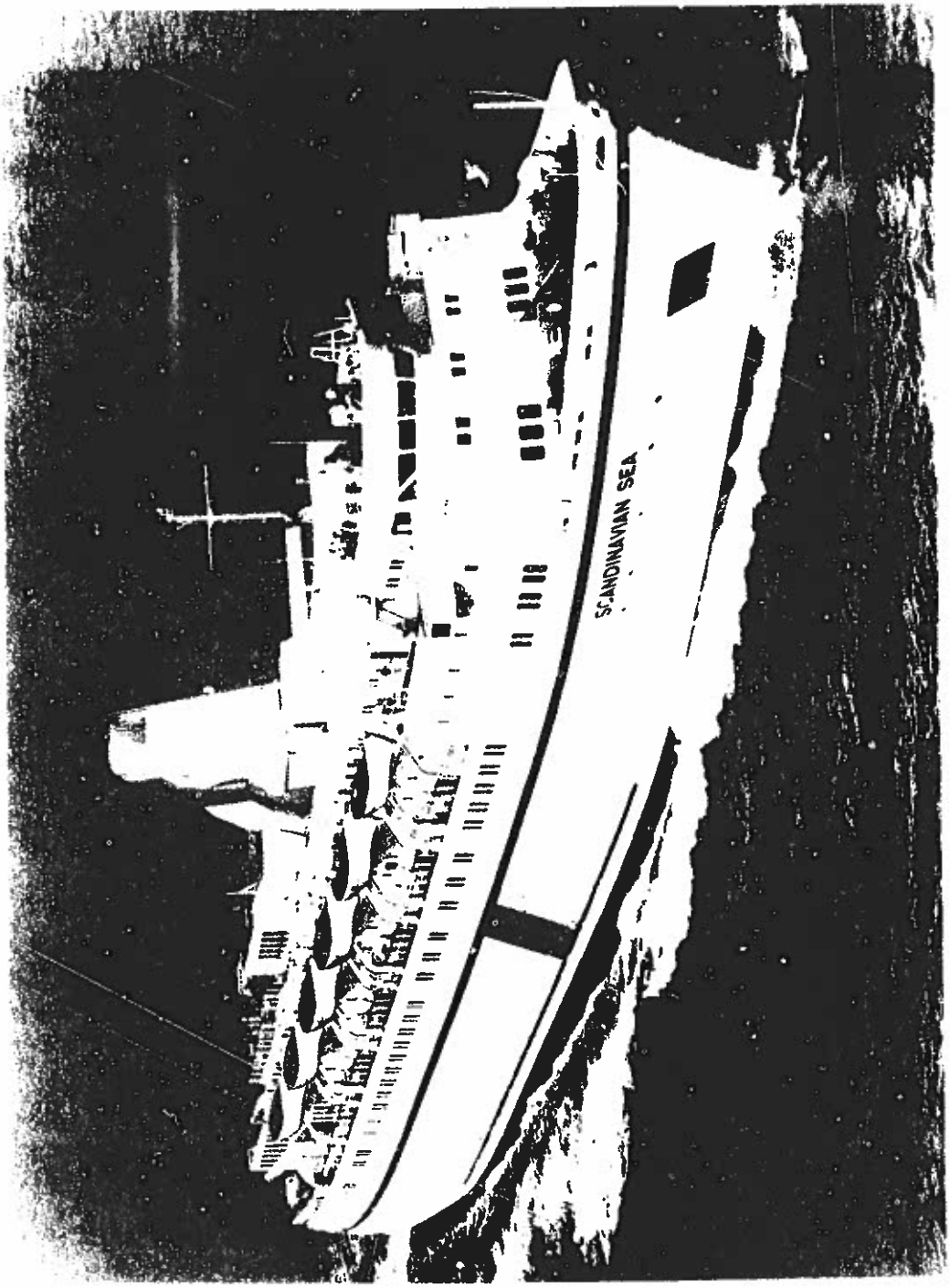


Figure 1.—The SCANDINAVIAN SEA.

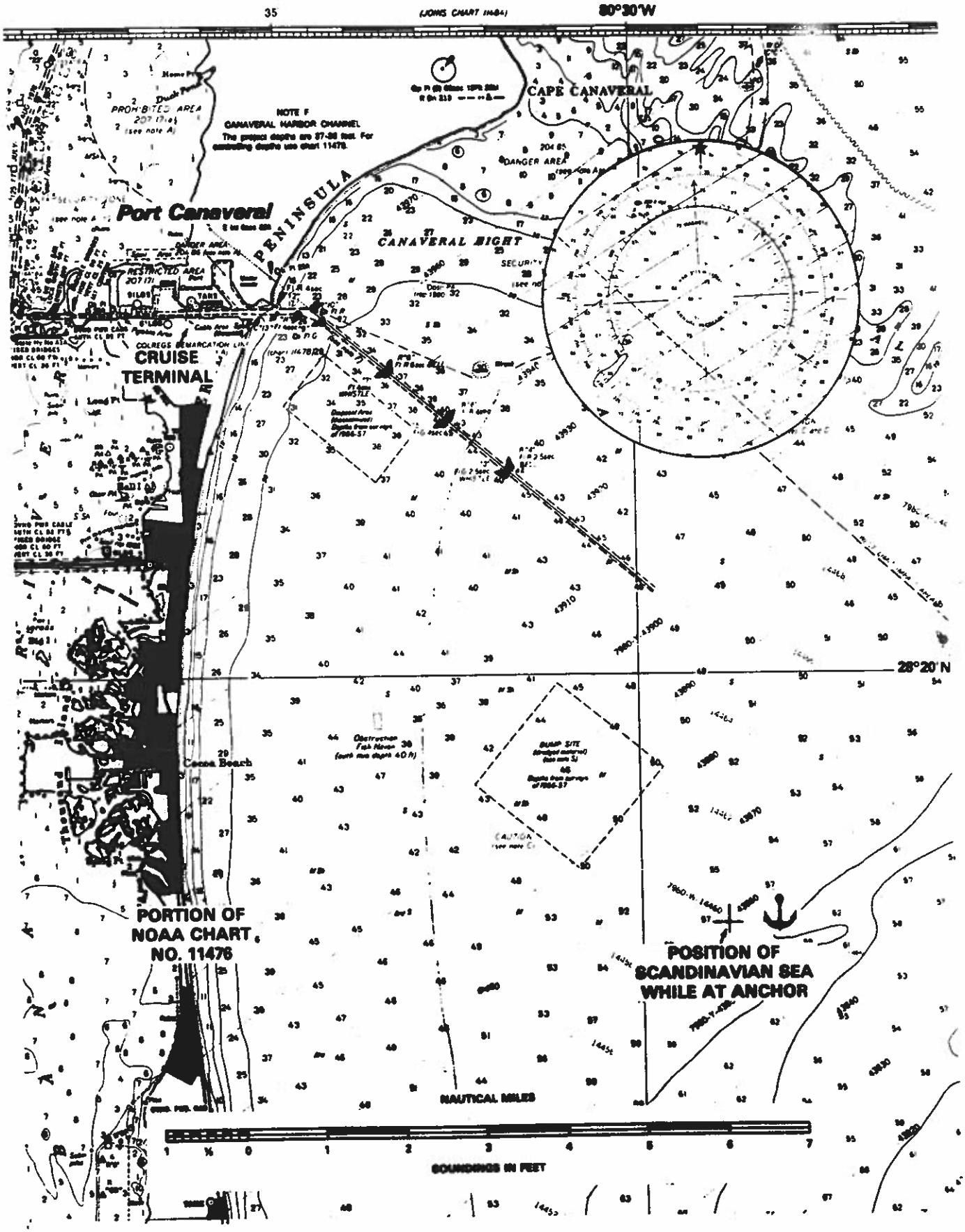


Figure 2.--Position of SCANDINAVIAN SEA at anchor.

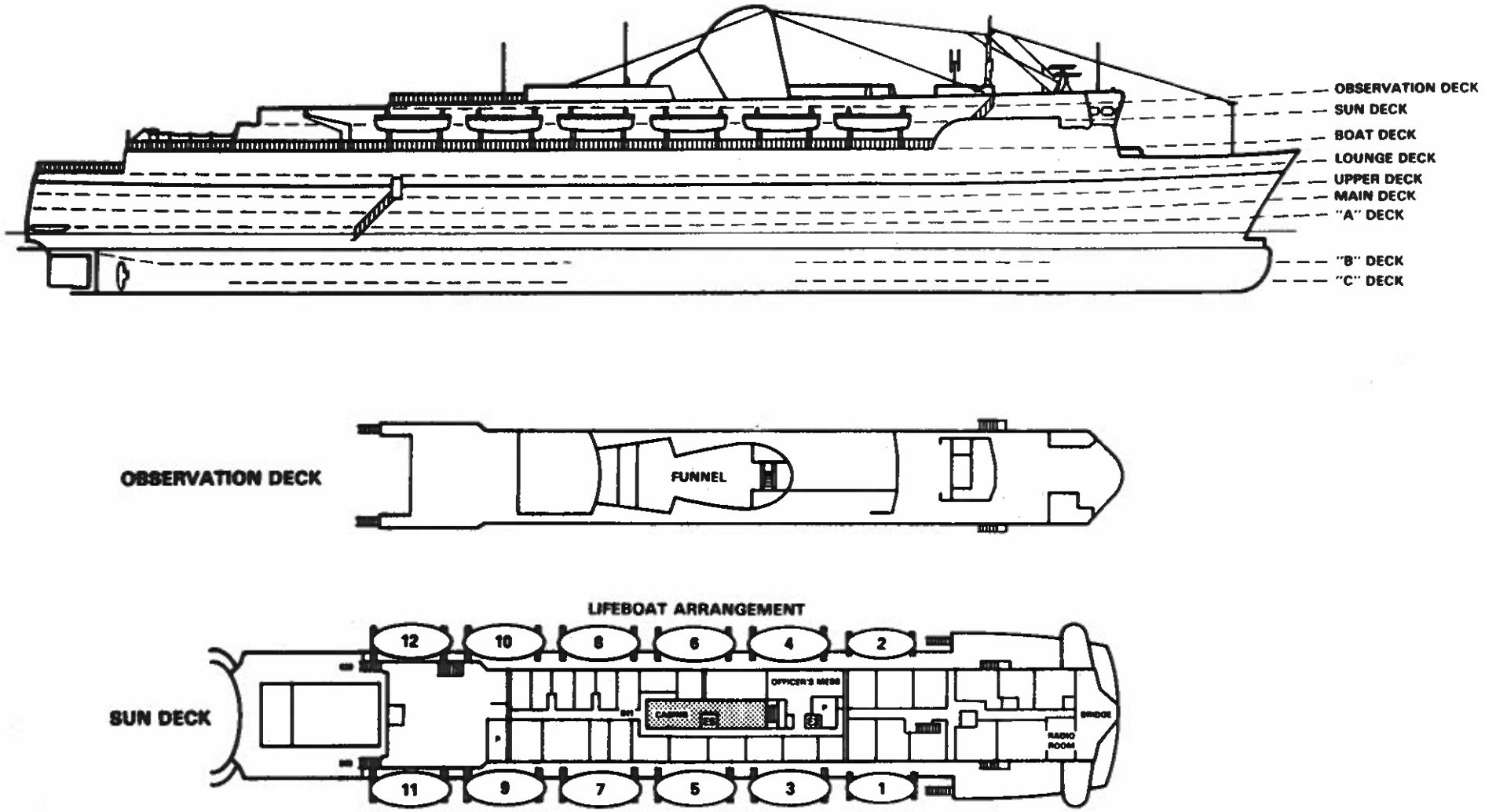
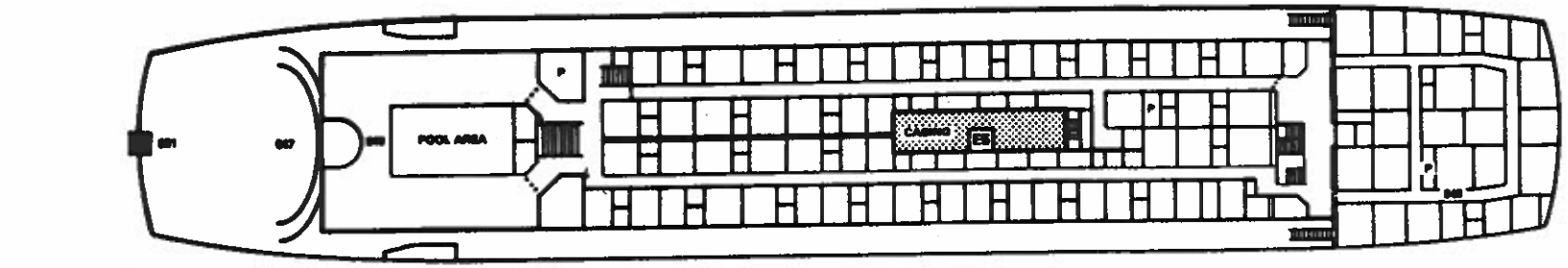
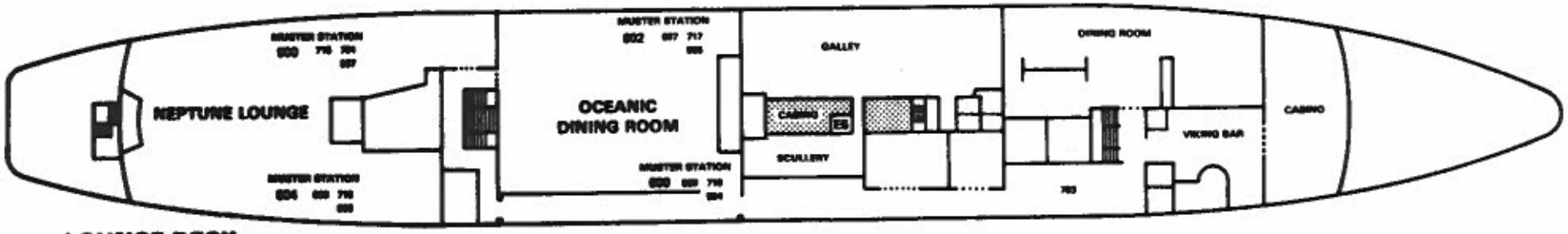


Figure 3.—General arrangement of SCANDINAVIAN SEA. (Sheet 1)

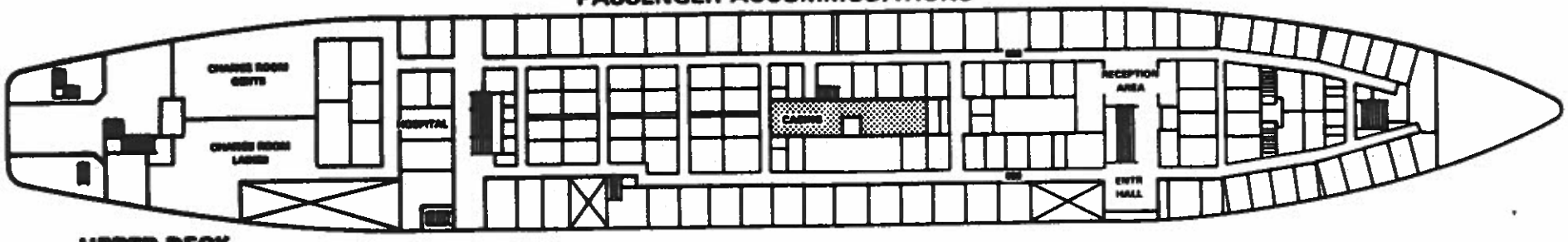


BOAT DECK



LOUNGE DECK

PASSENGER ACCOMMODATIONS



UPPER DECK

Figure 3.--General arrangement of SCANDINAVIAN SEA. (Sheet 2)

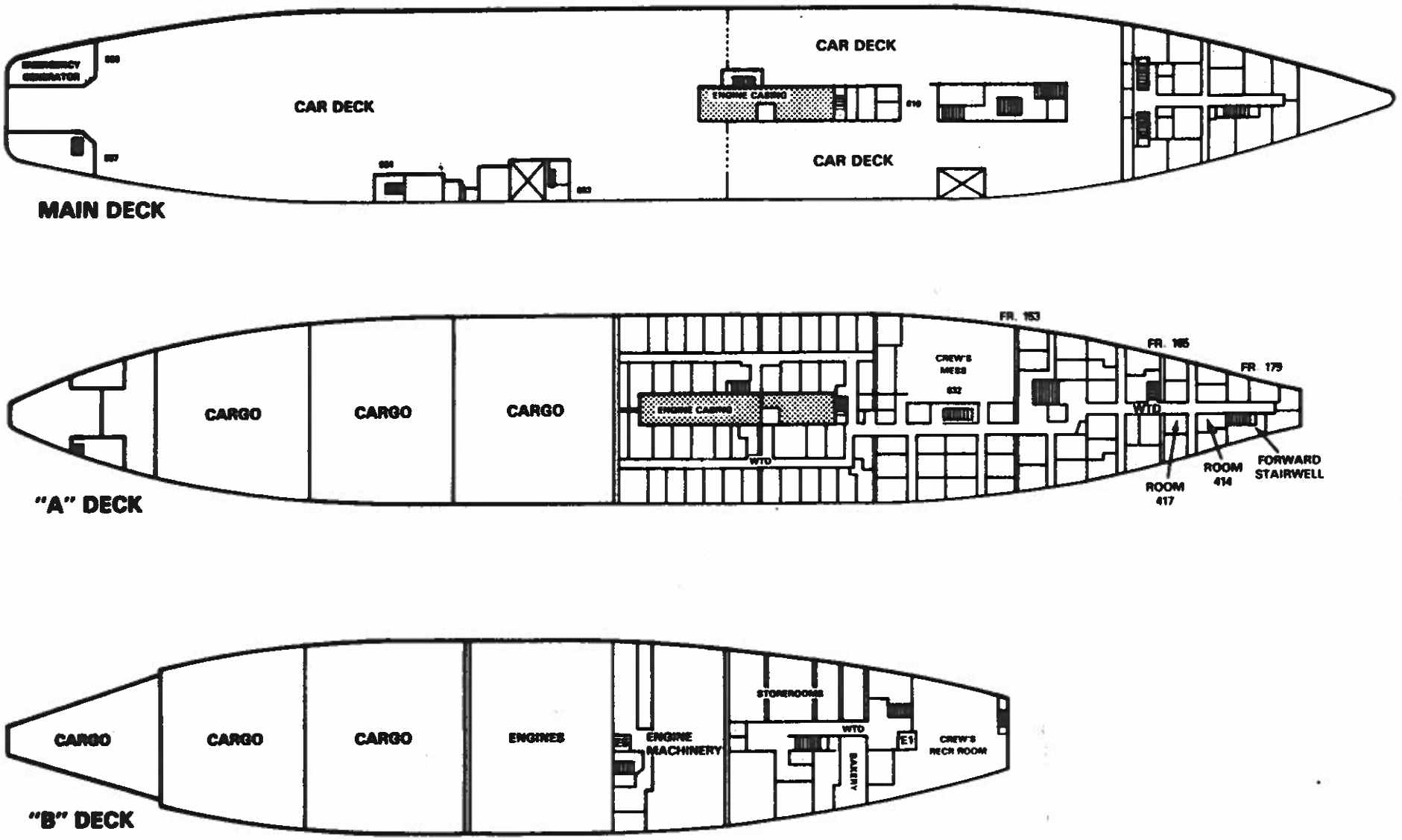


Figure 3.—General arrangement of SCANDINAVIAN SEA. (Sheet 3)

The plumber returned to room 414 but, because of the intensity of the heat, was able to penetrate only about 2 feet into the room. He discharged the fire extinguisher until there was no pressure remaining, left the fire extinguisher in the open doorway, returned to the area where the firefighting team was preparing hoses (in the stair column aft of frame 153 (numbered from aft), "A" deck), and informed the chief officer that there was still fire in the room. The bar waiter left the area and reported to his assigned fire station.

Under the direction of the chief officer, the firefighting group took a charged firehose, entered the area through the fire door at frame 153 and proceeded to room 414. Protective clothing (fire suits) was available but was not used by members of the firefighting group. A firesuit was available in a locker on the main deck in the stair column at frame 140. The smoke and heat in the passageway forced the firefighters to keep close to the deck while moving forward toward room 414. The first officer, who was wearing an air-pac, led the team into the room. The chief officer stated that shortly afterward, the smoke and heat forced them to retreat to the area aft of the fire door at frame 153. (See figure 3.) The chief officer and several members of the firefighting team then proceeded aft on "A" deck, up the main stairs to the upper deck level, and descended to the "A" deck level using the forward stairs at frame 178. At that time, one of the mobile fire groups (the fire investigation group) was cooling the main deck level directly over the forward "A" deck area. The chief officer and the firefighting group reached the "A" deck level and opened the fire door just wide enough to insert the hose nozzle. The chief officer said that the heat was so intense that the door could be opened only for about 15- to 30-second intervals. Unable to reach the fire by the forward stairs, the chief officer left the area after closing the doors and ordered his team to cool the adjacent deck.

Meanwhile, the first officer, who had led a hose team into room 414, retreated aft on "A" deck because he had exhausted his air supply. He instructed the remaining members of the hose team to continue cooling down the area and get as close to the fire as possible. He then reported via radio to the master on the bridge the status of the firefighting efforts and the fact that they had run out of air. The fire investigation group meanwhile continued cooling the main deck which was still warm. The vessel was then approaching the berth at Port Canaveral and the first officer was ordered by the chief officer to report to the after deck and assist in mooring. Before he left, the first officer had informed the chief officer that flames were no longer visible in room 414, but that the heat still was intense. The charged fire hoses were left in the "A" deck area leading through the fire door at frame 153 not allowing the fire door to fully close. The chief electrician recalled that the passageway lights were still on. Before going aft, the first officer first went up to the bridge and discussed the line handling assignments with the master.

Meanwhile, at 1940, the master had informed the Coast Guard (USCG) Station, Cape Canaveral on VHF-FM radio channel 16 that there was a fire aboard the SCANDINAVIAN SEA on a "lower deck, believed to be under control, 6 miles out." At 1945, the USCG advised the Cape Canaveral pilots by radio of the fire aboard the vessel and that it was returning to port. At 1956, the master requested the Coast Guard to have shoreside firemen meet the vessel at the pier on arrival. At 2000, as the vessel was approaching the channel entrance, a USCG patrol boat intercepted it and provided an escort. At 2009, the pilot boarded and directed the vessel into the harbor. With the aid of two tugboats, the pilot turned the vessel around and at 2035, the SCANDINAVIAN SEA berthed starboard side to the pier at the Port Canaveral Cruise Terminal. The vessel was equipped

with side ports 3/ on the starboard side only. The assisting tugs, which remained alongside the burning vessel and were joined later by a third harbor tug, used fire monitors to direct streams of water against the forward part of the hull to cool it.

