

MARINE INVESTIGATION REPORT (AMENDED)

M98W0245

UNCONTROLLED DESCENT OF A LIFEBOAT

BULK CARRIER "IOLCOS GRACE"
ANCHORAGE "K", VANCOUVER HARBOUR
BRITISH COLUMBIA
9 NOVEMBER 1998

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

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Summary

While conducting a lifeboat drill, an uncontrolled descent of a totally enclosed lifeboat occurred. The forward lifting hook of the port lifeboat released prematurely, the forward end of the boat dropped and the keel swung past the vertical, at which point the after lifting hook also released. The boat fell approximately seven metres to the water, landing on its side before capsizing and floating upside down. Five of the six crew members in the lifeboat were able to escape or were rescued from the boat by divers. The sixth person was removed from the boat by the rescue divers but had suffered fatal injuries.

Ce rapport est également disponible en français.

Other Factual Information

	"IOLCOS GRACE"	No. 2 Lifeboat
Registry Number	37082	—
Port of Registry	Panama	—
Flag	Panama	—
Type	Bulk Carrier	totally enclosed lifeboat
Gross Tons ¹	38022	—
Length	233.7 m	6.5 m
Draught	7.25 m	—
Built	1990, Hitachi Zosen Corporation Maizuru, Japan	1989, Shigi Shipbuilding Co. Ltd. Osaka, Japan
Propulsion	Diesel, 7,620 brake horsepower	Diesel
Number of Crew	22	25 (full capacity as lifeboat) 6 (as rescue craft)
Registered Owner	Magnum Maritime S.A. Panama	—

Crewing of the "IOLCOS GRACE"

The nationalities of the 22-person crew on the "IOLCOS GRACE" at the time of the occurrence were diverse, with crew members from Greece, Ukraine and the Philippines. English, a second language for all the crew, was the language used to communicate on board. When the vessel changed owners in April 1998, an all new crew had joined the vessel. Some officers and unlicensed personnel were again changed in September 1998. The vessel was crewed and operated in accordance with existing regulations.

Description of No. 2 Lifeboat

The lifeboats on the "IOLCOS GRACE" are totally enclosed lifeboats of glass-reinforced plastic construction. The boats are rated both as lifeboats and as rescue craft, with estimated launching weights of 4500 kg and 3075 kg in the two modes of operation, when carrying 25 persons or 6 persons, respectively. Pairs of davits built by Manabe Zoki Co. Ltd. are used to launch the boats and the lifting hooks at each end of the boats are released simultaneously by operating a lever located within the lifeboat.

¹ Units of measurement in this report conform to International Maritime Organization (IMO) standards or, where there is no such standard, are expressed in the International System (SI) of units.

Circumstances Leading to the Occurrence

With the vessel at anchor awaiting a berth at Vancouver, British Columbia, the master ordered a boat drill at 1000 on Monday, November 9, the first full drill since his joining the vessel in September 1998. All of the crew except those on watch participated. This was the first full exercise with crew members on board the boats since the vessel had been taken over by new owners seven months earlier. Few of the crew had any previous experience with totally enclosed lifeboats. During previous boat drills, the boat was empty when it was lowered to the boat deck level and boat deck winch controls were used. There is no provision to bowse the boat at the boat deck level.

The starboard lifeboat was the first boat lowered, manned by five persons, with the second officer in charge in the boat. The second officer lowered the boat using the remote winch brake wire, which is led inside the boat. As the boat was being lowered, the second engineer noted that it was lowering much faster than normal and, being near the davit winch, he pushed down on the brake lever, engaging the shut-off brake and slowing the speed of descent. When the boat reached the water, the lifting hooks were released, the boat was manoeuvred using the engine, and then retrieved and returned to its stowed position in the davits.

The crew then readied the port boat for lowering. Having witnessed the rate at which the starboard boat had lowered before the second engineer intervened, the chief officer, who was in charge of the boat, reportedly asked the master to have someone stand by the winch brake while the port boat was being lowered. This was not done. A crew of six persons, composed of the chief officer, second engineer, fourth engineer, boatswain, an oiler and the cabin boy, entered the boat while it was in its stowed position in the davits. Initially, as the chief officer pulled the remote winch brake wire, the boat would not move, even when the boatswain, and then the oiler, tried to assist. Using his radio, the chief officer informed the master that the brake would not release but the boat suddenly moved slightly and the master ordered the chief officer to lower the boat. As the chief officer pulled on the remote brake wire the boat crew felt the boat swing wide, away from the davits.