Passenger Evacuation.--At 1932, the master instructed the passengers over the P.A. system to assemble on the open decks. He advised them not to be alarmed, that the crew was well trained in firefighting, and that upon docking they should proceed ashore using the after gangway. Further, passengers were advised not to return to their cabins, that their personal belongings would be secured, and that they would be given additional information at the terminal. Lifejackets were distributed to the passengers from two locations at the after end of the boat deck.

At 2040, the master advised the passengers that there was no danger and again instructed them to leave the vessel by the after gangway as soon as it was placed aboard through the upper deck sideport. The master stated that at the time there was no panic reported among the passengers and that some even appeared jovial.

At 2057, a gangway was rigged and the passengers disembarked immediately. The ship's logbook shows that at 2115, all passengers were ashore. The terminal manager representing Scandinavian World Cruises, Inc., stated that the evacuation of the vessel was orderly and was accomplished in about 15 minutes, slightly faster than under normal circumstances. Terminal personnel provided buses for passengers who did not have transportation and accommodations were obtained for persons staying in the area.

Firefighting Response

March 9.--Shortly after the master of the SCANDINAVIAN SEA contacted the USCG at 1955, the USCG notified the Brevard County Sheriff's Department and requested a pumper truck to standby on the pier at the cruise terminal to await the arrival of the SCANDINAVIAN SEA. The Sheriff's Department notified the Brevard County Fire Dispatcher who, in turn, notified the Cape Canaveral Volunteer Fire Department, and the Merritt Island Volunteer Fire Department.

When the SCANDINAVIAN SEA berthed, two firetrucks and a pumper truck were manned and standing by at the pier. The Cape Canaveral fire chief and three firemen boarded the SCANDINAVIAN SEA, met the chief officer on the car deck, and proceeded forward to "A" deck. The chief officer described the fire's location, and two firemen equipped with air-pacs then proceeded into "A" deck accommodation area to investigate. The firemen returned to the car deck and reported to the fire chief that they had not seen any fire but that they had seen plenty of smoke, and that the vessel's crew was using ship's firehoses to wet down the area. The local firemen brought aboard a portable generator and two smoke ejectors (portable blowers) to ventilate the spaces in the vessel where there was a heavy concentration of smoke and heat. They rigged the ejectors on the main deck level, one near an open sideport and the other at the main stairwell. One fireman, who initially investigated the "A" deck area, stated that he attempted to use some of the ship's hoses to cool the area to gain access but after three hoses ruptured shoreside hoses were then used. The fireman stated that when advancing into heat and smoke, he wanted a hose and nozzle that he knew was sound and would protect him. He reported finding minor fires and an extraordinary amount of heat in the overhead spaces. He also said that he briefed the Merritt Island fire chief on the heat situation when that department's

3/ Hinged openings in the ships hull through which gangways and brows are rigged.

firefighters arrived on scene about 2130. As more local volunteer firemen arrived on board, they brought additional equipment and hoses from the pumper trucks on the pier.

Meanwhile, the officer-in-charge of the USCG Station Port Canaveral had dispatched his executive petty officer to the terminal. He arrived on time to meet the vessel upon arrival. The officer-in-charge had instructed the petty officer to take the damage control plan 4/ of the SCANDINAVIAN SEA that was on file at the station. After the vessel arrived at the berth, the petty officer requested that additional USCG personnel be dispatched from the station and that the USCG Cutter DILIGENCE, which was berthed at the station, provide a rescue and assistance (R&A) team equipped with breathing apparatus to assist fighting the fire. At 2059, the petty officer boarded the vessel with Cape Canaveral and Merritt Island firemen. Shortly afterward, a six-man R&A team from the DILIGENCE and the officer-in charge of Station Port Canaveral boarded the vessel. The officer-in-charge attempted to communicate with the local firemen about the location of the fire while members of the R&A team stood by on the car deck (main deck) and awaited orders. The officer-in-charge directed the USCG personnel who had their breathing apparatus ready, to go below to "A" deck and assist the firemen. (All were equipped with canister-type oxygen breathing apparatus (OBA), except one of the station personnel who was wearing an air-pac.) Two other USCG personnel were instructed to investigate the extent of the fire.

About 2115, the damage control assistant from the DILIGENCE arrived with four additional USCG personnel and took charge of the R&A team. He brought four additional OBAs and sent two 2-man teams to investigate the fire. The officer-in-charge tried unsuccessfully to meet with the ship's officers and the local fire chiefs to obtain information about the status of the ship's ventilation and power supply in the fire area. At 2225, the officer-in-charge ordered his station personnel off the vessel because he considered the firefighting activity at that time to be unsafe. He said that since he did not know who was actually in charge he notified the Cape Canaveral fire chief of his action.

The damage control assistant and the R&A team from the DILIGENCE remained aboard the vessel. They continued to assess the situation and began to secure the portable ventilators brought aboard earlier by the Cape Canaveral and Merritt Island firemen. After returning to the car deck, the R&A team manned a hose and went forward into the main deck accommodation area. Team members said that the deck was hot and a fire broke out behind them, but that it was quickly extinguished. They continued cooling the deck, but they eventually withdrew because the heat from below became unbearable. The damage control assistant said that he checked on the status of the electrical power in the "A" deck accommodation area, and that one of the R&A team members told him that the power had been secured. The vessel's chief electrician stated that about 2200 he secured the power to the 220-volt lighting circuits to "A" deck forward. The damage control assistant also inquired of the local firemen as to who was the person in charge, but he was unsuccessful. After conferring with the officer-in-charge of the Coast Guard station, the damage control assistant determined that his function should be limited to assisting the fire companies. The DILIGENCE's R&A team continued to cool down the main deck using the ship's fire hoses.

4/ A plan of the vessel indicating the location of the controls for watertight doors tank valves, bilge suction valves, cross-flooding valves, and the locations of watertight doors and coamings and manhole covers.

About 2230, the commanding officer and the engineering officer from the USCG Cutter DILIGENCE arrived on scene and toured the vessel to assess the situation. The DILIGENCE's commanding officer assumed the role of onscene commander in charge of all USCG personnel. His damage control assistant briefed him on the situation and together with the DILIGENCE's engineering officer and the SCANDINAVIAN SEA's chief officer, toured the area and checked to see if the ship's power and ventilation systems were still in operation. They noticed the ship's power was on and heard ventilation blowers operating in the car deck area. The engineering officer stated that during the tour he saw fire doors leading into the forward main vertical fire zone held open with various objects, such as floor type ash trays, and that he closed some of the open fire doors and stopped some of the portable fans. The shoreside firemen were standing by with hoses looking for hot spots and making sure there were no "flash-backs." The overhauling 5/ efforts ceased, however, after the fire doors were closed. The DILIGENCE's commanding officer and engineering officer then met with the ship's master and chief engineer and apprised them of the situation. It was agreed that the ship's main generators and all ventilation should be secured, including the portable ventilating fans that the local firemen had brought aboard, and that the emergency generator should be placed in operation. The DILIGENCE's damage control assistant accompanied the ship's engineer while this was being done. (It was learned later that a service generator was left running to power the engineroom bilge pump.)

Most of the firefighting effort had stopped in the "A" and main deck areas. Some of the Cape Canaveral fireman had been directed to the boat deck to cool down anything hot. At the time, firemen were able to walk through the passageway without breathing apparatus. The Cape Canaveral fire chief stated that it was his opinion that the USCG had assumed the firefighting responsibility. The SCANDINAVIAN SEA's officers were of the same opinion. The SCANDINAVIAN SEA's chief officer said that he continued to answer questions directed to him by shoreside firemen and gave directions as to the routes to follow to gain access to the fire area.

The Cape Canaveral fire chief said that between 2230 and 2300, "we had it fairly well cooled and most everything under control." About this time, the ship's ventilation system may have been reactivated.

The Merritt Island fire chief said that about 2300, while walking through the "A" deck area he heard a loud explosion. He and his men immediately left the area and retreated to the car deck. He said that the Merritt Island firemen had responded to the fire to assist the Cape Canaveral firefighters, but that no direct orders had been given to them to coordinate with any other fire teams. The Cape Canaveral and Merritt Island firemen communicated via truck radios on the pier because their hand-held portable radios did not have common frequencies.

The SCANDINAVIAN SEA's master said that about 2300 while he was conferring with the commanding officer and the engineering officer of the DILIGENCE and local fire chiefs on the bridge, he noticed smoke emitting from the doorway to the forward stairwell into the foredeck. He said that it appeared that the fire had reflashed somewhere in the forward main vertical zone. At that time, the local firemen and the R&A team resumed fighting the fire. The DILIGENCE's engineering officer stated that when he returned to the car deck, he noticed the smoke increasing and stressed the importance

5/ The process of pulling down burned debris to locate any hot or smoldering material and cool it down to prevent any reflash of the fire.

of stopping the portable ventilation fans and closing the fire doors to the firemen standing in the car deck. He also stated that the Cape Canaveral fire chief responded by saying "Okay, its your fire." Prior to this, it was unclear who actually was in charge of fighting the fire. Each shoreside firefighting team seemed to be acting independently. The master of the SCANDINAVIAN SEA also said that he believed that the USCG had taken charge of the firefighting aboard the SCANDINAVIAN SEA. Shoreside firefighters did not leave the vessel at this time but assumed the role of assisting the USCG. The fire chiefs from the Cape Canaveral and the Merritt Island departments said that they believed the fire was out. The DILIGENCE's engineering officer said, however, that when he touched the main deck under the carpet, it was too hot to keep his hand on it. He said that when he saw smoke coming out of the forward stairwell he knew the fire was not out. According to the engineering officer, there were insufficient people available to properly fight the fire on three decks. He testified: "People would pull out from a fire team and there would be nobody to take their place. We just didn't have the resources to really be able to go up both sides of the passageways and really check everything out, so it was a very confused time."

With the prolonged exertion by the shoreside firemen, recharging of the air bottles for the air-pacs became critical. Patrick Air Force Base Fire Department personnel brought additional air bottles to the scene. Air Force trucks replenished air bottles and delivered foam to the fire companies at the cruise ship terminal throughout the evening and the next day. Kennedy Space Center Fire Department personnel responded to the fire on the SCANDINAVIAN SEA and brought additional foam and air bottles.

Pan-American World Airways, the contract fire department at the Cape Canaveral Air Force Station responded to the fire with a pumper truck and foam. Additional equipment continued to arrive at the terminal from civilian fire companies and various U.S. government agencies in the area, including the USNS RANGE SENTINEL. Patrick Air Force Base furnished a second pumper truck, 12 firemen suits, and 30 lengths of fire hose. A private salvage firm airlifted pumps to the scene on speculation. The Canaveral Port Authority arranged for hot food and refreshments for the firefighters.

March 10.--Between midnight and 0100, additional volunteer firemen arrived aboard the vessel. Combined teams of firemen and USCG personnel returned to the "A" deck, the main deck, and the upper deck with fog nozzles and foam applicators and attempted to advance into the affected areas behind a fog pattern. As one team was able to advance, another team would have to retreat because the intense heat forced them back. One team attempted to descend to the lower decks by using the door to the forward stairwell on the foredeck but was unable to penetrate the smoke and heat.

About 0100, the DILIGENCE's engineering officer requested a foam nozzle from the pier and injected foam into the Nos. 2B port, center, and starboard fuel oil tanks, which were partially filled, through the sounding tubes on the foredeck (lounge deck level). He was unable to locate the Nos. 2A port and starboard sounding tubes.

The DILIGENCE's commanding officer set up a command post on the vessel's car deck during the early morning hours. The master provided him with the vessel's plans. The chief officer and the chief engineer provided information about the location of various areas and about ship's systems. The DILIGENCE's commanding officer testified that, after the command post was set up, better coordination was achieved between the shoreside fire groups, the USCG, and the ship's crew although the fire chiefs from the local companies were not in agreement with the tactics that were now being employed by the USCG to fight the fire and wanted to increase ventilation. However, the ship's officers agreed with the USCG that the fire had to be contained and the surrounding areas cooled.

By 0400, fatigue had begun to set in on the firefighters. The OSC arranged with the Operational Commander in the Seventh District Headquarters in Miami to provide a relief crew of about 20 people from the USCG Cutter STEADFAST located in St. Petersburg, Florida, and personnel from the Gulf and Atlantic strike teams.

At 0940, USCG personnel from the STEADFAST led by the ship's damage control assistant arrived on scene. He organized the command post into an information center that kept track of the progress of the fire and the firefighting efforts. The command post was moved to the pier during the morning. Communications from the command post to various teams within the vessel was a continuous problem. The marine frequencies and the several industrial frequencies used by the local firefighting groups were different so messengers were used as needed.

At 1010, the Captain of the Port (COTP), who was also the commanding officer of the Marine Safety Office in Jacksonville, Florida, arrived on scene and relieved the commanding officer of the DILIGENCE as onscene commander. As COTP in Jacksonville, his jurisdiction extended to Melbourne, Florida, which included Port Canaveral. He stated that his function was to act as onscene coordinator rather than "onscene commander" and to "involve myself with all of the various agencies, other groups that might have some assistance or bearing on the incident; to maintain communications with them, and to assist in the efforts by maintain (sic) that liaison and maintaining that support."

At 1155, because of the potential danger posed by the forward fuel oil tanks, a meeting was held with the local fire department personnel, the vessel's master, and USCG officials. The attendees at the meeting decided to close the watertight door on "A" deck in the forward end of the vessel and put a layer of water over the forward fuel oil tanks. The forward storerooms and the anchor chain locker also were flooded to increase the vessel's forward draft to 22 feet in order to place the top of forward fuel oil tanks below the outside surface of the water. The SCANDINAVIAN SEA then developed a starboard list which stabilized at about 3°. One of the vessel's engineers broke several toilet bowls close to the deck on the starboard side to allow the water on the deck to drain into the forward sewage tanks. Drainage into the sewage system limited the water accumulation. The sewage pump was secured, however, when flooding of the deck over the fuel oil tanks commenced and the vessel's list increased significantly. By 1415, the list had increased to about 8°, and the firefighting efforts were suspended. (See figure 4.) Eductors 6/ were brought in to pump out the areas where water had collected on the starboard side of some of the lower decks. After conferring with the ship's officers, the STEADFAST's damage control assistant, the DILIGENCE's engineering officer, and the COTP established limits for the amount of list that the SCANDINAVIAN SEA would be allowed to assume. If the list exceeded 8°, the firefighting hose streams would be reduced by half; if the list exceed 10 1/2°, then all persons would be evacuated from the vessel; when the list returned to 6°, full firefighting efforts would be resumed. Firefighting personnel moved firetrucks and other associated equipment away from the berthed vessel. (See figure 5.)

6/ A low pressure pump which was high pressure water or air though a jet arrangement to draw fluids.

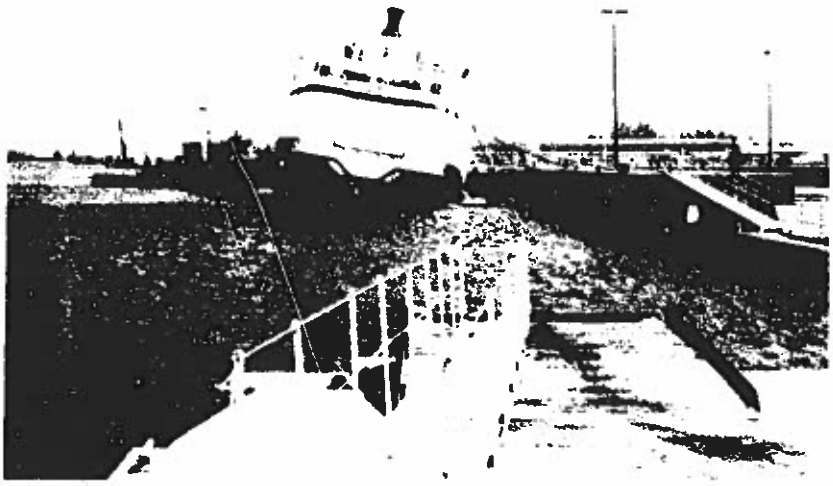


Figure 4.—SCANDINAVIAN SEA, listing to starboard.

Figure 5.--Hoses from pumper trucks stretched on the pier.

As the starboard list approached 10°, the bottom of the portlights in the "A" deck accommodations in the midship area between frames 86 and 123 were even with the surface of the water.

At 1420, the COTP held a meeting with all of the fire department chiefs. They discussed the insufficient manpower to effectively fight the fire in all the areas and to simultaneously cool down the secured areas. Additionally, the air supply for the breathing apparatus was marginal and the eductor pumps in use were of insufficient capacity to handle the water that would be generated by any increased firefighting effort. It was agreed that the level of firefighting would not be increased at that time.

Additional USCG units were mobilized, and, at 1435, a security system was established at the ship's gangway to account for all persons boarding the vessel. Manpower resources still were considered inadequate to sustain continuous firefighting efforts and to provide backup support, and local firefighting groups were unable to supply any additional personnel. Additional USCG personnel were requested from Mayport, Ponce de Leon Inlet, the Marine Safety Office in Jacksonville, and a reserve unit in Jacksonville.

At 1620, the Atlantic Strike Team and the PAFB fire team arrived at the terminal. The strike team brought an air bottle recharging unit which was immediately placed into service, eliminating the need for local firemen to travel off scene to recharge the bottles for their air-pacs. At the time, very little firefighting was taking place. The COTP then decided to await dewatering of the vessel before proceeding with another full assault on the fire. By 1700, however, the list was still about 8° so the COTP instructed the Gulf Strike Team to bring additional portable pumps with their regular equipment. The DILIGENCE's engineering officer was assigned the task of overseeing the dewatering operation.

At 1800, a meeting was held in the Cruise Terminal's office with a representative from each of the principal organizations fighting the fire; the master, the chief officer, and the chief engineer of the SCANDINAVIAN SEA; and representatives of Scandinavian World Cruises, Brevard County Sheriff's Department, Canaveral Port Authority, Canaveral Marine Services, the Safety Board, and the U.S. Navy. The COTP explained the USCG's policy regarding firefighting in a port area. Although he was not trained in marine firefighting techniques, a civilian fireman was chosen to take charge of the firefighting efforts. He assigned four teams to resume fighting the fire after the vessel was sufficiently dewatered. Support teams were organized and arrangements made to have enough backup equipment available for a coordinated assault on the fire. Arrangements also were made with Patrick Air Force Base to borrow a portable lighting system, a generator, and a public-address system. Representatives of three commercial firefighting organizations each offered their services; however, the ship owner's representative quickly pointed out that, as far as he was concerned, it was the USGC's responsibility to engage private sources if needed. The COTP responded by saying that USCG funds are not available for engaging private firefighting organizations. The fire chiefs of the local fire companies stated that they do not provide funds for outside services. The Port Authority representative stated that the Canaveral Port Authority had the Cape Canaveral Volunteer Fire Department already under contract and that additional funding was not authorized. (See appendix B.) As a result, no commercial firefighting organizations were employed.

March 11.--At 0102, the Gulf Strike Team arrived at the terminal and made preparations to enter the vessel to survey the situation and choose locations for pumping out the water. Additional pumps were placed in designated areas. By 1000, the list was reduced to about 6°, and a full scale assault was made on the fire which had progressed into the upper deck and lounge deck although still contained in the forward vertical fire zone. Firefighting personnel attacked the fire on their assigned decks with 2 1/2-inch hoses with 1 1/2-inch hoses as backup. The STEADFAST's damage control assistant closely monitored the amount of water introduced into the vessel and based on the pumping capacity of the portable pumps and the eductors, limited the amount used. As the list increased, selected hose teams were pulled back until the pumps reduced the list. It was later determined that the list had at one time reached a maximum of 10.8° to starboard.

At 1208, the list exceeded 10° and all firefighting efforts were suspended temporarily. The firefighting teams evacuated the vessel, except some USCG personnel who remained on the upper deck aft of the fire zone boundary. The USCG personnel continued to operate the portable pumps, shifting them as necessary to maintain control of the list. When it was deemed safe again to continue firefighting efforts, the firefighting teams returned to the vessel. The fire was officially declared out about 1600.

Dewatering continued aboard the SCANDINAVIAN SEA until about 2145 when the COTP deemed it safe and he could prudently relinquish responsibility for the vessel's stability. The owners then engaged a private salvage firm to remove the remaining water and provide for the security of the vessel.

Medical Response

A triage 7/ center was set up on the pier by the Brevard County Emergency Medical Service to facilitate emergency treatment. A medical supervisor expressed concern that there might be the need to treat numerous persons exposed to the smoke. Ninety-one persons engaged in the firefighting operation were provided oxygen treatment for smoke inhalation or eye care treatment at the scene. One county fireman and four USCG personnel were treated at a local hospital for smoke inhalation and minor injuries and were released the same day.

Injuries to Persons

	Crew	Passengers	Others	Total
Fatal	0	0	0	0
Nonfatal	0	0	5*	5
None	202	744	0	946
Total	202	744	5	951

* The 91 emergency response personnel treated at the triage center are not included in this count.

7/ Medical evaluation station.

Vessel Damage

The SCANDINAVIAN SEA was severely damaged by fire, smoke, and water as well as by overhauling activity once the flames were extinguished. The forward main vertical zone was most affected by the fire. In room 414, fire investigators found a 3-foot-diameter circular burned pattern near the settee (see figure 6) which had burned through the carpet to the vinyl abestos floor tile beneath it. The "A" deck accommodations forward of frame 165, including the bulkhead and overhead panels, piping, ventilation ducts, and electrical wiring, were severely damaged. (See figures 7 and 8.) Of the 13 rooms on the "A" deck area forward of frame 165, 10 rooms including lockers, restrooms, and showers where doors had been left open were gutted. The doors in the other three rooms were closed and the rooms only showed evidence of smoke and some heat damage. The insulation on the electric wire cables in the overhead spaces above the passageway was completely burned.

The "B" deck recreation room located one deck below and aft of the "A" deck accommodation area was damaged primarily by water and smoke. The main deck accommodations in the zone were damaged similarly to the "A" deck as the fire progressed upward. Most main deck bulkheads and overheads were destroyed, and the portlights were broken. The warped surfaces of some of the structural steel members indicated that extreme heat was generated during the fire.

The upper deck accommodations had limited fire damage although the water and smoke damage was severe. Many of the bulkheads remained standing. Some hot spots were evident where the heat traveled upward through the vertical steel structural members. Steel deckplates in the upper deck passageways had buckled slightly due to the high heat in the spaces below.

The lounge deck was damaged by fire and smoke. The heaviest damage was found in the center portion of the casino and restaurant area where wood spacers were used against the steel to provide support for the asbestos panels. (See figure 9.)

The veneer covering on the steel bulkheads of the forward stairwell at frame No. 179, which extended from the "A" deck to the lounge deck, were burned to bare metal and the plates warped in some places attesting to the high temperatures in the area. (See figure 10.)

The boat deck accommodations incurred only minor fire damage; a wood deck in a locker burned due to the vertical transfer of heat through a steel structural member. The majority of the damage on the boat deck was caused by water, smoke, and overhauling activity by the firefighters.

The bulkheads at the aft end of the forward vertical fire zone were the primary fire boundaries. The fire doors in the boundary that were closed fully contained the fire and prevented the spread of flames to other parts of the vessel. In one instance, a temperature of 1250° F was measured on the after surface of the fire door in the stair column on the main deck at frame 153.

Although the fire was confined to the forward main vertical zone, the damage aft of the zone was caused primarily by smoke. The overhead panels in the upper decks were covered with smoke deposits. The port passageway on the upper deck as far aft as frame 100 and a room adjacent to the fire door at frame 100 were damaged heavily by the smoke and heat that traveled along the passageway through an open fire door at frame 153. The passenger accommodations and public spaces were contaminated by the smoke and the odor of smoke permeated most of the vessel.

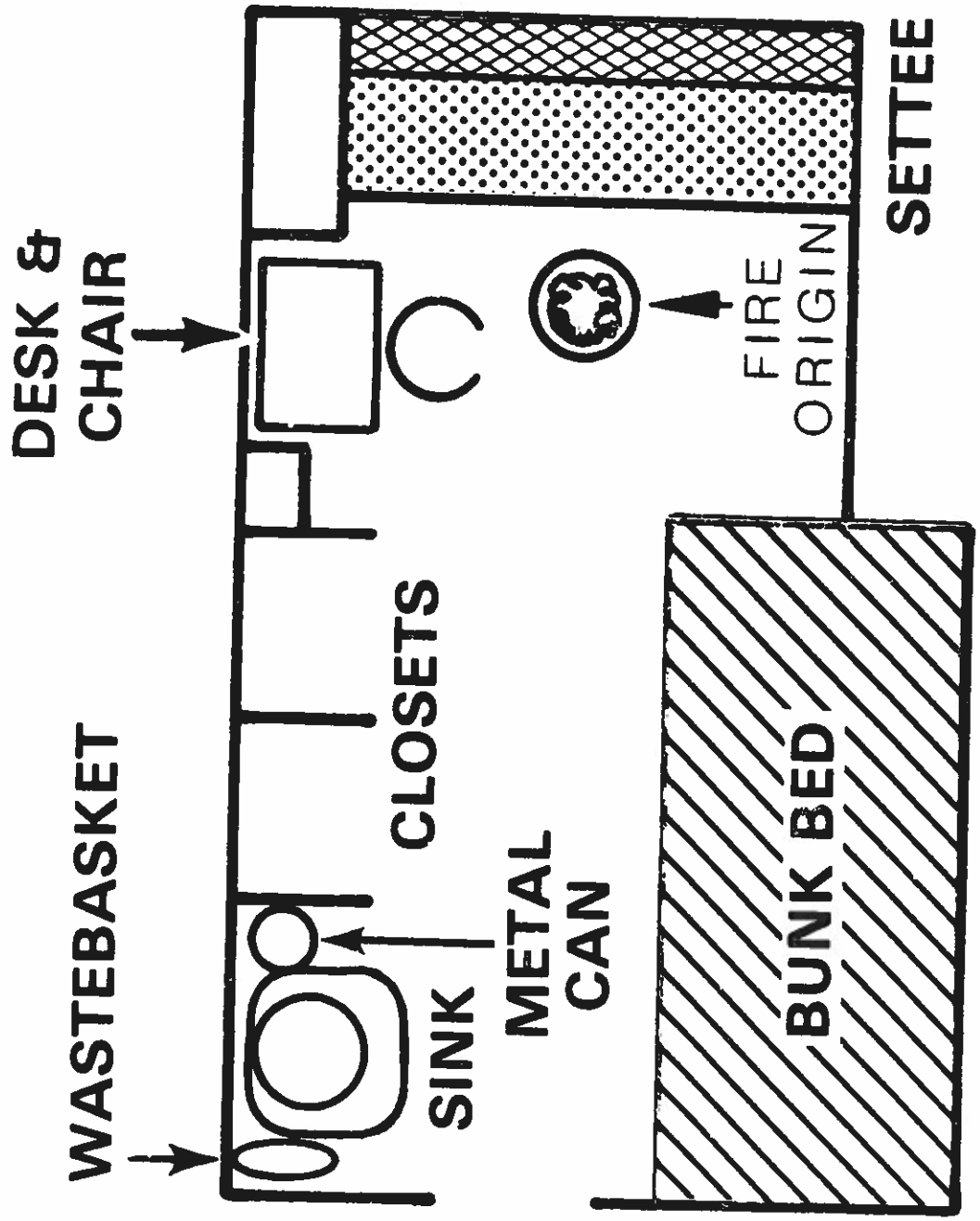


Figure 6.--Diagram of room 414.

Figure 7.--"A" deck passageway looking forward near room 414.

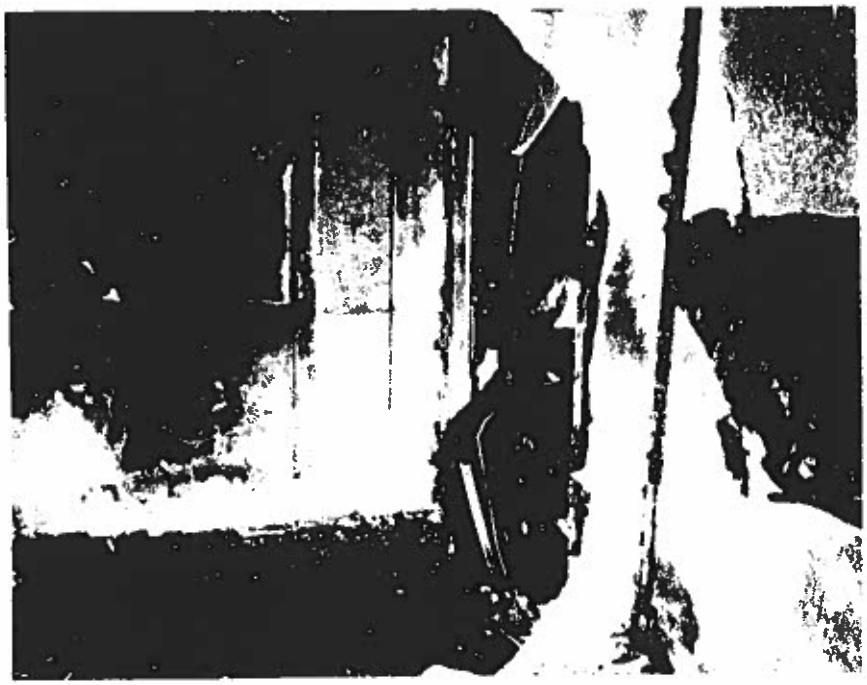


Figure 8.--Interior of room 414.

Figure 9.—Location of wood behind paneling on the lounge deck.

Figure 10.--View of stairwell at frame No. 179, looking toward "A" deck.

Damage from overhauling the fire extended well into the after sections of the vessel, especially in the crew accommodations on "A" deck, aft of the crew's messroom. Doors to rooms were broken in order to search for heat sources. The galley and dining room areas, however, were undamaged.

A condition survey was made by the vessel's insurance underwriters and a cost estimate was prepared to return the vessel to its condition before the fire. The cost of repairs exceeded the insured value of the vessel and it was declared a constructive total loss.

Other Damage

The cost of the firefighting operation in Port Canaveral was approximately $245,000. The amount included the expenses incurred by the Canaveral Port Authority, services of the local tugboat companies, the USCG, and for material furnished by other government agencies that responded to the emergency.

Crew Information

The crew of the SCANDINAVIAN SEA was multinational. The master and the majority of both the deck and engineering officers were Danish. The radio officer and a third engineer were British, and an assistant engineer was a Philippine citizen. The unlicensed members of the operating, deck, and engineering crews were mainly Honduran and Philippine citizens. The catering staff and the entertainers, which made up the largest portion of the crew, consisted of Danish, American, Honduran, Costa Rican, Jamaican, Haitian, Korean, Philippine, Nicaraguan, British, Indonesian, Italian, Portuguese, Turkish, Barbadian, Antiguan, German, Ghanian, and Yugoslav citizens. The Bahamian government requires only that unlicensed crewmen have a valid passport from their country of citizenship; no other seaman's documents are required. (See appendix C.)

Persons employed aboard the SCANDINAVIAN SEA were considered ship's crew although the catering staff consisted of employees of independent contractors. They were signed on the vessel as crew, subject to the lawful commands of the master and officers. The operating personnel, such as those in the deck and engineering departments and the hotel staff, which managed the passenger rooms, were employed by Scandinavian World Cruises, Inc. The concession staff, which included the food and beverage department, the sports director, the photographer, entertainers, and casino operators, were employees of individual contractors which provided professional services aboard the vessel.

At the time of the fire, 202 crewmembers were aboard the SCANDINAVIAN SEA. The manning 8/ conformed to the Bahamian Merchant Shipping Act, 1976, Part III, Sections 66-76. (See appendix D.) The requirements included a master, one chief officer, one first officer, and four engineering officers. Under the Bahamian shipping rules, a vessel over 1,600 registered tons may carry a reduced complement of deck officers if the voyage does not exceed 500 nautical miles (nmi). The USCG Control Verification for Foreign Vessels program accepted the reduced manning standard of the Bahamian rules. An official of Scandinavian World Cruises, Inc. pointed out that the SCANDINAVIAN SEA operated only on day cruises of less than 12 hours duration and, therefore, did not require the full manning normally carried on an oceangoing vessel of this size. The Bahamian Certificate of Registry does not list specifically the required manning for the vessel. (See appendix F.)

8/ Personnel requirements.

Vessel Information

The SCANDINAVIAN SEA, originally named BLENHEIM, was [illegible] in 1970 by the Upperclyde Shipbuilders, Ltd., Clydebank, Scotland, as a combination passenger/roll on-roll off refrigerated cargo vessel according to the rules and regulations of the Norwegian classification society, Det Norske Veritas (DNV), and has retained DNV classification for hull and machinery continuously. At the time of the accident, all the official documents, such as the International Load Line certificate, SOLAS certificate, Radio Safety Certificate, Tonnage Certificate, Classification Certificate, Passenger Ship Certificate of Inspection, Passenger Ship Safety Certificate, and the International Oil Pollution Prevention Certificate, were current. There were no outstanding or overdue deficiencies on the day of the accident. The vessel's particulars were:

Length overall	490.15 feet
Breadth	65.70 feet
Depth to main deck	29.0 feet
Draft	* 22.0/19.7 feet
Gross tonnage	* 10736.84/9588.52
Net tonnage	* 5830.68/5177.97
Deadweight in tons	* 3156/956
Horsepower	18,000

* This vessel is assigned a tonnage mark. If the tonnage mark is submerged, the higher figure applies.

The SCANDINAVIAN SEA was a twin-screw motor vessel with controllable pitch propellers, bow thruster, and stabilizer fins. Its two 18-cylinder Crossley Premier engines, which used both light and heavy fuel oil, gave it a sea speed of 22.5 knots.

Forward fuel oil deep tanks were located below the "A" deck accommodation area between frames 165 and 185. (See figure 11.) The Nos. 2A port and starboard deep tanks contained diesel oil, and the Nos. 2B port, center, and starboard deep tanks contained heavy fuel oil. A cofferdam separated the 2B tank top from "A" deck.

The vessel originally was built to transport vehicles or refrigerated cargo as well as passengers for service between London, England, and the Canary Islands. It was renamed the SCANDINAVIAN SEA in 1982, at which time the vessel underwent a minor conversion to adapt it for service as a daily cruise vessel. Three decks below the main deck were designated A, B, and C decks, and four decks above the main deck were designated as the upper, lounge, boat, and sun decks. The vessel was equipped with a stern ramp and side ports to service the four cargo holds. It was separated into six main fire zones by fire resistant bulkheads and fire doors and complied with the structural fire protection requirements of the British Board of Trade and the Safety of Life at Sea Convention 1960 (SOLAS 60). 9/ The bulkhead paneling generally was 3/4-inch asbestos cement board faced with a decorative wood veneer polished with two coats of lacquer; the unexposed side was

9/ The SOLAS Convention is the result of one portion of the work performed by the International Maritime Organization (IMO), formerly known as the Intergovernmental Maritime Consultative Organization (IMCO). The purpose of SOLAS is to insure that the merchant ships of the world meet a minimum standard of safety. The United States, as a party to the convention, is obligated to enforce its provisions. The Coast Guard is the U.S. enforcement agency for SOLAS and has the authority and responsibility to ensure that U.S. ships and foreign ships calling at U.S. ports comply with the convention as currently in force.

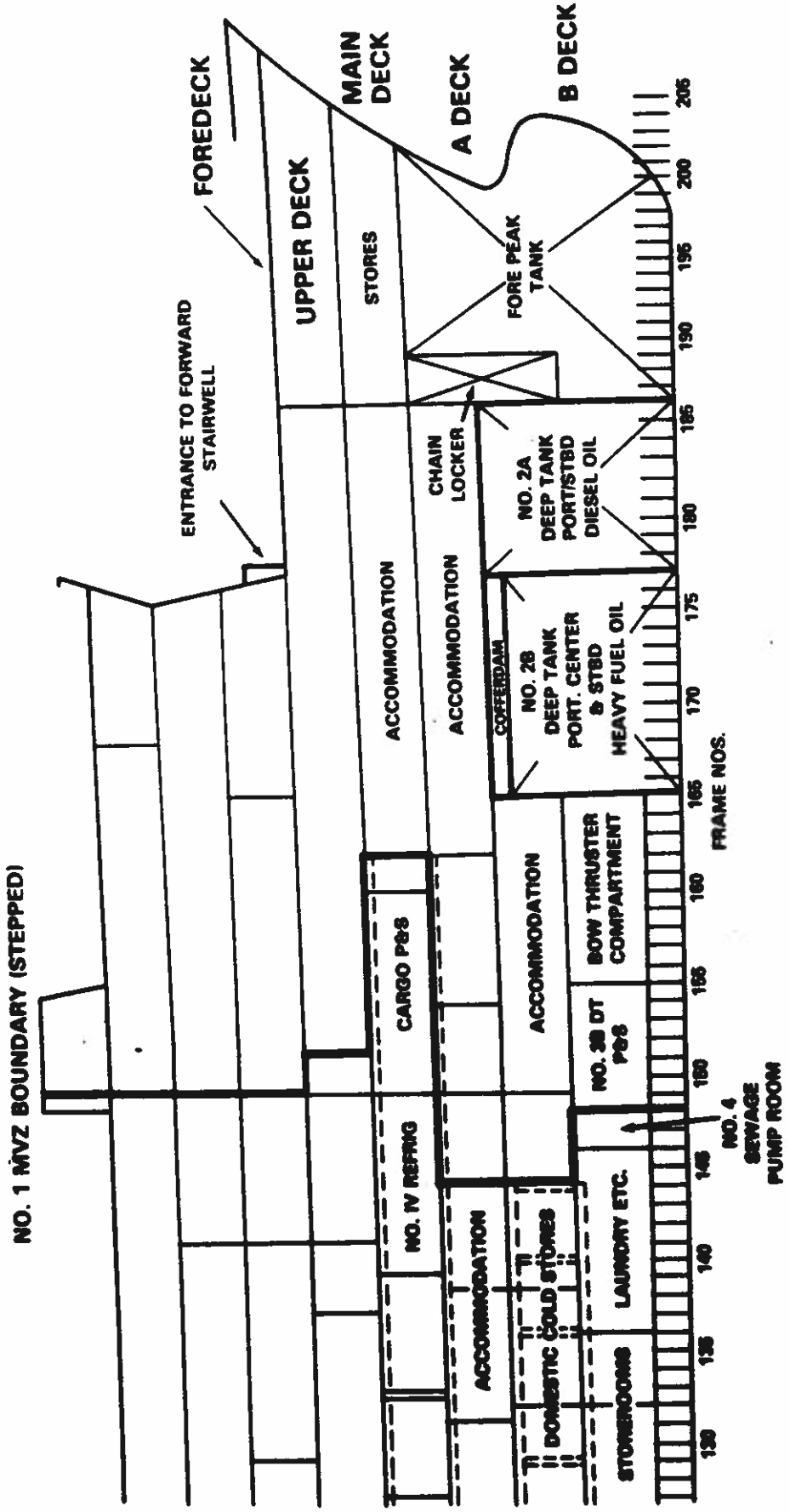


Figure 11.—Location of forward fuel oil tanks and forward main vertical zone boundary.

protected with two coats of flame retardant paint. The paneling tested by an independent testing laboratory in England in 1969 in accordance the applicable British standards 10/ and classified as "Very Low Flame Spread," Clas- The test report did not mention any measurement of smoke generation. Limitations on the amount of smoke produced during the combustion of materials of construction are not included in the SOLAS convention. Wood furniture was used extensively throughout the passenger and crew accomodations. (See figure 12.) The overheads in the public spaces, passageways, and accommodations were suspended about 18 inches below the structural steel decks, and electrical cables, pipes, and ventilation ducts were installed within the overhead space.

There is no internationally agreed-on smoke emission limitation on materials to be used in vessel construction. This is the case in spite of the fact that the predominant hazard associated with fire is smoke inhalation. However, the USCG has developed and published a flammability and smoke limitation for "interior finish" materials (Code of Federal Regulations, Subpart 164.012 (10)). The requirements are based on the ASTM test E-84 (tunnel test) and specify that flame spread shall not exceed 20 and that smoke shall not exceed 10. For reference, according to E-84, asbestos board is zero for flame spread and smoke. Red oak is given a flame spread and smoke rating of 100.

In general, the following construction materials were used:

Bulkheads - 3/4-inch asbestos cement panels
Ceilings - 3/8-inch asbestos cement panels
Structural insulation - mineral wool
Ducting and Hull Insulation - fibrous glass/mineral wool
Decks - steel
Linings - asbestos cement panels
Interior finish - melamine plastic laminate
Furnishings - wood and foam plastic
Floor covering - 72% wool/28% nylon carpet

Steel fire doors were installed throughout the vessel and held open electromagnetically. Controls to release the doors were located on the bridge and adjacent to each door. Closing of all fire doors within a main vertical fire zone would occur automatically if any one of the heat sensing devices was triggered by high temperatures. The master stated that on the day of the accident, although the fire doors in the forward main vertical zone closed automatically, he did not close the fire doors in the adjacent zone, using the bridge controls, until the passengers were on the open decks. The fire doors were not equipped with hose ports. 11/

The ventilation ducts were equipped with fire dampers that could be controlled locally or from remote controls located on the bridge. The dampers are held open by air-pressure and will close automatically if associated pneumatic tubing were to melt due to high temperatures. The master stated that the fire dampers were closed by use of the remote controls on the bridge when the ventilation was shut off upon discovery of the fire.

10/ B.S. (British Standard) 476:Part 1:1953, Section 2.
11/ A small door, usually about 6- by 6-inch, fitted at the bottom of a fire door opposite the hinged side to allow the fire door to be closed with a fire hose passing through. Hose ports are not presently required by international regulations.

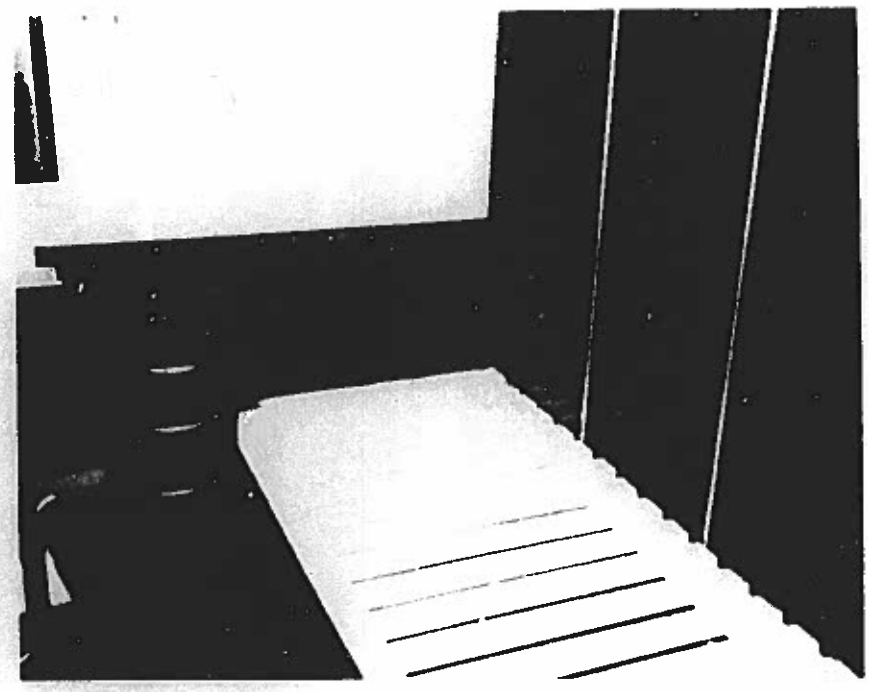


Figure 12.--Typical bed with wood mattress support.

The vessel was equipped with heat sensing fire detection devices located in the accommodation and public spaces and a smoke detection system located in the cargo holds and engine spaces. The heat sensors were located on the overhead panels in the rooms and passageways. There were no heat sensors in the overhead spaces between the paneling and the underside of the steel deck above. The sensors were set for a temperature of 58° C (136° F), except for those located in the ship's galley which were set for 93° C (199° F). They were grouped into 64 alarm circuits which included the sprinkler alarms for the cargo spaces and were connected to the heat detection cabinet on the bridge (see figure 13). The accommodation spaces were not protected by a sprinkler system. Each group of sensors within each main vertical zone was augmented by a number of manual "break glass" type of alarms mounted on the passageway and public room bulkheads. The spring loaded alarm switches required no further manipulation after the glass was broken.

The fire main system, consisting of 147 fire stations, each equipped with a 2 1/2-inch hose, was charged by two fire pumps located in the engineroom that were started by the engineers when the fire alarm was sounded. An emergency fire pump, located in the shaft alley, was powered by the emergency generator through the emergency switchboard. A number of fire stations throughout the vessel also were equipped with a 1-inch-diameter rubber hose that was constantly charged with water pressure from the sanitary water system.

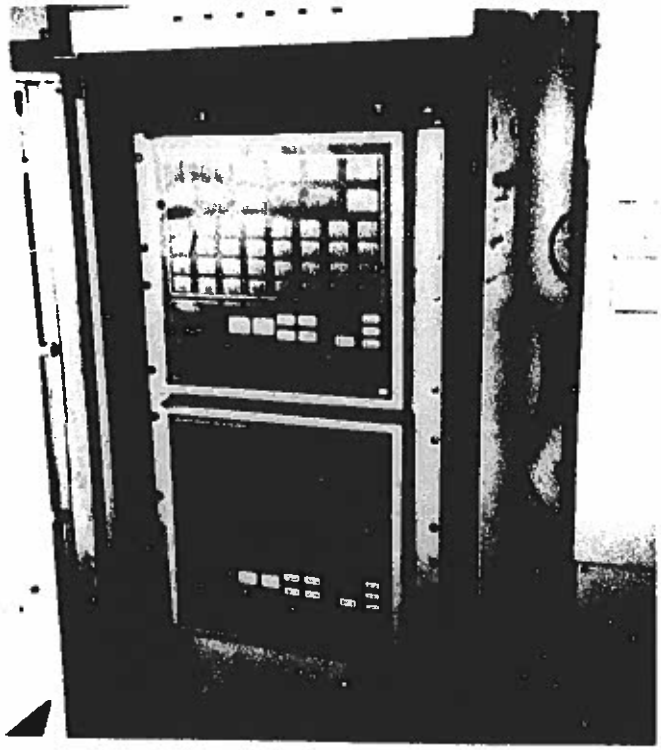


Figure 13.—Heat detection cabinet on the bridge.

The electrical system was typical of vessels built around 1970. The insulation on the electrical cables was self-extinguishing 12/ where the cables were run singly; however, when bundled, the insulation could be expected to propagate fire and generate thick black smoke and noxious fumes. Those cables installed during the 1982 conversion however were designed to be resistant to fire propagation in a bundled configuration.

The SCANDINAVIAN SEA was last inspected in January 1984 by a DNV surveyor who conducted an inspection and survey for class at Miami, Florida. The survey included hull, machinery, and safety inspections on behalf of the Bahamian Government.

The SCANDINAVIAN SEA had been operating out of Port Canaveral since February 1982. The vessel made a daily "cruise to nowhere" offering a cruise ship atmosphere with dining, sports, swimming, and gambling for up to 1,000 passengers, 6 days a week. The vessel departed at 1100 each day, routinely sailed to a point about 20 nmi off the Florida coast, anchored, and returned at 2200 each evening. On days with particularly rough seas, the vessel would anchor about 5 or 6 miles offshore for the comfort and safety of passengers, still providing all the amenities of a regular cruise ship. The "cruise to nowhere" was recognized as one of the tourist attractions of the region. The principal offices of Scandinavian World Cruises were located in Miami, but a "Sea Escape" office was maintained in Port Canaveral. Most passengers were booked through a reservation network of travel agents; however, some passengers walked into the cruise terminal and purchased tickets at the "Sea Escape" ticket counter. A daily passenger manifest was kept at the cruise terminal. The terminal manager for Scandinavian World Cruises stated

12/ IEEE Standard No. 45, "IEEE Recommended Practice for Electrical Installations in Shipboard."

that 1,030 passengers were booked for the cruise on Saturday, March 10 the day after the fire. The average number of passengers carried daily was about 700 with the figure increasing on weekends. These figures indicate that over 200,000 passengers were carried annually by the SCANDINAVIAN SEA. Before boarding the vessel, each passenger was required to fill out an embarkation card indicating his name, address, and citizenship. Passengers were given boarding passes that indicated their muster (emergency) station and on the reverse side, emergency instructions and illustrated directions on how to wear a lifejacket. In lieu of a fire and boat drill, emergency procedures were broadcast over the ship's PA system by the cruise director as the vessel departed.

The vessel called at Freeport in the Bahamas once a month to permit the crewmembers to renew their monthly work permits.

Port and Waterway Information

Port Canaveral is located on the east coast of Florida, 4 miles south of Cape Canaveral on the Canaveral Peninsula between the Atlantic Ocean and the Banana River. The 800-acre port is owned and administered by the Canaveral Port Authority, a public corporation chartered in 1939 by the Florida State Legislature. A five-member Board of Commissioners oversees the functions of the Port Authority. A Port Director, together with his staff, is responsible for the administration of the port's activities.

The entrance to the harbor is protected by stone jetties and is approached from the southeast. The entrance channel is 45 feet deep and 400 feet wide. Three basins on the north side of the channel contain the majority of berths in the harbor. The East Basin is used by the U.S. Navy. The Middle Basin contains a Navy pier and berths for commercial vessels, including a passenger ship terminal. The West Basin is restricted to fishing vessels and small craft because of the limited water depth available.

A 12-foot-deep canal connects the port with the Atlantic Intercoastal Waterway. Several deep draft berths along the main channel can accommodate tankers and bulk carriers. Two passenger ship berths with two passenger terminals, Nos. 2 and 3, owned and operated by the Canaveral Port Authority are located on the south side of the main channel, about 1/2 mile from the harbor entrance. The SCANDINAVIAN SEA berthed at Cruise Terminal No. 2 almost exclusively because of its daily departure schedule. Other cruise vessels, mostly foreign, also use the Port Authority's facilities. An additional passenger ship berth, No. 4, is under construction, just east of terminals Nos. 2 and 3.

The Canaveral Port Authority is actively engaged in promoting cruise ship trade. The S.S. ROYALE inaugurated a 4-day cruise service between the Bahamas and Port Canaveral in March 1984, which is estimated will add an additional 60,000 passengers a year to the cruise terminal activity that numbered over 309,000 in 1983. Numerous passenger ships, call at Port Canaveral because of the port's proximity to the Kennedy Space Center and Walt Disney World. The fishing industry contributes to the port activity with 50 scallop trawlers making daily trips to nearby fishing grounds. Shipments of oil and dry bulk cargo also are handled through the port.

Pilotage for Port Canaveral is provided by pilots licensed by both the State of Florida and the USCG. Pilotage duty is rotated between three pilots biweekly so two pilots are always available. Pilot services are arranged either by telephone or by radio directly with the duty pilot. A launch service is maintained by the pilots to provide transportation to and from the boarding area at the offshore entrance to the channel.

Tug service is available to assist vessels in berthing as required. Two commercial tugboats and two tugboats under contract to the U.S. Navy operate in the port.

Fire protection is provided by the Cape Canaveral Volunteer Fire Department under a contract (see appendix B) with the Port Authority and the city of Cape Canaveral. Paragraph 9 of the contract states:

> The City and the Fire Department shall not have the responsibility to provide fire protection on the water or to the ships in the Port basin if docked from the water side or to board any ship, but will cooperate with the Coast Guard and other parties to such extent as may be practical and feasible in firefighting activities.

The Port Director stated that there was no written fire contingency plan for the port although there had been some discussion between the fire department and USCG personnel. Some advanced planning had been done regarding the SCANDINAVIAN SEA since it was to be continuously operating from Port Canaveral on a daily basis. In April 1982, representatives of the USCG, the Port Authority, the local fire department, Scandinavian World Cruises, and the Sheriff's Department met aboard the vessel to discuss emergency safety procedures concerning risks which included fire, storm, or a bomb threat. Copies of selected drawings of the vessel were deposited at the USCG Station Cape Canaveral. Parties to the discussion generally agreed that in event of any emergency, the USCG would be called first and that it would then notify other appropriate authorities.

The Port Director stated also that, although paragraph 9 of the fire contract states that the fire department is not responsible for fighting shipboard fires, the fire department was to make its personnel and equipment available to the Port Authority or the USCG to assist as might be necessary. He said that he had an understanding with the fire chief that the fire department would take care of all fires in the port, including fires afloat, to the best of its ability. He also said that this was the first major shipboard fire that had occurred in the port and that the fire department did exactly what they said they would do, "they came and fought the fire."

Meteorological Information

On March 9, 1984, the weather offshore as recorded in the ship's log was:

Wind - NE - Force 3
Sea - NE - State 3
Temperature - 22° C (71.6° F)
Barometer - 1006 MB (29.71 in.)

A following summary of surface weather observations was recorded at Titusville, Melbourne, and Patrick Air Force Base Florida:

Sky: clear
Visibility: 7 to 15 miles
Air temperature: 59-63°
Wind direction: 050° to 080°
Wind speed: 3 to 5 knots

Survival Aspects

The SCANDINAVIAN SEA's emergency plan assigned duties to each crewmember, including the operating crew, concessionaires, and contractor personnel. The master was in operational command of any emergency aboard. The crew was organized into groups and subgroups, each reporting to the master on the bridge.

Master: On the bridge in command

Continuous Run Ship
- *Navigation and Stability - First officer
- Power and Propulsion - First engineer
- Document and valuables control - Hotel manager
- Food Group - Assistant food manager

*Under the reduced manning standards, the master assumed the duties of the first officer on the navigating bridge as well as operational command.

Mobil Fire Group
- Firefighters - Staff captain (chief officer)
- Fire Limitation Group - Second Officer (first officer)
- Search and Ambulance - Assistant Purser

Emergency Standby Group
- Boat and Raft Preparations - Boatswain
- Radio - Wireless operator
- Hospital - Nurse
- Technical Department - Chief engineer

Assistance Group - Entertainment manager

Evacuation Group
- Zone leaders - Chief steward
- Evacuation Control - Chief steward
- Provisions and Supply - Laundry manager

Emergency Procedures: (as per Emergency Plan)

EMERGENCY PROCEDURE

Anyone discovering a fire or similar grave hazard to the safety of the ship shall immediately notify the bridge by the quickest means available. Pushing the alarm button nearest the source will pinpoint its position on the bridge safety control panel.

In the case of fire do your utmost to put it out with the extinguishers nearby, and to get persons out of the danger area.

Do not open doors or hatchways which are giving off smoke until you have your extinguisher ready. Keep low and covered, be prepared for a stab of flame in the instant you open up.

If you don't succeed in putting out the fire with the equipment at hand close up again and do your best to seal off all openings feeding air to the flames.

Remain at the scene until a mobile firefighting grou[illegible]ves, tell them what has happened and whether you think anyone is tr[illegible]d inside.

Go immediately to your own emergency station.

If you, either on work or off duty, hear the alarm, you shall prepare yourself to go to your emergency station. Listen carefully to the speaker system to follow the instructions from the Operational Command.

All persons in "The Continuous Run Ship Group" and "The Mobile Fire Group" shall immediately muster accordingly to the "Emergency Plan."

The Boat and Raft Launching Plan assigned key members of the deck department to be in charge of each of the 12 lifeboats:

No. 1 - Staff Captain (Chief Officer)
No. 2 - Second Officer (not carried)
No. 3 - First Officer
No. 4 - Boatswain
No. 5 - Quartermaster
No. 6 - Carpenter
No. 7 - A.B. Seaman
No. 8 - A.B. Seaman
No. 9 - A.B. Seaman
No. 10 - A.B. Seaman
No. 11 - A.B. Seaman
No. 12 - A.B. Seaman

Persons in charge of the liferaft stations: Port side - Entertainment Manager Starboard side - Chief Steward.

Emergency fire and boat drills involving crewmembers were conducted each Thursday morning before passenger boarding. (Passengers were not included in the drills because there was a new group each day and the daily cruise was of short duration.) A simulated fire was set in a different location each week and mobile fire groups were ordered to the scene with proper equipment. The chief officer, who was in charge at the scene, checked the equipment brought by the members of the various groups and provided instruction in the use of the breathing apparatus, fire suits, hoses, and procedures in fighting fires. After the fire drill was concluded, a boat drill was held and the crew mustered at the boat stations.

On March 8, 1984, a fire drill followed by a boat drill was conducted aboard the vessel. According to the vessel's official logbook, the smoke detector system was tested, the crew mustered at their emergency stations, and four firehoses were charged. Following the fire drill, lifeboats Nos. 4 and 6 were lowered into the water and the releasing gear was tested. Boats Nos. 1, 3, and 5 were lowered to the embarkation deck. The dates and type of drills were entered in the official logbook as required by the Merchant Shipping Act, 1976 of the Commonwealth of the Bahamas.

A fire patrol was maintained aboard the SCANDINAVIAN SEA daily from 2200 until 0700 during which time a seaman would patrol the accommodation areas. The ship's master stated that the fire patrol would make a tour of the vessel every hour using a key-punch clock system to insure that all accommodation and public spaces were covered.

Tests and Research

Laboratory Analysis of Materials.--An independent laboratory contracted by the USCG, tested various materials, such as the core of the overhead panels, insulation used on ventilation ducts, a wood chip board from a lounge bulkhead, various structural, fiberglass, and sound insulation, to determine their compliance with U.S. 13/ and international fire standards. In general, the samples complied with the standards except the wood chip board. Results of the tests are summarized as follows:

Sample	Furnace T (°c)	Surface T (°c)	Wt. Loss %	Flaming (sec.)
(Overhead) Ceiling panel core	5.7	10.12	15.17%	0
Spiral duct insulation	11.1	0	4.40	0.6
Wood chip board	253.8	258.9	74.32	670
Structural Insulation	15.4	24.3	11.5	3.8
Insulation from penetration closures	51	73	9.86	16
MVZ *insulation	21.3	34.0	4.81	0
Fiberglass	12.6	7.76	1.95	0
Sound insulation	8.7	7.76	3.49	0
Beam insulation	74.4	88.1	8.92	3
Structural insulation	56.3	85.7	8.85	5

*Main vertical zone

Samples of overhead panels from a passageway were tested to determine their compliance with 46 CFR 164.012 (ASTM Test E-84), Surface Flammability Test. The test samples produced an average flame spread of 24 on the exposed side of the panel. The concealed side of the panel, however, produced flame spread numbers of 86 and 140, indicating that only one side of the panel had low flame spread characteristics. SOLAS 60 and the 1967 amendments require both sides of passageway panels to have low flame spread characteristics. Although no uniform international test standards existed when the SCANDINAVIAN SEA was built, the test sample still did not comply with the international requirements.

13/ 46 CFR 164.009 (ASTM Standard D-1571-73)

The carpeting used aboard the SCANDINAVIAN SEA was tested for flammability by an independent laboratory using two methods; the flooring radiant panel test (commonly used by the U.S. carpet industry) and the new IMO flammability test. The flooring radiant panel test found the carpet sample to have a critical radiant flux (CRF) at extinguishment of 0.70 watt per square centimeter (w/cm^2) as compared with the current U.S. standard for buildings of 0.25 or 0.45 w/cm^2. The higher figure, which is desirable, indicates the heat necessary to sustain burning. The IMO flammability test gave similar results. As a comparison, 100 percent wool carpet (currently required in some passenger ships) when tested in the IMO test apparatus, has a critical flux at extinguishment (CFE) of 2.25 w/cm^2. This figure is much greater than that of wool blend or synthetic carpets.

Although the carpet on "A" deck did not contribute significantly to the fire, the heat conducted through the decks above did ignite the carpeting which, according to the soot analysis, did contribute to smoke generation.

Chemical Tests of Debris.--A partially burned towel with an alcohol odor found in the wastebasket in room 414 was retained for analysis for an accelerant. The towel was analyzed by the Florida State Fire Marshall's Laboratory using gas chromatography. The analysis was limited to alcohol detection due to the nature of the equipment. No alcohol was detected, most likely because alcohol is soluble in all proportions in water, and, since the area was flooded, the alcohol would have been diluted below the detection limit. The sample was then sent to the Bureau of Alcohol, Tobacco and Firearms for gas chromatography/mass spectrometry analysis for nonethanol component residues that are characteristics of rum or similar beverages. No residues were detected.

Soot samples were collected from four locations (the upper deck passageway outside cabin 644, in cabin 738 of the upper deck, in cabin 720 of the upper deck, and from the clock in the lobby of upper deck (frame 148)), to determine the source material that contributed to the smoke.

Analysis of the soot samples was made using a computerized pyrolysis/mass spectometry technique. Based on a computerized library of soot spectra, this analytical technique is used to identify the polymer from which the soot was formed. Basically, when polymeric materials burn, the combustion process is incomplete, and the smoke or aerosol that is generated contains components or fragments of the original polymer. These fragments make it possible to identify the polymer from a "fingerprint."

The results of the analysis showed that soot taken from the first three areas originated from burning wool, nylon, PVC, and a cellulosic material. Analysis of the soot taken from the fourth area showed that it originated from burning wool, nylon, and cellulosic materials. The carpeting material on board the ship was reported to be a wool/nylon blend of 80 percent wool and 20 percent nylon. Chemical analysis showed the carpet to be 72 percent wool and 28 percent nylon. Other sources of the wool and nylon soot may have been clothing and bedding that was consumed in the fire. The source of the PVC soot was the electrical wire insulation and molding in the cabins. Clothing and wood furnishings could account for the cellulosic related soot.

Stability Study.--Because the SCANDINAVIAN SEA developed a list during the firefighting efforts, a study was made of the vessel's stability condition at the maximum observed list. The liquid loading of the vessel, including fuel oil, fresh water, and ballast water, combined with the measured amounts of water trapped in the compartments on the various decks, were applied to the hydrostatic properties of the vessel. Although the water levels were carefully measured, certain assumptions had to be made regarding the volume of entrapped water.

The results indicated a small loss of righting arm 14/ at the maximum reported heel angle. More significantly, however, was the projected loss of righting arm of the vessel if the water had been applied to the fire for an additional hour at the reported rate of 5,000 gallons per minute with no dewatering. The calculations indicated that the ability of the vessel to right itself after an external heeling force has been applied would have been reduced over 50 percent from the condition of the vessel upon arrival at the terminal.

The study also determined that the longitudinal spread of entrapped water in circumstances similar to those found aboard the SCANDINAVIAN SEA can add to the loss of righting forces. This is especially true in the upper decks where there is little or no watertight subdivision to prevent water from spreading fore and aft along the low side of a vessel with a list. The study indicated that the vessel was in no danger of capsizing but pointed out that immersion of the portlights could have caused flooding if one or more of them had failed.

Fuel Load Calculations.--The primary source of fuel for the propagation of the fire on the SCANDINAVIAN SEA was interior finish, furnishings, electrical cables, and materials brought into the accommodation spaces. In an effort to determine the significance of these fuels, the quantity of fuel in a room was estimated. The following table is an estimate of the type and amount of fuels with the corresponding heats of combustion of each material.

Material	Quantity(lb)	BTU/lb	BTU(K)	Eq. lb Wood
wood	200	8000	1600	200
paper	10	8000	80	10
clothing*	80	8000	640	80
melamine	140**	8000	2240	140
polyurethane	4	12000	48	6
trash can	5	8000	40	5
butadiene	8	16000	128	16
vinyl tile	68	4000	544	34
polyester	20	15000	300	38
wool	40	9000	360	45
		Total Wood Equivalent		574 lb

* not part of ship's furnishing
** exposed side of panel only

The floor area in room 414 where the fire originated is about 65 square feet, giving a fuel loading of approximately 8.8 lb/sq. ft. This is quite high when compared to a typical bedroom which is 4 to 5 lb/sq.ft. The burning rate, R, in a room with a window or door area, A, and window or door opening height, H, can be calculated based on the following relationship:

14/ The perpendicular distance between the vertical forces of gravity and buoyancy when a vessel is heeled over due to an external force.

$R = 0.62\ AH$

R = lb/min or burning rate
A = opening area (2.5-ft. by 6.75-ft. door size)
H = height of opening (door of 80 in.)

In this case, the theoretical burning rate is 27.2 lb/min., or 217,000 BTU/min. However, in the cabin all the combustibles were not consummed. For example, most of the carpeting and some of the wood furniture burned only partially.

Other Information

Electrical Problems in Room 414.--On March 8, the occupants of room 414 requested the chief steward to submit a maintenance request to repair several light fixtures and an electric wall receptacle in the room. About 1400 on March 9, the ship's electrician checked the electrical circuits in the room and found that the light fixtures and the electric wall circuit were operating properly. The electrician then left the maintenance request slip on the desk to indicate that he had been there, closed the door to the room, and left the "A" deck area.

Between 1600 and 1630, one of the occupants of room 414 and the chief steward, returned to room 414 to check on the condition of the lights. They found the fixtures to be in good operating order and assumed that the necessary repairs had been made. They departed a few minutes later and closed the door.

Coast Guard Control Verification.--The Control Verification program, a system of examinations by the USCG of foreign vessels calling at U.S. ports, conducted under the authority of Regulation 19, Chapter I, SOLAS 74, was developed to insure compliance by the vessel with the applicable sections of the SOLAS convention. On January 17, 1984, a control verification examination was conducted aboard the SCANDINAVIAN SEA by two USCG inspectors from the Marine Safety Office (MSO) while the vessel was berthed in Miami, Florida. The examination, described in USCG booklet CG-840F, "Control Verification or Examination of Foreign Vessel," serves as an aid to the inspector about the most vital items in the examination. After the USCG inspectors met with the master about 0900 and explained the procedures and requirements of the examination and recorded data about the lifesaving equipment, a fire drill was conducted. The alarm was sounded and the crew mustered in the car deck (main deck). Two firefighting parties were formed and two firehoses were charged with water. A coupling to which a nozzle was attached came off one hose and another hose was substituted promptly. Five hoses were checked from fire stations on the car deck. There were 147 fire stations on the vessel. None of the hoses in the accommodation areas were checked.

A lifeboat drill then was conducted and the port boats were lowered into the water. A USCG inspector checked the crew's lifejackets. Because the vessel was starboard side to the pier, the starboard boats were left in their cradles although the boat engines were started and the gears checked for operation. (See appendix E.) One of the USCG inspectors stated that there were only two deficiencies noted: a wire sheave on the davits of the No. 8 lifeboat was seized, and a rubber mat was missing on the deck at the emergency switchboard. In a letter dated January 2, 1984, to the USCG, Scandinavian World Cruises, Inc., stated that the deficiencies had been corrected.

All the fire doors were released from the bridge and the closures were checked. Selected fire doors were operated locally to check their operation. Several fire dampers were inspected and the galley vents were checked for grease. The fire and bilge pumps in the engineroom were tested and found in satisfactory order.

Fire Safety Standards.--USCG records indicate the SCANDINAVIAN SEA was constructed to the standards of the International Convention for the Safety of Life at Sea, 1960 (SOLAS 60) and incorporated Method I structural fire protection, one of three methods permitted under SOLAS 60. Method I construction generally requires minimal use of combustible material. The main vertical zone boundaries are required to prevent the passage of smoke and flame for a period of 1 hour. Within each zone, noncombustible materials are required in the construction of internal divisions, eliminating the need of a sprinkler system in the accommodation areas. All three methods of structural fire protection are based upon the following basic principles: (1) division of passenger vessels into main vertical zones by thermal and structural boundaries so that no zone is over 131 feet (40 m) long; (2) separation of passenger accommodations spaces from the remainder of the ship by thermal and structural boundaries; (3) detection, containment, and extinguishment of the fire in the zone of origin; and (4) protection of the means of escape.

SOLAS 60 was in force when the SCANDINAVIAN SEA was built in 1970. U.S. authorities have had a continuing concern about the condition of structural fire protection on foreign passenger vessels calling at U.S. ports because SOLAS 60 did not require the best fire protection technology available at that time. U.S. representatives urged the Maritime Safety Committee of the Intergovernmental Maritime Consultative Organization (IMCO) (now International Maritime Organization (IMO)) to upgrade the structural fire protection standards at a special meeting in May 1966. As a result, IMCO Resolution A.108 was presented to the General Assembly of contracting governments as a proposed amendment to the SOLAS 60 convention to upgrade fire safety standards for "existing passenger vessels." IMCO Resolution A.108 was never ratified formally although the General Assembly agreed on the amendment. The United States unilaterally enforced the provisions of IMCO Resolution A.108 and the accompanying amendments upon all passenger vessels over 100 gross tons, having sleeping accommodations for 50 or more passengers, and embarking U.S. citizens at ports of the United States, because of the perceived need to provide higher standards of fire protection aboard these ships. IMCO Resolution A.108 became known as the Fire Safety Standards of 1966. Additional amendments were proposed in 1967 which applied to new passenger ship construction which, like the 1966 amendments, were not ratified. Eventually, however, both the 1966 and 1967 amendments were incorporated into a new convention--SOLAS 74. The SCANDINAVIAN SEA was not required to comply with the 1967 amendments under international or U.S. law, but it appears to have been built to those requirements.

Before the SCANDINAVIAN SEA entered the cruise service from U.S. ports, selected ship's plans were submitted to USCG headquarters for review under the control verification program. Included was a statement by the vessel's owners that it met the Method I requirements of SOLAS 60 as well as the requirements of the 1967 amendments (Part H) to SOLAS 60. (The 1967 amendments were nearly the same as the requirements for U.S. flag passenger vessels.) Several potential discrepancies were noted by the USCG which were resolved in a later submittal.

After the plan review at USCG headquarters, the plans were forwarded to the Marine Safety Office in Jacksonville, Florida, and used during the control verification examination by USCG inspectors. After completion of the examination on April 20, 1982, a control verification certificate was issued to the vessel allowing it to carry U.S. citizens out of U.S. ports.

During the postaccident inspection of the vessel, several conditions were discovered that did not conform to the applicable standards. The longitudinal bulkhead at the forward end of the lounge deck adjoining the Casino, between the Dancing Bar and the adjacent dining room (see figures 4 and 9) contained combustible material. The paneling was supported by wood spacers installed directly against structural steel members. In the overhead spaces in the port side longitudinal passageway of the upper deck, forward of the fire door at frame 100 (see figure 5), draft stops were not installed every 45 feet as required. The USCG's original control verification examination and plan review of the vessel failed to reveal these discrepancies. This condition raised questions after the fire about which method in fact was enforced during construction. In a letter to its surveyor in Miami, dated August 3, 1984, DNV stated that the SCANDINAVIAN SEA was constructed according to Method III, referring to a report of January 19, 1982, 12 years after construction was completed as documentation. The plans of the vessel were reexamined by the USCG after the accident and verified to have met the 1967 amendments in almost all respects and, therefore, the owners contention that the vessel was constructed to Method I requirements of SOLAS 60 including the 1967 amendments was correct. As the cognizant classification society at the time of design and construction of the SCANDINAVIAN SEA, DNV should have known that the vessel was built to the requirements of the 1967 amendments to SOLAS 60, Method I and that combustible materials in bulkheads are not permitted. In response to a query by the USCG, further confirmation that the vessel originally was built to SOLAS 60 standards, including the 1967 amendments, for Method I construction was received on November 5, 1984, from a former director of the company that originally owned the vessel who is presently chairman of the classification committee of the class society Bureau Veritas of Paris, France.

Within SOLAS construction regulations, there are two categories of stateroom: category 6 and category 7. In a stateroom designated category 6 (which is an accommodation space of minor fire risk), furnishings, such as bedding chairs, draperies, carpets, and interior finish materials, are restricted to minimize fire risk. By electing to restrict combustible content, the builder may use class "B-O" bulkheads between category 6 spaces. If the builder does not restrict content, then the staterooms are designated category 7 and the spaces must be separated by class "B-15" bulkheads. It was concluded that all staterooms in the SCANDINAVIAN SEA were category 7 spaces in which bulkheads have higher fire ratings but the furnishings are unregulated.

SOLAS does not limit smoke producing material or in any way attempt to control smoke production other than in the basic limitation that construction materials be non-combustible and that exposed surfaces have low flame spread characteristics.

Det Norske Veritas Safety Examination.--In addition to conducting periodic surveys for class, a surveyor from the Norwegian classification society DNV conducted safety examinations of the SCANDINAVIAN SEA on behalf of the Bahamian Government. The safety examination is conducted annually for renewal of the Passenger Ship Safety Certificate (see appendix G) issued under the provisions of SOLAS 1974, and was last completed on January 14, 1984. Included in the examination are subdivision and stability, machinery and electrical installations, structural fire protection, sprinklers, fire alarm and fire detection systems, protection of special category spaces, patrols, fire main, portable fire extinguishers, fixed fire extinguishing systems, fireman's outfit, lifesaving appliances and navigational equipment, pilot ladder, and mechanical pilot hoist (if fitted).

Contingency Plans.--The USCG COTP at Jacksonville, Florida, within whose jurisdiction Port Canaveral lies, stated that the only contingency plan in his area he was aware of was one for a different port and in that plan, developed by the Marine Safety Office in Jacksonville, is a notation that said "In view of the geographical distances and time delays [sic] at arriving at Port Canaveral, contingency planning and immediate responsibility would not be considered."

The COTP has the authority to take full or partial control of any vessel in his jurisdiction when he deems such action is necessary. He can enlist the aid of local, State, and Federal authorities to assist, generally based on the degree of danger a vessel poses to the port. (See appendix A.)

A contingency plan to provide for various emergencies both afloat and ashore where company vessels or facilities are involved had been prepared by Scandinavian World Cruises, Inc. It described in detail the duties and responsibilities of the company officials regarding communications, notification to relatives of both passengers and crew of any emergencies, public information, and arrangements to be made for typical situations. Of particular note is the statement: "The ship's master has command and therefore control of the vessel at all times while he is on board, and is in full control of the emergency if it is directly related to his vessel. He must, therefore, exercise prudent seaman-like judgments at all times."

ANALYSIS

Origin of Fire

A number of factors suggested that the fire aboard the SCANDINAVIAN SEA was set deliberately with the aid of a flammable liquid.

- It is difficult to burn carpeting completely through without some other fire fueling product. It is most uncommon for carpeting to burn in a circular pattern (in this case, about 3 feet in diameter) in the absence of a flammable liquid;

- The burn pattern in the corner above the wastebasket indicates the fire burned upward from within the wastebasket;

- The construction of the vessel was mainly asbestos and steel, materials that resist fire spread. The combustibles were mainly cabin furnishings, clothing and personal effects, the formica like covering over the asbestos wall panels, and the carpeting. The carpet in room 414, similar to the carpet used throughout the vessel, was a fire resistant type that would not burn without the aid of an accelerant or other fuel; and

- There was no evidence of electrical arcing or other cause of the fire although their had been earlier complaints of electrical problems in this room.

The 3-foot-diameter burn pattern found in the carpeting indicates that a fire was set or fed with an accelerant. The heat of a fire rises so that the radiative flux to the surface, as in this case to the carpet, is low and generally insufficient to ignite and burn a product, such as carpeting without some other heat sources. This would be

particularly true of carpeting over a heat conductive, non-combustible floor material, such as steel. In this instance, the carpeting was laid over vinyl tile which was laid over steel deck material, so that heat would have carried away rapidly. While carpeting can be burned and frequently is in home fires where the floor is wooden or in fires of intense heat with high fuel loading and sufficient oxygen, these factors were not present. Carpeting also will burn if thermoplastics melt and drip or run onto the floor covering. In this particular fire, it was possible the circular pattern found in front and under the settee could have been caused by the melting of the cushions (polyurethane) of the settee. To determine the probability of such an occurrence, the Safety Board examined settees in other rooms to determine the construction materials used in the settee. It was determined that the settee was constructed of a wood frame, a foam rubber (probably butadiene) seat, and a polyurethane back. Polyurethane was the only material in the construction that had the potential to melt and pool. However, it could not have pooled and created the circular pattern found in the investigation. The burn pattern was too far forward in the room. Since the back cushion of the settee was polyurethane, any polyurethane that had melted would have dripped on the carpet along the back wall of the room resulting in a linear burn pattern and not the circular pattern found some distance from the wall.

The burn pattern in the corner under the sink of room 414 indicated that combustible material in the wastebasket burned upward, i.e., there is a typical "V" pattern. The fact that the towel which had an odor of alcohol was not completely consumed, suggests that ashes and debris from the walls or ceiling of the room fell into the wastebasket and limited the availability of oxygen to continue the combustion process.

Based on this evidence, it is probable to a high degree of certainty that the fire was started with the aid of a flammable liquid placed on the carpeting in front of the settee. Furthermore, the investigation revealed that the fire in the wastebasket under the sink was started in a towel soaked in alcohol or some other flammable fluid and that it was a secondary ignition source, being ignited by hot gases after the fire was in progress.

The fire was reported to the bridge first by telephone and then by an alarm in the heat detection cabinet. The first alarm came from zone 32 which is on "A" deck aft of the watertight door at frame 165 and forward of the fire door at frame 153 (room 414 is in zone 31, "A" deck forward of frame 165) which indicates that, at the time the fire was discovered, it had not reached a temperature high enough to activate the heat detector (136° F) on the overhead panel of room 414. If the heat detector in room 414 had been activated by high temperature, then the No. 31 zone alarm would have sounded before No. 32. Any heat moving aft in the "A" deck passageway would have passed by two heat detectors in zone 31, one located in room 414 and the other in the passageway, before passing through the watertight door at frame 165 into zone 32. The Safety Board concludes that the fire alarm in zone 32 must have been manually activated although the Board was not able to identify the individual who actually activated it. The chief steward stated that he broke the glass on a manually operated fire alarm in the crew recreation room on B deck forward, which is in zone 40. The fire patrol was not on duty at the time so it is not known accurately when anyone passed through the "A" deck area before the ship's plumber discovered the fire.

The intense heat radiating from the overhead in the passageway that was reported by the chief officer soon after the discovery of the fire probably came from the hot gases that flowed out through the open door of room 414 and into the upper portion of the

passageway. The firefighting party, which had not donned firefighting suits, was not equipped to withstand much heat, and incorrectly concluded that it radiated from within the overhead space. In the murky smoke-filled passageway, the chief officer and his firefighting group did not realize that the asbestos core of the panels would effectively block such heat if, in fact, it originated in the overhead space. The Safety Board believes that the origin of the fire was the carpet in room 414 supported by an accelerant. The actual source of ignition could not be determined.

Combustibility of Accommodation Spaces

The material used in the construction of the SCANDINAVIAN SEA, while conforming to the requirements of Method I construction, nevertheless eventually burned and destroyed the subdivision in the lower decks of the forward zone. The asbestos cement paneling used for bulkheads and overheads, asbestos sheets covered with a thin veneer of Micarta or Formica 15/ a melamine type of material, was heated until the veneer ignited and burned, although the panels contained the fire on "A" deck for a considerable length of time. The tests conducted on samples of the same panel material from the vessel indicate, that with some exceptions, the original construction satisfied the requirements of the fire safety standards of SOLAS 60 for fire restrictive construction. The various test results indicate, however, that there is a need to standardize the testing procedures for materials used in construction of passenger vessels built to SOLAS requirements. The furniture and bedding installed at the time of construction were not made of fire retardant materials, or required to be. The high fuel loading generated the heat necessary to ignite the panel veneer. If the furnishings and materials placed in the accommodation areas were included in the amount of combustibles permitted by the SOLAS convention, the duration of the original fire would have been reduced and the fire probably would have been confined to a few rooms. The furnishings and materials used in accommodations on existing passenger vessels should be modified to meet the standards of SOLAS 74.

Although the insulation on the original electric cables aboard the vessel was self extinguishing when tested in a single cable configuration, this test had little significance for cables installed in bundles. Such configuration can be expected to propagate fire. The shipboard cable flammability problem was addressed internationally by IMO which adopted a resolution in 1975 that became effective in September 1, 1984, that states: "All electric cables shall be at least of a flame retardant type and shall be installed so as not to impair their original flame retardant properties." Unfortunately, IMO failed to identify a flammability test method in the amendments to SOLAS 74.

The smoke generated during the fire was not confined to the forward main vertical zone. With some of the fire doors in the zone boundary partially or fully open during some stage of the fire to allow access into the zone by firefighting teams and equipment, smoke escaped from the zone and eventually permeated the remainder of the vessel. Firefighter's efforts to deal with the smoke accounted for much of the damage that contributed to the (constructive total) loss of the vessel. Some smoke probably passed through the ventilation and air-conditioning ducts even though the fire dampers were reported closed. The fire retardant bulkhead paneling, although classified as "Very Low Flame Spread" by a British testing laboratory and acceptable under the present SOLAS standard, did not meet the U.S. requirements for limited smoke generation. There is no internationally agreed upon smoke emission limitation for materials to be used in vessel construction, despite the fact that the predominant personnel hazard associated with fire

15/ Trade names.

is smoke inhalation. The USCG has developed and published a flammability and smoke requirement for "interior finish" materials in 46 CFR 164.012 (10), (based on the ASTM test E-84 (tunnel test)) which states that flame spread shall not exceed 20 and smoke shall not exceed 10. These flame spread and smoke requirements are quite stringent. The USCG should urge IMO to modify the fire safety standards in the SOLAS 74 treaty to add criteria to address the quantity of smoke generated as well as flame spread to the existing requirements for paneling used in passenger vessels, and also to standardize material testing procedures.

Propagation of Fire

The fire spread throughout "A" deck through the passageways and open doors of the state rooms as evidenced by the fire damage. An examination of the door hinges indicated that the doors of 10 rooms had been open during the fire. The remaining three rooms in which the doors were closed, as indicated by the undamaged condition of the hinges, escaped fire damage and were affected only by smoke. Fire spread to the upper decks by the transfer of heat through the vertical steel structural members. This indicates that structural fire protection standards to preclude the conduction of dangerous heat levels to decks above and below through steel structural members were not adhered to during construction. During the overhauling process before the fire reflashed about 2300, the penetration of the paneling by the firefighters damaged the protective barrier designed to prevent the spread of the fire.

The intense heat that was concentrated in the forward stairway and that extended from the "A" deck to the lounge deck probably resulted from the fact the fire door at the "A" deck level at frame 180 was not continuously closed. When the chief officer divided the firefighting group in an attempt to approach the fire from forward and descended the stairwell from the main deck and opened the "A" deck fire door, the intense heat on the other side of the door escaped into the stairwell. Although he stated that when he retreated from the area, he closed the "A" deck fire door, there was repeated subsequent entry by shoreside firemen who may not have closed the door. The burned out condition of the stairwell indicated that a chimney effect was created by the open door allowing the fire to spread upward. When the fire reflashed shortly before 2300, the fire doors to the stairwell probably were open as a result of the ventilation efforts of the shoreside firemen.

Containment Within the Vertical Fire Zone

Although sprinklers are not required in the accommodation areas under current regulations for passenger vessels which meet fireproof construction standards, the fire on the SCANDINAVIAN SEA would have been quickly extinguished if a sprinkler system had been installed. The USCG should consider requiring sprinkler systems in the accommodation areas of passenger vessels regardless of the type of construction thereby reducing the dependency on personnel response. When the fire was first discovered, the fire doors and fire dampers were closed, and the ventilation systems were stopped, sealing the forward main vertical zone which effectively isolated it from the remainder of the vessel. The use of cooling water on the decks and bulkheads forming the zone boundary also aided in preventing any lateral spread of the fire into the adjacent vertical fire zone. The heat and smoke damage which extended beyond the forward vertical zone was due to both ship and shoreside firefighters having left open various openings, mainly fire doors, for personnel access or for fire hoses to be led through the opening. Inspection of the vessel after the fire showed that the fire hoses at the fire stations within the forward

main vertical zone were not used to fight the fire, but that hoses were dragged in from the adjacent main vertical zone into the vertical stair column aft of frame 153 and left in the fire doors, preventing them from fully closing. If hose ports had been installed in the fire doors into the forward main vertical zone, the zone could have been sealed off more effectively, restricting the air supply to the fire. Such ports are described in U.S. regulations for passenger vessels in 46 CFR 72.05-25(a)(6) but are not permitted to be installed in fire doors of main vertical zone boundaries by 46 CFR 76.10-10(d); the USCG should consider amending the regulation to require such installation. Further, the USCG should propose to IMO that fireproof construction standards in the SOLAS treaty be amended to require the installation of hose ports in fire doors on passenger vessels, including those in class A bulkheads of main vertical zones and stair columns to permit fire hoses to be passed through closed fire doors.

Firefighting Efforts

SCANDINAVIAN SEA.--Generally, vessel crews are instructed and directed by licensed officers in fighting fires at sea when no other assistance is available. These firefighting practices are tailored to the various systems built into the vessel. The drills that were held weekly aboard the SCANDINAVIAN SEA were intended to maintain the firefighting capability of the crew even with the crew turnover on each day's voyage. The vessel's emergency plan and crew emergency station assignment cards, which were issued to each crewmember, provided the information necessary for them to report to their respective emergency stations, supplemented the instruction given by the licensed officers during the weekly drills, and should have sufficed to deal with emergencies aboard the vessel. The response to the fire on March 9, however, indicated that the drills and instruction fell short of their intended purpose.

After the plumber discovered the fire in room 414, he failed to attack the relatively small circle of flame on the carpet with the equipment readily available to him. The burned circular pattern found later by the fire investigator confirmed that the fire at that time must have been small. The plumber, who had firefighting training, should have instructed the bar waiter or the occupant of room 417 to turn in the alarm while he remained on the scene and fought the fire. The fire could have been extinguished before it grew to an uncontrolable size.

The firefighting equipment aboard the vessel, although adequate, was not fully or effectively utilized by the ship's crew. The firefighting group used fire hoses located outside the fire zone where the fire was located. Although this action was necessary to gain access through the smoke and heat after the fire had gained momentum, the first crewmembers to discover the fire, the ship's plumber and a bar waiter, never used hoses from nearby fire stations nor did they utilize the small 1-inch rubber hose located in the area (4 feet from room 414) that was pressurized from the vessel's sanitary system. The plumber, by reason of his duties, should have been aware of the availability of this equipment. The fire in room 414 could have been fought immediately with this water source if the fire extinguishers failed to completely extinguish the flames. Leading the fire hoses into the area through fire doors at the forward main vertical zone boundary bulkhead prevented the proper sealing off of the zone to isolate the area as prescribed in the emergency plan. The chief officer stated that several ship's fire hoses failed during the firefighting efforts, and that a hose nozzle blew off while he was attempting to gain access to "A" deck through the forward stairwell at frame 179. It is unclear if the fire hoses in the "A" deck accommodations had been included in any recent inspection or testing of the emergency equipment.

Availability of Equipment.--Firefighting equipment on the SCANDINAVIAN SEA was readily available to the personnel assigned. Each member of the three mobile fire groups was responsible for bringing certain equipment to the scene. The practice was adhered to on the day of the fire except for the firefighting suits. The vessel's emergency plan called for four members of the firefighting group, in the charge of the staff captain (chief officer), to each bring a firefighting suit to the scene of the fire. The staff captain then would determine what equipment was to be used, including the firefighting suits, and issue instructions accordingly. Although a fire suit locker was located on the main deck in the stairwell at frame 140, none of the members of the firefighting group brought the suits. Adherence to the emergency plan probably would have allowed the firefighters to further penetrate the heat affected area and find the source of the heat in the "A" deck passageway and take early action to combat it.

The self-contained, fresh air breathing apparatus (air-pacs) that first were used by the ship's firefighters apparently did not have fully charged bottles. Use of the air-pacs during the weekly drills probably left the bottles with less than full capacity and severely limited their usefulness in an emergency. The chief officer, when questioned as to the recharging capabilities aboard the vessel, stated that there was an air compressor aboard to fill the air-pac bottles. He said that he believed it did not work, but since the SCANDINAVIAN SEA was in port every day, there would have been no problem in getting them filled ashore. Moreover, it is doubtful whether the air-compressor aboard the vessel was of sufficient capacity to keep enough bottles continuously filled to satisfy the requirements of the ship's firefighting group for any extended period of time. The master believed that he did not have enough spare air-pac bottles to fight a fire in the accommodation area. With the large amount of air needed, and with only partially filled bottles, the firefighting capabilities of the ship's crew was greatly reduced. Air-pac bottles used for drill purposes should be so designated and should be separated from the spares kept for emergencies. The insufficient supply of fully charged air-pac bottles did not allow the firefighting group time to adequately cool down the area and may have contributed to the reflash of the fire. The Safety Board believes that extra air-pac bottles should be put aboard the vessel for use during drills and demonstrations.

Responsibility of Master and Crew.--When the fire first was reported to the master and the chief officer, who were on the bridge of the SCANDINAVIAN SEA, their immediate response was executed in accordance with the vessel's emergency plan. The master first looked (and properly so) to the passenger's safety. The vessel's proximity to the terminal at Port Canaveral facilitated the successful evacuation of the passengers. The absence of any personal injuries or fatalities among the passengers and crew was largely due to the master's decision to proceed to port immediately.

After the SCANDINAVIAN SEA was berthed safely at the pier and the shoreside firefighters and the first USCG emergency response team had boarded, the firefighting efforts of the ship's crew were reduced to an advisory role. The ship's officers provided information as to the location of the fire and the routes to follow to gain access, including furnishing drawings showing the arrangement of the various decks; however, the various shoreside fire companies proceeded to act independently without any coordination. The master relinquished control of the firefighting efforts, believing the USCG was in charge of the shoreside firefighters. He stated "[sic] if the Coast Guard is coming on board like they did this evening, I will not go against the Coast Guard officer if he is going to take charge of leading these different fire fighters, civilian and their own firefighters." While the officer's of the SCANDINAVIAN SEA were trained in shipboard firefighting, they found it difficult to put this knowledge to use in conjunction with the activity of the local firefighters. The master, who had remained on the bridge, should have recognized through

reports from his officers that the shoreside firemen were not familiar with the techniques of shipboard firefighting and, at that time, should have reasserted control of the firefighting activities utilizing his officers to direct the operation. While the Cape Canaveral fire chief was charged with the responsibility of providing fire protection in the port, the master nevertheless continued to be responsible for the safety of his vessel and could not abdicate this role in the face of activity by shoreside firefighters that clearly was increasing the hazard to his vessel. The Safety Board believes that the master of the SCANDINAVIAN SEA should have exercised more authority over the actions of the local volunteer firemen when it was evident they were not trained in shipboard firefighting techniques and in fact were hazarding the vessel. When the commanding officer and the engineering officer of the DILIGENCE boarded the vessel, the lack of coordination became apparent to them. After their brief tour of the vessel and after they conferred with the master about the progress of the firefighting efforts, it became apparent to the engineering officer of the DILIGENCE that the method of firefighting employed by the shoreside firefighters was not correct. Although the USCG attempted to adhere to its policy of only providing assistance and technical expertise to the local fire departments, the lack of coordination by the local fire departments during the initial phase of their firefighting efforts and the inaction of the master justified the action of the USCG in assuming control.

There is evidence that when the fire reflashed about 2300, there was little if any firefighting activity, either by the ship's crew or shoreside personnel. Testimony from the vessel's crew and the shoreside firemen indicated that prior to the reflash, it was possible to walk through the "A" deck area without the aid of breathing apparatus. If the firefighting teams, either ship's crew or shoreside, had taken advantage of the situation at that particular time and thoroughly drenched the area with water, the reflash of the fire may have been prevented. The Safety Board believes that a properly trained and supervised ship's crew should have been able to quickly extinguish the original fire and prevented widespread damage to the vessel. The Safety Board also believes that the combined efforts of the ship and shoreside firefighters should have extinguished any reflash of the fire rapidly or, for that matter, should have prevented a reflash. It is entirely possible that if a professional firefighting company had been engaged as soon as there was any doubt as to the sufficiency of the firefighting efforts by either the crew or the local firemen, the damage could have been limited to one or possibly two decks in the forward zone.

USCG Rescue and Assistance.--When the officer-in-charge of the Port Canaveral USCG Station arrived at the scene, he had the plans of the SCANDINAVIAN SEA sent over to the vessel from his files to provide some information to the shoreside firefighters about the layout of the vessel. The lack of coordination of the firefighting efforts during the early stages of the operation resulted in the complete disregard of the early information furnished by the USCG. The information conveyed in the April 1982 meeting held aboard the SCANDINAVIAN SEA to discuss the procedures that were to be followed in the event of emergencies, such as a fire, apparently had been forgotten by the local firemen who had attended. When the officer-in-charge of the Coast Guard Station withdrew his men from the vessel because he felt it was unsafe, the local firemen's perception of the effectiveness of the Coast Guard was seriously compromised. Therefore, it was only when the officer-in-charge called for the officers and crew of the USCG Cutter DILIGENCE to furnish a Rescue and Assistance team, supplemented by station personnel, that the Coast Guard's authority became a factor. Although units such as the USCG Station Cape Canaveral primarily are search and rescue units, their personnel are likely to be the first to respond to local port emergencies where there are

no COTP units. Because persons requesting USCG assistance look to any USCG unit to have expertise in all marine matters, regardless of the mission of the particular unit, confusion can result and accordingly the USCG role in the maritime activities of the port should be expanded to include COTP functions wherever there is substantial marine activity.

When the CO of the DILIGENCE assumed the role of onscene commander until COTP personnel could arrive from Jacksonville, he established a timely USCG presence that carried the necessary authority to provide much needed coordination. It was fortuitous that the DILIGENCE was in port at the time; it could have been at sea. Response by other USCG units although rapid, could not have provided an immediate USCG presence with authority and expertise for a major emergency. The Safety Board believes that with the planned expansion of the port and the projected increase in the number of ships calling, especially passenger ships, the USCG should evaluate the need for on-going COTP representation in Port Canaveral.

Local Fire Departments.--The first response to the fire by the Cape Canaveral and Merritt Island fire departments included 4 pumper trucks and about 25 firemen. Through mutual assistance agreements, additional men and equipment from both local and Federal government agencies also were ordered to the scene. The ability to organize men and equipment when needed, especially in the port area when tugs with fire monitors and USCG vessels may be involved, requires good communications between units so that their combined efforts can be utilized efficiently. When the various units on scene were unable to communicate quickly and messengers had to be used, valuable time was wasted, especially when firemen were working with equipment from departments other than their own. This inability to coordinate the various fire departments by means of radio because of the lack of common radio frequencies resulted in delays and needless exposure of firefighters to danger. Various fire departments and other emergency response units who respond to port emergencies should have compatible communication equipment to coordinate with the port authority and to be able to operate as a unified group. Port contingency plans should include this provision.

Terminal Facilities.--The Port Canaveral Cruise Terminal No. 2 where the SCANDINAVIAN SEA regularly berthed provided access to the vessel for the emergency equipment. Although fire hydrants, lighting, and fresh water connections were available, the facility could not provide electrical power for the portable electric pumps that could have been used early in the operation to dewater the vessel. In the event of a generator failure on the SCANDINAVIAN SEA, there was no pierside source of electricity to provide shore power to the vessel. Vessels calling at the cruise terminal normally do not require any services other than gangways and fresh water; however, a shore power connection supplying the type of electricity generally used aboard modern vessels would be a safety factor. The Safety Board believes that the Canaveral Port Authority should consider installing an electrical power source for use by vessels berthing at the cruise terminals to power emergency equipment if needed.

Overhauling of Fire.--When the overhauling efforts by local firemen extended beyond the area affected by the fire and smoke, the vessel was damaged considerably. The repair estimate so exceeded the insured value, the underwriters declared the vessel a constructive total loss. A fire that originally was confined to a small area eventually damaged virtually the entire vessel. This leaves serious doubt as to the effectiveness of the firefighting efforts. The method of overhauling by shoreside firemen reflected their lack of knowledge of the vessel's designed fire protection barriers. Apparently, there was no consideration given to protecting the vessel beyond the forward main vertical zone by either the crew, the owners, or the local firemen. Although the principal objective of shipboard firefighting is to extinguish the fire without injury to personnel, it also should be accomplished with the least possible amount of damage to the vessel.

No direction was given to local firemen by the ship's officers as to the amount of water that safely could be introduced into the vessel before a critical list developed. The COTP's decision to suspend the firefighting efforts on March 10 until the list was under control was a necessary action under the circumstances. Although the stability study indicated that the vessel could safely have taken a greater list without capsizing, the projected amount of water, at the rate it was being applied, would have reduced the safety margin unacceptably.

Survival Aspects

The evacuation of the passengers from the SCANDINAVIAN SEA was performed without difficulty. The decision by the master to turn the vessel around and berth starboard side to the pier to place the sideports on the pierside in order to emplace a gangway facilitated the evacuation. The entire operation involving the passenger's safety was effective despite scattered complaints by some passengers who believed that some of the crewmembers, who were responsible for passenger comfort and well being, were not performing properly. Terminal personnel representing both Scandinavian World Cruises and the Canaveral Port Authority responded well to the emergency considering the large numbers of people moving through the area, including passengers and emergency personnel responding to the fire.

It was fortunate that the SCANDINAVIAN SEA was close to Port Canaveral and was able to return to port quickly and disembark the passengers and crew safely. If the vessel had been further offshore, or if the vessel had been unable to return to port, almost 1,000 passengers and crew may have had to abandon the vessel at sea using lifeboats and rafts, and the reduced manning scale permitted for deck officers probably would have severely limited the supervision of the launching of the boats, particularly if the deck officers had been involved with firefighting. Even though the manning scale conformed to the Bahamian Merchant Shipping Act, the three deck officers who would have been looked to for guidance in any emergency, would have found it difficult to properly supervise the operation. Moreover because the passengers are given only written and verbal instructions on abandon ship procedures and do not participate in an actual lifeboat drill during the abbreviated cruise, they would have encountered difficulty moving about an unfamiliar vessel to find their boat stations which would have led to delays in abandoning the vessel.

Crewmembers not directly involved with fighting the fire, and who unnecessarily remained aboard, created some confusion when the firefighters were attempting to approach the fire area. The master, through his subordinates aboard the vessel, should have anticipated the problem and ordered ashore those crewmembers who were not engaged in fighting the fire and operating the vessel as soon as the terminal personnel indicated that they could accommodate them. The Brevard County Medical Service supervisor, who boarded the SCANDINAVIAN SEA immediately after the passengers disembarked, acted judiciously when he recognized a possible threat to their safety and expressed concern to the master about the welfare of the persons remaining aboard.

USCG Control Verification Procedures

Under its control verification program, the USCG reviews a foreign vessel's plans and conducts limited examinations of the vessels, but it relies mostly on certification by the government of the ship's registry to assure compliance with SOLAS requirements. The intent of the program is to insure that foreign passenger vessels carrying U.S. citizens as passengers from U.S. ports are constructed and maintained to the minimum standards

required by the SOLAS 74 convention, to which many nations, including the Commonwealth of the Bahamas are parties. The Passenger Ship Safety Certificate (see appendix G) issued by DNV on behalf of the Bahamian Government does not state specifically that the SCANDINAVIAN SEA complied with the fireproof construction standards of SOLAS 74. Although the USCG examination of the SCANDINAVIAN SEA in Miami in January 1984 included a fire and lifeboat drill, the Board is concerned about the adequacy of the examination as a whole. The examination, although by design not as stringent as those given to U.S. flag passenger vessels, nevertheless should fulfill the intent of the program. The USCG inspector stated that he checked five hoses on the car deck, one of which failed, but did not check any hoses from the accommodation areas. It is not certain whether the car deck hoses were the only hoses of the 147 fire stations aboard the vessel that were checked at each of the USCG verification examinations or whether others were included. With the failures of several hoses in "A" deck forward during the fire, it is doubtful that hoses in the area were among those tested during a recent examination. The Safety Board believes that when fire hoses are examined for adequacy under the control verification program, the USCG inspector should select a number of hoses from areas throughout the vessel, not just from an area that is convenient for the crew.

During the lifeboat drill conducted for the USCG inspectors, the SCANDINAVIAN SEA was berthed starboard side to the pier. The starboard lifeboats were not tested in a fashion similar to the port boats. The configuration of the sideports (starboard side only) dictates that the vessel usually berths starboard side to the pier. This berthing procedure did not permit the starboard boats to be tested in the presence of the USCG inspectors and it could not be determined whether any USCG inspector had ever seen the starboard boats tested. The USCG inspector who conducted the examination in January 1984 stated that, although he did not actually see the starboard boats lowered, he checked the vessel's logbook and that he determined that the ship held a lifeboat drill weekly. If the SCANDINAVIAN SEA had been a U.S. flag passenger ship, each lifeboat would have been subjected to a thorough and comprehensive inspection by the USCG.

As a result of its investigation of the fire aboard the passenger ship ANGELINA LAURO 16/ on March 30, 1979, the Safety Board recommended that the USCG:

> Develop and implement more stringent requirements for conducting fire drills on passenger vessels operating under its control verification program to determine the crew's familiarity with shipboard fire protection features and their firefighting preparedness. (M-80-107)

Status: On October 7, 1981, the USCG Marine Safety Manual (Section 32-2-30) was changed to add emphasis to advance planning for coordination of resources in the event of a fire aboard a moored vessel. The revised second paragraph of the section reads:

> As appropriate, emergency drills aboard foreign passenger vessels should be conducted as a prerequisite to the issuance of Form CG-4504, 'Control Verification for Foreign Vessel' and at quarterly reexaminations.

16/ For more detailed information read "Marine Accident Report—Fire Onboard the Italian Passenger Ship ANGELINA LAURO, Charlotte Amalie Harbor, St. Thomas, U.S. Virgin Islands, March 30, 1979" (NTSB-MAR-80-16).
Italian Passenger Ship ANGELINA LAURO, Charlotte Amalie Harbor, St. Thomas, U.S. Virgin Islands, March 30, 1979" (NTSB-MAR-80-16).

> At each fire drill, the Coast Guard inspector shall insure that the vessel crew has included in its contingency planning necessary procedures to conduct a firefighting operation while moored. Emphasis should be placed on simulated hookups to shoreside water pressure through the international shore connection and a plan to provide necessary interpreters to facilitate English language communication and coordination with shoreside firefighting personnel and resources.

Although the meeting in April 1982 between SCANDINAVIAN SEA personnel and representatives of the local fire department, the USCG, and the port authority was to provide for the coordination of the available firefighting personnel and resources (in addition to other types of emergencies) with ship's organization and procedures, only a limited number of the items agreed upon were actually implemented. The instructions in the Marine Safety Manual direct the USCG inspectors, during control verification examinations, to insure that the vessel's contingency plan for shipboard firefighting while moored include such coordination. The Safety Board urges the USCG to emphasize to its inspectors who conduct control verification examinations aboard foreign passenger vessels the importance of this section of the Marine Safety Manual.

The Safety Board is concerned that foreign vessels, like the SCANDINAVIAN SEA, which operate regularly out of U.S. ports and carry thousands of U.S. citizens as passengers each year, are not examined as thoroughly as U.S. passenger vessels are in the course of examinations between their periodic inspections. U.S. citizens aboard these foreign vessels should be afforded the maximum protection under existing U.S. and international regulations. The USCG control verification examinations may not provide adequate assurance that the lifesaving and fire protection safeguards of foreign passenger vessels which embark U.S. citizens at U.S. ports are in compliance with the SOLAS 74 convention which became effective internationally on May 25, 1980. Based on the test reports of the samples of material used in construction, the overhead paneling did not comply with the international requirements, which indicates that the USCG, using present procedures, cannot be certain that foreign passenger vessels built before the SOLAS 74 treaty do in fact meet the 1974 requirements.

Contingency Planning

The increased passenger ship traffic calling at Port Canaveral and the addition of new cruise ship berths and associated terminal facilities, together with the lessons learned from the SCANDINAVIAN SEA fire, necessitates that the Canaveral Port Authority formulate a contingency plan for the port. The Port Director agreed that there is a need for written contingency plans.

The COTP from Jacksonville, Florida, when responding to questions about the USCG's role in contingency planning for Port Canaveral, stated "contingency planning and immediate responsibility would not be considered." The Safety Board questions whether the USCG representative's assertion that he would not consider contingency planning for Port Canaveral is a correct reflection of USCG policy. The USCG Safety Manual, Part 86-6, Paragraph 5 states in part:

> District commanders, captains of the port and commanding officers of other units as directed by the district commander, are required to insure that ports within their jurisdiction have current and effective contingency plans, supported by the port community, to provide adequate response by the available Federal, state, municipal and commercial resources to fires and other accidents.

and enclosure (1) to COMDTNOTE 16000 dated 21 November 1983 Firefighting, USCG Policy states in part:

> Under this policy, Coast Guard Captains of the Port wo with port authorities and local governments within their areas of jurisdiction to maintain current and effective contingency plans, to ensure coordination of port community resources that will respond to fires and other incidents. Coast Guard units conduct regular unit drills adapted to the needs of local contingency plans and mutual agreements. Normally, the Coast Guard will not assume control of the overall firefighting efforts when appropriate local authorities are present.

No reference is made to geographical distances or locations with regard to the USCG's participation in local contingency plans. The Safety Board, therefore, urges the Canaveral Port Authority and the USCG to develop a contingency plan for Port Canaveral with special consideration given to emergencies aboard passenger ships and the effects of any future expansion of the port's cruise facilities. The Safety Board has learned that, based upon the SCANDINAVIAN SEA accident, the Canaveral Port Commissioners have formed a committee to look into the preparation of a contingency plan for Port Canaveral.

The Cape Canaveral Volunteer Fire Department which was under contract to the Canaveral Port Authority to provide fire protection to the port area, including the Cruise Terminal, responded to the fire aboard the SCANDINAVIAN SEA in a similar manner to any house or building fire, using techniques that are well established for fighting such fires. Shipboard firefighting, however, requires different techniques such as limiting the use of water because it can adversely affect the stability of a vessel and the possible use of foreign designed fire protection systems. Design features that prevent the spread of fire with built in fire protection and firefighting systems that may be peculiar to vessels present a difficult challenge to the shoreside fireman. If the fire department is to have responsibility for waterfront fires and assisting in fighting shipboard fires, it should train several of its personnel in shipboard firefighting techniques so that the port could be able to cope with such disasters. This type of training and the enhancement of the local fire department's capabilities should be incorporated in port contingency planning. Port contingency plans also should provide for shipboard firefighting training for selected personnel among the local fire department's supervisory personnel so that catastrophies, such as the SCANDINAVIAN SEA fire, can be handled with the correct response and can be coordinated properly.

Retention of plans of the SCANDINAVIAN SEA by the officer-in-charge of the local USCG Station for information purposes in the event of an emergency involving the vessel was commendable and would have been highly useful had they been used to any extent when the vessel first arrived. Those passenger vessels regularly calling at Port Canaveral should provide the Canaveral Port Authority with plans of the vessel for use by local authorities in any emergency when assistance from ashore is needed. In addition, regular meetings between the ships personnel and local authorities, including the fire departments, port authority officials, USCG, and emergency medical officials, should be conducted so that each participant is fully aware of what services each can offer when needed.

CONCLUSIONS

Findings

1. The fire was discovered in room 414 about 1920 by a crewmember before any heat detection devices were activated.

2. The first alarm on the ship's fire detection system probably was activated manually.

3. Although the source of ignition was not determined, the origin of the fire was the carpet in room 414 to which an accelerant had been applied.

4. The source of the heat discovered in the "A" deck passageway by the ship's firefighting group probably was the fire in room 414 and not a fire in an overhead space as the crew believed.

5. The successful debarkation of 744 passengers without any injuries or fatalities was largely due to the master's decision to return to port immediately after the fire was discovered.

6. There was an unnecessary delay in ordering the excess crewmembers off the vessel after the passengers disembarked.

7. In the early hours of the fire after the vessel had berthed at the cruise terminal, there was confusion aboard the vessel as to who was in charge of firefighting.

8. The shoreside firefighters were not adequately trained in shipboard or marine firefighting techniques and by ventilating the fire affected spaces, contributed to the flareup of the fire.

9. The lack of common radio communication frequencies hampered the ability of the various firefighting groups to coordinate the firefighting efforts.

10. The Coast Guard Captain of the Port acted responsibly in assuming control of the firefighting on the SCANDINAVIAN SEA when it became obvious to him that there was no one person directing the operation.

11. Under the reduced manning scales, there was an insufficient number of deck officers aboard the SCANDINAVIAN SEA to properly supervise an offshore evacuation into lifeboats of over 1,000 persons had it been necessary.

12. After the crew initially put out the flames in room 414, they failed to followup and investigate possible heat sources to prevent a reflash.

13. Hose ports fitted in fire doors, including doors in the vertical fire zone boundary, would have enhanced the ability to seal off the area.

14. The failure of the ship's firefighting groups to equip themselves with available protective clothing hampered their ability to properly fight the fire.

15. The master failed to exercise his responsibility and authority to direct firefighting efforts aboard his vessel when it became evident that the shore based firemen were not trained in shipboard firefighting techniques and in fact were hazarding the vessel.

16. The Coast Guard's Control Verification examination in January 1984 was not adequate to fulfill the intent of the verification program.

17. The lack of coordination and the absence of a port contingency plan caused an unnecessary delay in the firefighting operation after the vessel arrived at the cruise terminal.

18. The cognizant Coast Guard Captain of the Port, based in Jacksonville, Florida, is too distant from the Port Canaveral area to provide rapid response to waterfront emergencies arising there.

19. The design and fireproof construction of the SCANDINAVIAN SEA prevented the spread of the fire throughout the vessel and successfully contained the fire in the forward main vertical fire zone.

20. An installed sprinkler system would have extinguished the fire in its early stages.

21. The spread of the fire within the forward main vertical zone was due in part to the fuel load of the furnishings which were not required to be fire retardant. The fire spread could have been limited to a few rooms if the furnishings had met the fire standards of SOLAS 74.

22. The warping of some of the structural steel members was evidence that extremely high heat was generated during the fire.

23. Neither the convention applicable to the SCANDINAVIAN SEA nor the stricter SOLAS 74 convention include any criteria to limit the quantity of smoke generated by the fire retardant paneling used in the bulkheads within the forward main vertical fire zone. Standards comparable to those imposed by the United States would have reduced the amount of smoke damage to the vessel.

24. Ventilation of a fire is not an appropriate firefighting technique in ship fires due to the predominant use of non-combustible construction materials and the ability to cut off the air supply to the fire.

25. The fire retardant bulkheads that were designed to prevent the spread of fire in the vessel were damaged as a result of the overhauling activities during the fire.

26. The lack of standardized testing procedures for materials to be used in passenger vessels constructed under the SOLAS convention makes it difficult to assure that a ship is in compliance with the international requirements.

27. The Coast Guard's control verification program is inadequate to assure that foreign passenger vessels built before the SOLAS 74 convention meet the applicable requirements for fireproof construction.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the fire aboard the SCANDINAVIAN SEA was the deliberate or accidental ignition of an accelerant on the carpet in room 414. Contributing to the fire damage was the failure of ship's firefighters to follow up and investigate any possible further heat source after extinguishing the flames in room 414. Contributing to the uncontrolled propagation of the fire was the failure of the master to exercise his authority over the firefighting efforts of shoreside firefighters.

RECOMMENDATIONS

As a result of this accident investigation, the National Transportation Safety Board made the following recommendations:

--to the U.S. Coast Guard:

Direct the Captain of the Port, Jacksonville, Florida, to participate in establishing a port contingency plan for Port Canaveral with the Canaveral Port Authority and local jurisdictions in the port community. (Class II, Priority Action) (M-85-29)

Through its various means of communications, i.e. Coast Guard publications and local notices to mariners, periodically provide the maritime industry with a clear statement of the Coast Guard's policy and capabilities concerning firefighting in United States ports and waterways. (Class II, Priority Action) (M-85-30)

Under the Control Verification Program for foreign passenger ships calling at United States ports and embarking U.S. citizens as passengers, conduct more comprehensive examinations of the fire and emergency equipment and safety procedures aboard vessels. (Class II, Priority Action) (M-85-31)

Propose to the International Maritime Organization (IMO), modification of the fire standards of SOLAS 74 to include criteria (1) to limit smoke generation as well as flame spread of bulkhead paneling for passenger vessels (2) to reduce the fuel loading in passenger and crew accommodations, and (3) to standardize the testing of combustible materials used in construction. (Class II, Priority Action) (M-85-32)

Amend U.S. regulations and seek international agreement to require passenger ships to be provided with hose ports in all fire doors so that they may be fully closed when fire hoses have to be led through fire doors. (Class II, Priority Action) (M-85-33)

Expedite U.S. rulemaking and seek international agreement to require all passenger vessels to have a sprinkler system installed in accommodation areas regardless of the type of fireproof construction used. Class II, Priority Action) (M-85-34)

Evaluate the need for an increased level of Captain of the Port representation in Port Canaveral, Florida. (Class II, Priority Action) (M-85-35)

--Canaveral Port Authority:

In cooperation with the U.S. Coast Guard, the local port community, and the operators of passenger vessels regularly calling at Port Canaveral, develop a port contingency plan and schedule periodic drills. (Class II, Priority Action) (M-85-36)

Require that passenger vessels regularly calling at Port Canaveral submit copies of ship's plans showing interior arrangements, the location of emergency equipment, emergency procedures, fuel oil tanks, and a list of emergency services which may be required to the port authority for immediate reference in the event of an emergency. (Class II, Priority Action) (M-85-37)

Provide a source of temporary electrical power at each berth in your cruise terminal suitable for operating onboard or responding emergency equipment. (Class II, Priority Action) (M-85-38)

--Scandinavian World Cruises:

Furnish the local authorities in the various United States ports where your vessels regularly call, copies of ship's plans showing interior arrangements, the location of emergency equipment and emergency procedures, fuel oil tanks, and a list of emergency service requirements in the event of an emergency affecting the vessels. (Class II, Priority Action) (M-85-39)

Cooperate in the development of port contingency plans by local authorities at United States ports where company vessels call regularly. (Class II, Priority Action) (M-85-40)

Provide the vessels in your fleet with extra air-pacs utilizing bottles for use during drills and demonstrations in addition to those carried as spares. (Class II, Priority Action) (M-85-41)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ G. H. PATRICK BURSLEY
Member

March 26, 1985

APPENDIXES

APPENDIX A

EXCERPTS FROM MARINE SAFETY MANUAL (CG)

PART 86-6—FIREFIGHTING

86-6-1. BACKGROUND AND AUTHORITY

The Coast Guard has traditionally maintained a position of providing firefighting equipment and training programs to protect its own vessels and property. In the majority of instances this is entirely adequate; however, captains of the port are frequently called upon to provide assistance at major fires on vessels or at port facilities. Due to our position of secondary response, the firefighting operations in which we are involved are usually large and involve volatile petroleum products or hazardous materials.

The purpose of this part is to set forth the Commandant's policy concerning Coast Guard assistance in fighting fires on or along the navigable waters of the United States or in areas near Coast Guard property.

86-6-1A. RESPONSE TO FIRES ON OR ALONG NAVIGABLE WATERS

The general provisions of the Ports and Waterways Safety Act of 1972 (33 U.S.C. 1221 *et seq.*) gives the Coast Guard, among other authorities, the authority to prevent damage to, or the destruction or loss of any vessel, bridge, or other structure, on or in the navigable waters of the United States. This includes land structures and shore areas immediately adjacent to those waters. This statute, together with the already-codified functions and powers of the Coast Guard to render aid and save property (14 U.S.C. 88(b)), provides authority for such assistance against fires as the Coast Guard may afford with its available resources. Within this category, the Coast Guard may be involved in rendering assistance in either of the following areas:

(1) Those port, harbor or waterfront areas under the jurisdiction of a municipality or community and having regularly constituted, equipped and disciplined Federal, state, municipal or local firefighting forces. These areas include local fire protection districts under the jurisdiction of organized volunteer or call firefighting forces. Within such areas, Federal, state, municipal or local firefighting forces, whether composed of full-time personnel, volunteer, or call firefighters, retain both supervisory and operational firefighting responsibility.

(2) Other areas outside the jurisdiction of a municipality or community along the navigable waters of the United States upon which vessel or facility fires may occur. In these areas the Coast Guard may be the only agency with equipment and personnel positioned to provide a practicable waterborne firefighting capability.

86-6-1B. RESPONSE TO FIRES NEAR COAST GUARD PROPERTY

Under the provisions of 42 U.S.C. 1856–1856d, each agency charged with the duty of providing fire protection for any property of the United States may enter into a reciprocal agreement with state and local firefighting organizations to provide for mutual aid. These reciprocal agreements may provide for the reimbursement of either party to the agreement for all or part of the costs incurred in furnishing fire protection. (This act also provides that emergency assistance in extinguishing fires and preserving life and property may be rendered even in the absence of a reciprocal agreement when it is determined by the agency head concerned to be in the best interests of the United States.) In this category, therefore, the Coast Guard may be involved in rendering assistance where reciprocal firefighting agreements are in effect with firefighting organizations maintaining facilities in the vicinity of Coast Guard property. These agreements call for mutual aid in furnishing fire protection. It is noted that these agreements are executed for the mutual benefit of the Coast Guard and a second party, and are not dependent on geographical location or marine involvement.

86–6–5. CONTINGENCY PLANNING

Annex F to the Coast Guard *Natural Disaster Preparedness Plan,* CG-368–2, points out the need for coordinated plans of action prior to actual emergencies. Annex F also places several requirements on district commanders and captains of the port relative to firefighting, support response agreements and hazard assessments in and along the navigable waters of the United States. District commanders, captains of the port and commanding officers of other units as directed by the district commander, are required to insure that ports within their jurisdiction have current and effective contingency plans, supported by the port community, to provide adequate response by the available Federal, state, municipal and commercial resources to fires and other accidents.

86–6–10. MUTUAL AGREEMENTS

Preplanning is equally important for the protection of Coast Guard facilities. District commanders, commanding officers of headquarters units and commanding officers designated as captains of the port should determine whether, with respect to units under their jurisdiction, the negotiation of a mutual fire protection agreement would be in the best interests of the Coast Guard for the benefit of Coast Guard property. (The *Civil Engineering Manual* (CG-251) and the *Safety Manual* (CG-405) should be referred to for additional information concerning fire protection for Coast Guard units.) If, as the result of any such evaluation, it is determined that a formal mutual agreement is desirable, a written understanding covering the obligations and the extent of authorized action of each of the parties may be negotiated with local firefighting officials.

Each agreement shall include a waiver by each party of all claims against every other party for compensation for any loss, damage, personnel injury, or death occurring in consequence of the performance of such agreement. The agreement shall also set forth that Coast Guard equipment is maintained primarily for the purpose of supporting Coast Guard operations; that if the equipment and personnel are available, the Coast Guard will, when properly notified of an actual or potential emergency, respond and render such assistance as is possible; and that in furnishing such service, the Coast Guard assumes no responsibility for failure to respond or for failure of equipment or personnel in any particular instance. Generally, the Coast Guard receives, or will receive, use of facilities and materials of the same or equivalent value from the other participants in the agreement. Plate 86–6–10.1 may be utilized as an example for such agreements. Any agreement may provide for the reimbursement of any party for all or part of the cost of materials used (e.g., foam) by a party in furnishing fire protection for or on behalf of any other party. In such circumstances, agreements must be prepared individually.

It is contemplated that mutual fire protection agreements will generally be negotiated only with governmental entities, public corporations, or associations maintaining fire protection facilities. However, in appropriate circumstances, and where there is sufficient justification, such agreements may be negotiated with private corporations or associations maintaining fire protection facilities. Any local agreement will not relieve a unit of its responsibilities to maintain assigned equipment, self-sufficiency for unit fire protection, and appropriate proficiency in firefighting techniques.

District commanders and commanding officers of headquarters units are expressly authorized to negotiate mutual fire protection agreements with local municipalities without prior approval of the Commandant. Copies of all such agreements shall be forwarded to the Commandant (G-WLE) for postaudit.

86–6–15. FIREFIGHTING ASSISTANCE RESPONSE

Coast Guard forces should proceed to the scene of a fire in accordance with effective contingency plans or mutual agreements. As discussed in 86–6–1B, 42 U.S.C. 1856b provides authorization for emergency

response in the absence of a mutual agreement. In determining the necessary Coast Guard response, consideration should be given to the fire's reported magnitude and potential, the presence of other firefighting forces, and the adequacy of firefighting forces on scene.

86-6-15A. GUIDELINES

While it is clear that the Coast Guard has an interest in fighting fires involving vessels or waterfront facilities in or along the navigable waters of the United States or fires in the vicinity of Coast Guard property, this interest does not extend to preemption of local responsibility and authority for firefighting. The involvement of Coast Guard forces in actual firefighting shall only be to a degree commensurate with our personnel and equipment levels. The Coast Guard intends to maintain its historic "assistance as available" posture without conveying the impression that we stand ready to relieve local jurisdictions of their responsibilities.

All Coast Guard forces and equipment shall be under the overall command of the designated Coast Guard on-scene coordinator (OSC). District commanders, commanding officers of headquarters units or captains of the port shall assign an OSC for each incident in which Coast Guard firefighting forces or equipment are being utilized. This assignment will be made regardless of the actual overall supervisory authority at the scene of the emergency.

86-6-15B. NON-COAST GUARD SUPERVISED FIREFIGHTING ACTIVITES

In those areas in which responsibility for the supervision of firefighting activity is vested in a local public safety official or officer of a firefighting organization, orders for the coordination of Coast Guard firefighting activities at the scene shall be passed through the Coast Guard on- scene coordinator (OSC) by the official in charge of the firefighting operations. Coast Guard personnel shall not assume control of the overall firefighting efforts whenever appropriate local authorities are present. Appropriate local authorities are those public officials who are charged with public safety in the field of firefighting. The OSC shall have the responsibility for evaluating the orders and executing those which will not create any unwarranted risk to Coast Guard personnel or equipment.

86-6-15C. COAST GUARD SUPERVISED FIREFIGHTING ACTIVITIES

In those areas in which the supervision of firefighting activities falls to the Coast Guard, the Coast Guard on- scene coordinator's (OSC) orders for the coordination of firefighting forces, supplied by other agencies or organizations, shall be passed through the senior public safety official, firefighting organization officer or firefighter of each organization. The Coast Guard OSC shall have overall responsibility for the most effective utilization of all personnel and equipment in fighting marine and waterfront fires within this category.

86-6-20. TRAINING

As with other operational responses, a degree of training will be required to attain a satisfactory level of effectiveness. Regular unit drills can be adapted to the needs of the contingency plan and mutual agreement for this purpose. The contingency plan and mutual agreement should be periodically exercised to test its practicality and to improve its procedures. Provisions for cross-training in special equipment, techniques, or operating procedures will be especially helpful in increasing the competency and confidence of the participants. For more specific guidelines concerning unit training refer to Chapter 11. For contingency planning information refer to subpart 86-6-5.

86-6-25. HEADQUARTERS SUPPORT

The Commandant does not intend to acquire a greatly expanded firefighting capability, but will continue efforts to provide effective firefighting and personal protection equipment primarily for the protection of Coast Guard property and personnel.

Specialized equipment will be made available in sufficient quantities to adequately protect Coast Guard property, especially the property located in high-hazard industrial complex areas. This requirement may necessitate stockpiling firefighting chemicals and equipment in some districts. The Chief, Office of Engineering (G-E), will consult with the Chief, Office of Operations (G-O), and the Chief, Office of Marine Environment and Systems (G-W), to insure that retrofit and new construction programs receive adequate attention relative to external firefighting capabilities. The Chief, Office of Merchant Marine Safety (G-M), and the Chief, Office of Research and Development (G-D), will insure that design and equipment information, in keeping with the current state of the art, is available for use by operational program directors for the most effective use of Coast Guard capabilities.

86-6-30. INTERNATIONAL SHORE CONNECTION

The International Convention for the Safety of Life at Sea (SOLAS) 1960, requires that an International Shore Connection (Ship) be carried aboard all passenger and cargo vessels of 1000 gross tons or greater when on an international voyage. The universal coupling as illustrated and described in 46 CFR 162.034, is designed to connect fire main systems of one vessel to another or between a shore facility and a vessel. The connection shall be constructed of material suitable for 150 pounds per square inch service, and shall have a flat face (flange) on one side and a permanently attached coupling that will fit the ship's hydrants and hose on the other. The flange can be gasketed and bolted quickly enabling an assisting vessel or waterfront facility to provide emergency fire main pressure to a distressed vessel. The United States is a signatory to the 1960 SOLAS agreement which became effective 26 May 1965. The Coast Guard is responsible for its implementation with respect to U.S. merchant vessels and for encouraging local waterfront facilities to procure and have available the International Shore Connection (Shore). Captains of the port should encourage waterfront facility operators, municipal fire departments and other interested organizations to obtain the connection and have it readily available in a conspicuous location.

APPENDIX B

EXCERPTS FROM CONTRACT BETWEEN THE CAPE CANAVERAL VOLUNTEER FIRE DEPARTMENT AND THE CANAVERAL PORT AUTHORITY

FIRE PROTECTION AGREEMENT

THIS AGREEMENT is entered into this 26th day of July, 1983, by and between the CANAVERAL PORT AUTHORITY, a body politic and a body corporate under the laws of the State of Florida, hereinafter called "PORT", and the CITY OF CAPE CANAVERAL, FLORIDA, a municipal corporation under the laws of the State of Florida, hereinafter called "CITY", and CAPE CANAVERAL VOLUNTEER FIRE DEPARTMENT, a nonprofit corporation, hereinafter referred to as "FIRE DEPARTMENT".

WHEREAS, the parties originally entered into a Fire Protection agreement on November 18, 1970, and

WHEREAS, it is to the mutual benefit of all parties to continue with a cooperative agreement to provide fire protection for both the Port and the City, and

WHEREAS, it is necessary to make certain modifications in the original agreement, it is

MUTUALLY COVENANTED AND AGREED AS FOLLOWS:

1. The term of this agreement shall be for a period of three (3) years commencing October 1, 1983 through the period ending September 30, 1986.

2. The City and the Fire Department shall conduct fire protection activities in Port Canaveral in the same manner as the City provides fire protection within its corporate limits. The City and the Fire Department will periodically inspect the fire hydrants located in Port Canaveral.

3. The Port agrees to pay the Fire Department for the fire protection services provided herein a sum equal to one-third (1/3) of the Fire Department's operating budget excluding the following items:

(a) Fire hydrant rentals for the City;
(b) Fire hydrant installation costs;
(c) Fireworks

4. The Fire Department's proposed budget for the year commencing October 1, 1983 and ending September 30, 1984, is $100,000.00, a copy of which is attached as Exhibit "A". The Port will not be

liable for payment as provided herein until the Fire Department obtains final budget approval from the City.

5. The Port's cost for fire protection service will be determined each year in accordance with the formula set forth in paragraph 3 above. The individual designated by the City as Fire Chief will present a proposed budget for the Fire Department to the Port and the City on or before June 15 each year for budget purposes.

6. The Port will pay the cost of fire protection pursuant to this agreement in the following manner:

(a) Quarterly installments commencing October 1 of each fiscal year.

7. It is not anticipated by the Fire Department that any major capital expenditures will be required during the term of this agreement. Capital expenditures are defined as rolling stock (major firefighting equipment). In the event that a capital expenditure becomes necessary in order to maintain adequate firefighting equipment to serve the Port and the City, it is anticipated that the parties will negotiate a separate contract for the acquisition of such equipment.

8. The City may designate a member of the Fire Dpartment who is qualified to conduct fire inspections. Fire inspections of all facilities in Port Canaveral (both those owned by the Port and those leased to tenants) will be inspected annually in accordance with applicable Florida Statutes; the Standard Fire Prevention Code, 1982 Edition as supplemented; the Standing Building Code, 1982; and the National Fire Protection Associates' Code, No. 101, 1981, Second Edition as supplemented.

9. The City and the Fire Department shall not have the responsibility to provide fire protection on the water or to the ships in the Port basin if docked from the water side or to board any ship, but will cooperate with the Coast Guard and other parties to such extent as may be practical and feasible in firefighting activities.

10. The City and the Fire Department shall be deemed an independent contractor and shall keep and maintain adequate public liability insurance as to their activities and operations.

11. The City agrees to maintain firefighting equipment equivalent to the present basic equipment which consists of: one 1,000 gpm pumper truck; two 750 gpm pumper trucks; and one brush truck during the term of this agreement. However, should any of these items become disabled, the City will effectuate repairs as soon as practicable but will not be required to obtain a replacement piece during the down period.

12. It is specifically understood and agreed that the City shall have no responsibility or obligation as to fire control or protection on the north side of Port Canaveral under control of the U.S. Government or its agencies.

13. In order to enhance the capability of the Fire Department in both the Port and the City to respond to fire calls during working hours, the Port agrees to encourage Port employees to join the Fire Department and will excuse employees engaged in answering fire calls during working hours with pay.

14. This agreement may be renewed by the mutual consent of the parties for an additional three (3) year period.

15. Each party to this agreement has the right to terminate by giving to the other parties (1) year's advance written notice.

IN WITNESS WHEREOF, the undersigned Port, by and through its duly authorized officers, has executed this Agreement this 13th day of July, 1983.

ATTEST:

CANAVERAL PORT AUTHORITY, a body politic and a body corporate

Secretary

By: Chairman

(Corporate Seal)

APPENDIX C

PERSONNEL INFORMATION

Master

Captain Leo S. Kjeldsen, 43, the relief master of the SCANDINAVIAN SEA attended a maritime training school in Denmark before going to sea as a seaman for about four years. Following service in the Danish Navy for two years, he again sailed as able seaman for about six months before entering navigation school. In 1965, he joined the DFDS company and in 1969, he started sailing on passenger ships. In 1978 he was named relief master of passenger vessels for DFDS and has continually served in that capacity until the present. He first joined the SCANDINAVIAN SEA as relief master in August 1983. He holds a Danish Certificate of Competency as master, first class, issued April 13, 1983, and a License of Qualification for master, first class, issued by the Commonwealth of the Bahamas on September 5, 1983.

Chief Officer

Mr. Anders C. Pedersen, 30, the chief officer started sailing as an apprentice for the Maersk Line in 1977. After 2 1/2 years he went to a Danish maritime school and after passing the mate's examination in June 1977, started sailing as a deck officer on general cargo ships. He also served as first officer and teacher aboard the DANMARK, a Danish sail training vessel, before starting service on passenger vessels in 1982. He had served on other passenger vessels, as chief officer before joining the SCANDINAVIAN SEA. Mr. Pedersen holds a Danish Certificate of Competency as mate, first class issued June 21, 1978. He also holds a License of Qualification for mate, first class, issued by the Commonwealth of the Bahamas.

First Officer

Mr. Lars Kragelund, 25, the first officer, started his maritime training in Denmark in 1976. After 5 months, he went to sea on vessels of the DFDS fleet for 21 months as an apprentice before entering navigation school. After passing the mate's examination in 1982, he started sailing on passenger vessels, joining the SCANDINAVIAN SEA in 1983. He held a Danish Certificate of Competency as mate, first class, and a License of Qualification as mate, first class, issued by the Commonwealth of the Bahamas.

Radio Officer

Mr. Bruce M. McArthur, 36, the radio officer, started his sailing career in 1966 after attending college in England. He has continuously served as a radio officer for 18 years except for periods in 1970, 1975, and 1979, when he was ashore for additional training in radar maintenance and other marine electronics. As a citizen of Great Britain, he was licensed as a marine radio officer by the British Government. He had served aboard the vessel for approximately 12 years, including 10 years before it entered the cruise trade as the SCANDINAVIAN SEA.

Chief Engineer

Mr. Mogens R. Enevoldsen, 55, had served aboard the SCANDINAVIAN SEA for 9 months as chief engineer. His previous experience included 18 years as chief engineer aboard passenger vessels and 10 years aboard cargo vessels as third, second, and first

engineer. He possessed a Certificate of Competency issued by the Danish Government in 1960 and valid for service on both steam and motor vessels as ch engineer, and a comparable Bahamian license.

First Engineer

Mr. Erling Sorensen, 36, had served aboard the SCANDINAVIAN SEA since December 1982. He joined DFDS as junior engineer in 1974 and after serving as third and second engineer on various passenger vessels, was promoted to first engineer in 1977. He attended engineering school in Denmark for 2 1/2 years and after passing an examination, was issued a Certificate of Competency as engineer by the Danish Government. In addition to his Danish certificate, he also had a Bahamian License of Qualification as first class engineer of motor vessels issued in June 1978.

Chief Electrician

Mr. Hans. J. Rytter, 45, started his seagoing career in the Danish Navy in 1959. After 1 1/2 years service, he went to sea on a Norwegian merchant vessel for 6 years as an electrician. He then worked ashore until 1975 when he went back to sea, serving on tankers, general cargo and container vessels. He joined the SCANDINAVIAN SEA about 1982, serving as electrician up to the present. He had a Danish certificate as a ship's electrician.

Plumber

Mr. Froilan Burgos, Jr., 27, the ship's plumber who first discovered the fire in Room 414, is a citizen of the Republic of the Philippines. He had been employed aboard the SCANDINAVIAN SEA for 26 months. He held a license as fourth marine engineer issued in 1979 by the Professional Regulation Commission of the Philippine Government. He had served on tankers, cargo ships, and tugboats as motorman, oiler, and apprentice engineer before joining the SCANDINAVIAN SEA.

Chief Steward

Mr. Dermott K. Satchell, 37, had served as chief steward for two weeks before the fire. He had joined the vessel in January 1984, as a supervisor in the hotel staff. He started going to sea in July 1982, aboard another DFDS vessel as a room steward. He was promoted to supervisor of room stewards when he joined the SCANDINAVIAN SEA. A citizen of Jamaica, he held no seaman's documents from either his own country or the Commonwealth of the Bahamas. He claimed to have a lifeboat certificate issued by the U.S Government but did not produce one.

Occupants of Room 414

Mr. Camille Jean, 38, was employed as an assistant pantryman by the food and beverage contractor aboard the SCANDINAVIAN SEA. He had been working aboard the vessel since December 1983. He was a Haitian citizen but did not have either seaman's documents nor identification. He stated that they had been destroyed in the fire. He first started going to sea about 1972, or 1973, serving on several cruise ships sailing out of Miami.

Mr. Charles A. Bloodman, 33, a citizen of Antigua, was employed as a pastryman aboard the vessel, also by the food and beverage contractor. He had been working for about 3 days on the SCANDINAVIAN SEA when the fire occurred. He had been sailing for about 3 to 4 years. He was last employed as an assistant steward on another passenger vessel. He had also sailed as an able seaman on a cargo vessel.

APPENDIX D

EXCERPTS FROM BAHAMIAN SHIPPING ACT

No. 16 of 1976

An Act to make provision for the registration of ships; for the control, regulation and orderly development of merchant shipping; to make provision for the proper qualification of persons employed in the sea service; to regulate the terms and conditions of service of persons so employed; and for matters connected with and incidental to the foregoing.

(Assented to: 29 November 1976)

BE it enacted by The Queen's Most Excellent Majesty, by and with the advice and consent of the Senate and the House of Assembly of the Commonwealth of The Bahamas, and by the authority of the same, as follows:—

PART I

Preliminary

Short title and commencement.

1. This Act may be cited as the Merchant Shipping Act, 1976, and shall come into operation on such date as the Minister may appoint by notice in the Gazette, and the Minister may so appoint different dates for different Parts or sections of this Act.

Interpretation.

2. In this Act, unless the context otherwise requires —

"allotment note" means a note mentioned in section 95;

"apprentice" means an apprentice to the sea service;

"approved" means approved by the Director;

"Bahamian ship" means a ship for the time being registered as a Bahamian ship under section 4;

"Bahamian waters" means all areas of water subject to the jurisdiction of The Bahamas, and includes territorial waters, internal waters and archipelagic waters;

PART III

MASTER AND SEAMEN

Certificates of Competency

Ship to be provided with certificated officers.

66.—(1) Every Bahamian foreign-going ship, every Bahamian home-trade ship carrying passengers and every Bahamian home-trade ship of not less than 500 tons register tonnage when going to sea from a place in The Bahamas, and every foreign ship carrying passengers to or from a place in The Bahamas which is not provided with certificated officers in accordance with the national laws of the country of registry, shall be provided with officers duly certificated under this Act according to the following scale —

(a) in every case, a duly certificated master,

(b) if the ship is over 100 tons but not over 500 tons register tonnage, at least one officer besides the master holding a certificate not lower than —

(i) mate in the case of a home-trade ship;

(ii) second mate in the case of a foreign going ship;

(c) if the ship is over 500 tons but not over 1600 tons register tonnage and is engaged on voyages where the distance between the ports visited —

(i) does not exceed 500 nautical miles, at least one officer besides the master holding a certificate not lower than second mate;

(ii) exceeds 500 nautical miles, at least two officers besides the master, one holding a certificate not lower than second mate and the other a certificate not lower than third mate;

(d) if the ship is over 1600 tons register tonnage and is engaged on voyages where the distance between the ports visited — .

(i) does not exceed 500 nautical miles, at least two officers besides the master, one holding a certificate not lower than first mate and the other a certificate not lower than second mate;

(ii) exceeds 500 nautical miles, at least three officers, besides the master, namely a first mate, a second mate and a third mate, all of whom shall be duly certificated;

(e) if any seaman officer is carried in addition to those required by paragraphs (b), (c) and (d) of this subsection for the purpose of keeping a watch at sea, he shall hold a certificate not lower than —

(i) mate in case of a home-trade ship;

(ii) third mate in the case of a foreign-going ship;

(f) if the ship is a motor ship of under 500 shaft horse power, at least one engineer holding a certificate not lower than third class engineer;

(g) if the ship is a motor ship of over 500 but not over 2500 shaft horse power and is engaged on voyages where the distance between the ports visited —

(i) does not exceed 500 nautical miles, at least two engineers, one holding a certificate not lower than second class engineer and the other a certificate not lower than third class engineer;

(ii) exceeds 500 miles, at least two engineers, one a first class engineer and the other a first class engineer or a second class engineer, all duly certificated;

(h) if the ship is a motor ship of over 2500 but not over 5000 shaft horse power she shall be provided with at least three engineers, one a first class engineer, one a second class engineer and one a third class engineer, all of whom shall be duly certificated;

(i) if the ship is a motor ship of over 5000 shaft horse power, she shall be provided with at least one third class engineer duly certificated in addition to those engineers required under paragraph (h) of this subsection;

(j) if any engineers are carried in addition to those required by paragraphs (f), (g), (h) and (i) of this subsection for the purpose of keeping a watch in the engine room at sea, they shall hold a certificate not lower than third class engineer.

(2) No person other than a seaman officer or engineer officer holding a certificate or licence under this Act may take charge of a watch on deck or in the engine-room of a Bahamian ship at sea, and no person other than a duly certificated engineer shall be left in charge of the boiler room of a Bahamian ship in port if the boilers are under steam.

(3) Any person who —

(a) having been engaged as one of the above-mentioned officers goes to sea as such an officer without being duly certificated; or

(b) employs a person as one of the above-mentioned officers without ascertaining that the person so employed is duly certificated,

shall be guilty of an offence.

(4) An officer is not duly certificated within the meaning of this section, unless he is the holder for the time being of a valid certificate of competency under this Act, or a licence under section 68, of a grade appropriate to his rank and status in the ship and to the tonnage or shaft horse power or the type of engine of the ship or to the trade in which the ship is engaged or of a higher grade.

(5) Where it appears to the Minister that a ship may be unreasonably delayed because the owner is unable to provide officers in accordance with the foregoing scales, and the Minister is satisfied that —

(a) the owner has exercised due diligence to provide such officers; and

(b) the ship is properly and efficiently manned for the voyage she is about to undertake,

the Minister may on the written application of the owner exempt that ship from any of the provisions of this section.

Grades of certificates of competency

67.—(1) Certificates of competency shall be granted in accordance with this Act in each of the following grades —

(a) Master of a foreign-going ship;

(b) First mate of a foreign-going ship;

(c) Second mate of a foreign-going ship;

(d) Third mate of a foreign-going ship;

(e) Master of a home-trade ship;

(f) Mate of a home-trade ship;

(g) First class engineer;

(h) Second class engineer; and

(i) Third class engineer.

(2) A certificate of competency as master or first mate of a foreign-going ship is superior to a certificate of competency as master of a home-trade ship, and entitles the holder to go to sea in that capacity, but a certificate of competency as master of a home-trade ship does not entitle the holder to go to sea in any capacity in a foreign-going ship.

(3) A certificate of competency as second mate or third mate of a foreign-going ship is superior to a certificate of competency as mate of a home-trade ship and entitles the holder to go to sea in that capacity, but a certificate of competency as mate of a home-trade ship does not entitle the holder to go to sea in any capacity in a foreign-going ship.

Examinations for certificates of competency and foreign certificates

68.—(1) For the purpose of granting certificates of competency the Minister may —

(a) cause examinations to be held at such times and at such places as he may direct;

(b) appoint examiners to conduct the examinations;

(c) make regulations for the conduct of the examinations and the qualifications of candidates and do all such acts and things as he thinks expedient for the purpose of the examinations, and may fix fees therefor;

(d) cause to be delivered to every candidate who is duly reported by the examiners to have passed his examination, and to have given satisfactory evidence of his experience, ability and good character, the appropriate certificate of competency;

(e) prescribe the rights and obligations of holders of certificates of competency and offences for which certificates may be forfeited or suspended.

(2) Where the laws of any other country provide for the examination for, and grant of, certificates to persons intending to act as masters, seamen officers and engineers on board ships, and —

(a) the Minister is satisfied that all examinations are so conducted as to be equally effective as the examinations for the same purpose in The Bahamas under this Act; and

(b) the certificates are granted on such principles as to show the like qualifications and competency as those granted under this Act,

the Minister may in the case of persons holding such certificates, who desire to go as master, seaman officer or engineer in Bahamian ships, direct that —

(i) if the person is a citizen of The Bahamas he shall surrender such certificate and be granted a certificate of equivalent grade under this Act;

(ii) if the person is not a citizen of The Bahamas he shall, on payment of the prescribed fee and subject to such conditions as the Minister may impose, be issued with a licence

authorising him to go to sea in a Bahamian ship in the same rank or station as if his certificate had been granted under this Act.

(3) A licence issued under subsection (2) of this section shall —

(a) during its currency have the same force as a certificate of competency granted under this Act and may be cancelled or suspended for like reason; and

(b) be valid for a period of five years from the date of issue, and may be renewed on payment of the prescribed fee.

(4) The Minister shall by notice in the *Gazette* from time to time declare the names of the countries to which subsection (2) of this section has application.

Offences relating to certificates of competency.

69. Any person who —

(a) makes any false representation for the purpose of obtaining for himself or for any other person any certificate of competency or of service as a deck officer or engineer;

(b) forges or fraudulently alters any such certificate or any official copy thereof;

(c) fraudulently makes use of any such certificate which is forged, altered, cancelled or suspended or to which he is not justly entitled; or

(d) fraudulently lends such a certificate or licence to or allows the same to be used by any other person,

shall be guilty of an offence and liable on summary conviction to a fine of one thousand dollars or to imprisonment for eighteen months.

Record of certificates of competency.

70. A record of certificates of competency and the suspending, cancelling, or altering of such certificates and any other matter affecting them shall be kept in such manner as the Minister may direct.

Loss of certificate.

71. If a master, mate or engineer proves to the satisfaction of a registrar that he has, without fault on his part, lost or been deprived of a certificate of competency already granted to him, that registrar shall, and in any other case may, upon payment of the prescribed fee, certify and deliver to him a copy of the certificate to which, by the record kept in pursuance of this Act, he appears to be entitled, and a copy purporting to be so certified shall have all the effect of the original.

Master to inform registrar of officers on board ship.

72.—(1) Upon the signing of the crew agreement, the master of every Bahamian ship shall forthwith inform the Director in writing

of the name, grade and number of the certificate and licence of each officer (including the master himself) employed on the ship.

(2) Whenever a certificated officer ceases to be employed on the ship, or a new certificated officer becomes employed on the ship, the name, grade and number of the certificate and licence of that officer shall forthwith be despatched in writing to the Director by the master of that ship.

Prohibition of going to sea under-manned

73. Subject to subsection (5) of section 66, if a Bahamian ship goes to sea or attempts to go to sea without carrying such officers as it is required to carry under section 66, both the owner and the master shall be guilty of an offence and liable on summary conviction to a fine of one thousand dollars, and a registrar may suspend the certificate of registry of the ship until she is properly manned.

Production of certificates and documents of qualification

74. Any person serving or engaged to serve in any Bahamian ship and holding any certificate or other document which is evidence that he is qualified for the purposes of section 66, shall on demand produce it to any registrar, inspector or proper officer and (if he is not himself the master) to the master of the ship, and if he fails to do so without reasonable cause he shall be guilty of an offence and liable on summary conviction to a fine of one hundred dollars.

Use of English language

75.—(1) Except where otherwise provided in this Act, all correspondence, documents, forms or other writings shall be in the English language, and in the case of the crew agreement, official log-book and muster lists, in a prescribed form:

Provided that a foreign language version of any document may be appended to the English language version thereof.

(2) All written signs displayed on board Bahamian ships shall be in the English language with, if it is considered necessary by the master, a foreign language version appended thereto.

Crew's knowledge of English

76.—(1) Where in the opinion of a registrar or an inspector the crew of a Bahamian ship consists of or includes persons who may not understand orders given to them in the course of their duty because of their insufficient knowledge of English and the absence of adequate arrangements for transmitting the orders in a language of which they have sufficient knowledge, the registrar or inspector shall inform the master of his opinion and the ship shall not go to sea, and the registrar or inspector may suspend the certificate of registry of the ship until the position is rectified.

(2) If a ship goes to sea or attempts to go to sea in contravention of this section both the owner and the master shall be guilty of an offence and liable on summary conviction to a fine of five hundred dollars.

APPENDIX E

U.S. COAST GUARD CONTROL VERIFICATON

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

File No.
Date 20 January 1984

CONTROL VERIFICATION
for
FOREIGN VESSEL

SCANDINAVIAN SEA
(vessel)

SERVICE *(Use)* Passenger DISTINCTIVE NUMBER OR LETTERS C6DL GROSS TONS 10736.84

OWNERS DFDS Sea Cruises Ltd (Bahamas) AGENT Scandinavian World Cruises

REGISTRY Bahamas ; THIS COUNTRY IS/~~IS NOT~~ A PARTY TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, ~~1960~~ 1974 DATE KEEL LAID 1969

FOR PASSENGER OR CARGO VESSELS OF COUNTRIES WHICH ARE PARTIES TO THE ~~1960~~ 1974 SOLAS CONVENTION

This letter verifies that the above named vessel has been boarded as authorized by Chapter I, Regulation 19 of the International Convention for the Safety of Life at Sea, ~~1960~~ 1974. The vessel has a Passenger Ship Safety CERTIFICATE which was issued by Det Norske Veritas and expires on 21 March 1984

FOR CARGO VESSELS OF COUNTRIES WHICH ARE NOT PARTIES TO THE 1960 SOLAS CONVENTION:

This letter verifies that the Lifesaving Equipment has been examined and is considered adequate for _____ persons. This vessel was issued a _____ CERTIFICATE by _____ on _____. The certificate expires on _____.

This verification is effective until 21 March 1984 at which time the vessel's current certificate expires.

Passengers: 1062
Crew: 175
Total: 1237

R. F. [illegible] Commander, USCG
OFFICER IN CHARGE, MARINE INSPECTION

Port Miami, Florida

Dept. of Transp., USCG, CG-4332 (Rev. 12-67)

REPLACES PREVIOUS EDITION

GPO 915-825

APPENDIX F

BAHAMIAN CERTIFICATE OF REGISTRY

COMMONWEALTH OF THE BAHAMAS

CERTIFICATE OF REGISTRY

PARTICULARS OF SHIP

[illegible]	[illegible]	[illegible]	[illegible]
339313	SCANDINAVIAN SEA	50/1981	434 in 1970 in London as Blenheim

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Foreign	Motor: Twin Screw	Scotland	1970	Upperclyde Shipbuilders Clydebank, Scotland

Number of Decks	Three
Number of Masts	One
Rigged	Not
Stem	Raked with Bulb
Stern	Transom
Build	Carvel
Framework and description of vessel	Steel Passenger
Number of Bulkheads	9 WT

	FEET	TENTHS
Length from fore-part of stem, to the [illegible] / fore side of the rudder stock	468	5.0
Main breadth to outside of plating	65	7.0
Depth in hold from tonnage deck to ceiling amidships	16	5.0
Depth in hold from upper deck to ceiling amidships, in the case of two decks and upwards	25	0.0
Depth from top of upper deck at side amidships to bottom of keel	29	0.0
Round of beam on upper deck	0	3.0
Length of engine-room (if any)	87	4.0

PARTICULARS OF PROPELLING ENGINES, &c. (IF ANY), as supplied by Builders, Owners, or Engine Makers.

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Two	Diesel 4SA	1969	Crossley Premier Engines Ltd Manchester, England	Eighteen	400 mm	-	3214.3 / 18000
Two	One Oil Fired, One Exhaust Gas; Two; 7.21 kg/CM²; 6.74 kg/CM²	1969	Aalborg Verft, P.O. Box 661 Aalborg, Denmark		460 mm		19566 / 22 knots

PARTICULARS OF TONNAGE

The tonnage of this ship in accordance with her Bahamian Tonnage Certificate are:—

GROSS TONNAGE 10736.84 tons (30385.26 cubic metres)

REGISTER TONNAGE 5830.68 tons (16500.82 cubic metres)

This ship is assigned with a tonnage mark on each side of the ship which is 110 inches below the upper deck line and when this mark is submerged the above tonnages are applicable.

When the tonnage mark is NOT submerged the following tonnages are applicable:—

GROSS TONNAGE 9588.52 tons (27135.51 cubic metres)

REGISTER TONNAGE 5177.97 tons (14653.66 cubic metres)

A detailed summary of the tonnage for this ship is shown on The Bahamian Tonnage Certificate.

The number of seamen and apprentices for whom accommodation is certified 175

I, the undersigned, Registrar of Bahamian Ships at the Port of London [illegible]

Name, Residence, and Occupation of the Owner.	Number of Sixty-fourth Shares.
[illegible] (Bahamas) Limited, Sandringham House, 83 Shirley Street, [illegible], Nassau, N.P., [illegible]	Sixty-Four

Dated at London [illegible] FEB 3 1982 [illegible] One thousand nine hundred Eighty-Two

Registrar of Bahamian Ships.

NOTICE — [illegible]

M/V SCANDINAVIAN SEA
EXHIBIT # 2
DATE 3/22/[illegible]
[illegible signature]
[illegible] MARINE BOARD OF INVESTIGATION

COMMONWEALTH OF THE BAHAMAS

CERTIFICATE OF REGISTRY

PARTICULARS OF SHIP

Official Number	Name of Ship	No., Year and Port of Registry	No., Year and Port of previous Registry (if any)
339313	SCANDINAVIAN SEA	50/1981 Nassau	434 in 1970 in London as Blenheim

Whether Bahamian or Foreign Built	Whether a Sailing, Steam or Motor Ship; if Steam or Motor, how propelled	Where Built	When Built	Name and Address of Builders
Foreign	Motor: Twin Screw	Scotland	1970	Upperclyde Shipbuilders Clydebank, Scotland

Number of Decks	Three
Number of Masts	One
Rigged	Not
Stem	Raked with Bulb
Stern	Transom
Build	Carvel
Framework and description of vessel	Steel Passenger
Number of Bulkheads	9 WT

	FEET	TENTHS
Length from fore-part of stem, to the [illegible] / fore side of the rudder stock	468	5.0
Main breadth to outside of plating	65	7.0
Depth in hold from tonnage deck to ceiling amidships	16	5.0
Depth in hold from upper deck to ceiling amidships, in the case of two decks and upwards	25	0.0
Depth from top of upper deck at side amidships to bottom of keel	29	0.0
Round of beam on upper deck	0	3.0
Length of engine-room (if any)	87	4.0

PARTICULARS OF PROPELLING ENGINES, &c. (IF ANY), as supplied by Builders, Owners, or Engine Makers.

No. of sets of Engines	Description of Engines	When made	Name and Address of Makers	[illegible] Engines: No. of cylinders in each set	Diameter of cylinders	[illegible] Engines: No. of cylinders in each set	[illegible]
Two	Diesel 4SA	Engines 1969	Engines: Crossley Premier Engines Ltd Manchester, England	Eighteen	400 mm	-	3214.3 / 18000
No. of Shafts	Description of Boilers			Length of Stroke			
Two	[illegible] One Oil Fired, One Exhaust Gas; Number Two; 7.21 kg/CM²; [illegible] 8.24 kg/CM²	Boilers 1969	Boilers: Aalborg Verft, P.O. Box 661 Aalborg, Denmark	460 mm			19566 / 22 knots

PARTICULARS OF TONNAGE

The tonnages of this ship in accordance with her Bahamian Tonnage Certificate are:–

GROSS TONNAGE 10736.84 tons (30385.26 cubic metres)
REGISTER TONNAGE 5830.68 tons (16500.82 cubic metres)

Delete if not applicable

This ship is assigned with a tonnage mark on each side of the ship which is 110 inches below the upper deck line and when this mark is submerged the above tonnages are applicable.
When the tonnage mark is NOT submerged the following tonnages are applicable:–

GROSS TONNAGE 9588.52 tons (27135.51 cubic metres)
REGISTER TONNAGE 5177.97 tons (14653.66 cubic metres)

A detailed summary of the tonnage for this ship is shown on The Bahamian Tonnage Certificate.

The number of seamen and apprentices for whom accommodation is certified 175

I, the undersigned, Registrar of Bahamian Ships at the Port of London, hereby certify that the Ship, the Description of which is prefixed to this my Certificate, has been duly surveyed, and that the above Description is in accordance with the Register Book; that Knud Nielsen whose Certificate of Competency or Service is No. 100205 is the Master of the said Ship; and that the Name, Residence and Description of the Owner, and Number of Sixty-fourth Shares held by Sixty-Four are as follows:-

Name, Residence, and Occupation of the Owner.	Number of Sixty-fourth Shares.
DFDS Seacruises (Bahamas) Limited Sandringham House, 83 Shirley Street P.O. Box N.3247 Nassau, N.P., Bahamas	Sixty-Four

[illegible stamp] FEB 3 1982

Dated at London the 9th day of [illegible] One thousand nine hundred Eighty-Two

[signature] Registrar of Bahamian Ships.

NOTICE – A Certificate of [illegible] Title. It does not [illegible] contain notice of all changes of ownership, and in no case does it contain an official record of any mortgages affecting the ship. In case of any change of ownership it is important for the protection of the interests of all parties that the change should be registered according to law. Changes of ownership, address or other registered particulars should be notified to a Registrar immediately. Should the Vessel be lost, sold or broken up [illegible] thereof, together with the Certificate of Registry, if in existence, should immediately be given to the Registrar of Bahamian Ships at the nearest Registry Office.

APPENDIX G

SAFETY CONSTRUCTION CERTIFICATE

Form No PSC 104

COMMONWEALTH OF THE BAHAMAS

PASSENGER SHIP SAFETY CERTIFICATE

for ~~an~~ a short international voyage

Issued under the provisions of the

INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA 1974

Name of Ship	Distinctive Number or Letters	Port of Registry	Gross Tonnage	Particulars of voyages if any sanctioned under Regulation 27 (c) (iv) of Chapter III	Date on which keel was laid or ... (see NOTE on page)
"SOUTHWARD SEA"	C [illegible]	NASSAU	10736		Completed 19[illegible]

I, the undersigned certify

I. That the above-mentioned ship has been duly surveyed in accordance with the provisions of the Convention referred to above

II. That the survey showed that the ship complied with the requirements of the Regulations annexed to the said Convention as regards:

1) the structure, main and auxiliary boilers and other pressure vessels and machinery,
2) the watertight subdivision arrangements and details
3) the following subdivision load lines:

Subdivision load lines assigned and marked on the ship's side at amidships (Regulation 11 of Chapter II-1)	Freeboard	To apply when the spaces in which passengers are carried include the following alternative spaces:
C 1	2073 mm	
~~X~~		
~~X~~		

III. That the life-saving appliances provide for a total number of 1237 persons and no more, viz.:

12 lifeboats (including 2 motor lifeboats) capable of accommodating 1237 persons, and 1 motor lifeboats fitted with radiotelegraph installation and searchlight (included in the total lifeboats shown above) and 1 motor lifeboats fitted with searchlight only (also included in the total lifeboats shown above), requiring 57 certificated lifeboatmen;

- liferafts, for which approved launching devices are required, capable of accommodating ..... persons, and

7 liferafts, for which approved launching devices are not required, capable of accommodating 170 persons;

4 buoyant apparatus capable of supporting 80 persons;

18 lifebuoys,

1400 life-jackets. incl. 130 for children.