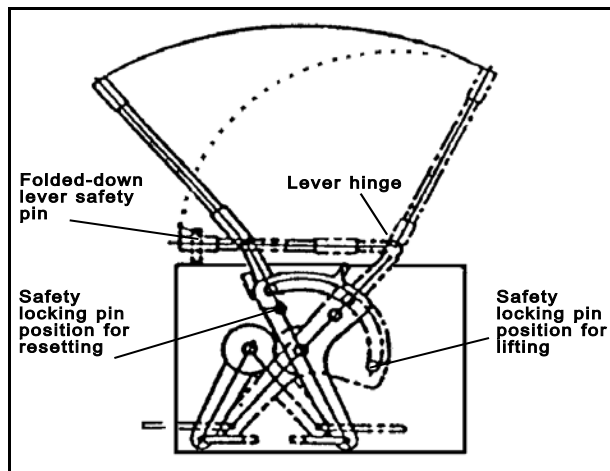
Observers on the boat deck saw the boat take a few violent swings as it lowered approximately 3 m from the davit heads. The boat struck the side of the deck as it swung, and the forward hook released. The third officer was on the bridge wing and he saw the forward end of the boat fall until the keel had passed the vertical and the boat was beginning to turn upside down. When the full weight of the boat came on the after hook, it also released and the boat fell, twisting, into the water. It struck the water on its side and then capsized. Before it capsized the fourth engineer and boatswain were able to get out of the side door. The side door closed behind them and their attempts to open it to let their shipmates out were unsuccessful as the door appeared blocked on the inside of the boat.

The oiler and the second engineer managed to open the door and get out of the boat and they were picked up immediately by a pleasure craft that had arrived on scene. Meanwhile, the crew on deck lowered two rope ladders and three crew members climbed down to try to assist the persons in the water. The Canadian Coast Guard (CCG) hovercraft arrived on scene, 35 minutes after the accident, with rescue divers on board. They dived and accessed the boat, rescuing the chief officer. A local dive school boat with divers aboard arrived and they assisted the CCG divers in securing the boat. The lifeboat keel was attached to the falls and the boat raised up slightly so the divers could get inside safely. The divers entered but could not move the wreckage inside to get the cabin boy out of the boat. The boat was then raised enough to allow two tugs to back under the boat and take the boat across their aft decks. The current moved the tugs from under the falls just as the boat was

lowered onto their decks. The boat rolled off the deck of the tugs and landed in the water right side up, and the divers were able to remove the cabin boy. He had head and chest injuries and was not breathing; resuscitation efforts were of no avail. According to the autopsy report, the cabin boy died of “mechanical crush asphyxia” after being struck on the chest.

The boatswain and fourth engineer suffered minor injuries, and the oiler had lacerations on his arm and back. They were released from hospital after primary treatment for shock and cuts. The three crew members who had gone down the rope ladder were picked up by craft arriving on the scene and they were also treated at the hospital and released. The second engineer was hospitalized, with a broken arm and broken ribs. He was released the day after the occurrence. The chief officer was hospitalized for several days for treatment of leg and arm injuries.

Single Point Hook Release Mechanism



The lifting hooks at the end of the lifeboat are fitted in brackets such that, when the hooks are unconstrained, the weight of the boat will cause the hooks to pivot open. Cams and pawls make up the locking mechanism that secures the hooks when in the lifting mode. The setting of the cams and pawls is controlled by bowden cables that lead to the release mechanism located alongside the engine casing, below the coxswain's seat. The actuating mechanism consists of a quadrant that pivots about its mid-length, pulling the bowden cables which, in turn, at bow and stern, retract a cam lever allowing the pawl piece to drop away from the hook. There are two holes in the quadrant into which a safety locking pin may be inserted to

lock the quadrant in either the lifting position or the position for resetting the lifting hooks. The quadrant is moved by a lever that extends above the cabin sole but which is hinged so that it may be folded down to the cabin sole when not in use. The safety locking pin that secures the quadrant in the lifting position has to be removed before the lever can be pulled to release the hooks; the long arm of the operating lever is held in the folded-down position by another safety pin.

The inner bowden cables are adjusted at the quadrant end by means of a left- and right-hand threaded rod connecting two yokes that link the inner cable and quadrant by way of clevis pins. The outer bowden cables can be adjusted by releasing its end clamps and moving the outer cable in the desired direction.

In the lifeboats on the “IOLCOS GRACE”, the release mechanism does not have a hydrostatic interlock for preventing premature release of the hooks, nor was there a requirement to have such a release. Later Shigi lifeboats have such an interlock, as required by SOLAS in 1994.

Operating Instructions

The system of releasing and resetting the hooks is laid down in the operations manual and in placards in the boat with both diagrams and text in Japanese and English. However, there are no instructions as to when the hooks should be reset or how the boat should be secured to the fall blocks. Instructions on how to reset the hooks are also absent from the owners' ISM manuals.

In a drill, once the boat is released and has moved away from the falls, the hooks are to be reset, ready for reconnecting to the fall blocks when the boat is to be lifted back on board. The procedure for resetting the hooks is to secure the quadrant in the resetting position, using the safety pin. This enables the quadrant to push on the inner bowden cables, restoring the cam levers and pawls to the locking position. In order for the mechanism to be reset correctly, both the forward and after hooks must be held simultaneously in the locked position to enable the cables, cams and pawls to engage properly. Because the outer bowden cable is held only at each end in a clamp, which by design can rotate, it is possible to force the lever back into the reset locked position even if the hooks are not 100 percent in the locking position. This causes the inner cable adjusters to deflect up or down and the outer cable clamps to rotate, as was found at the after adjuster in the port boat. When the boat is ready to be hooked onto the falls, the ring on the fall block is pushed under the hook, past a counter-weighted pivoting bar that prevents the ring from unhooking.

This procedure is not described in the manuals on board the vessel and none of the deck officers knew the correct sequence for resetting the hooks or how to correctly secure the hooks to the fall blocks. Both the second and third officers were under the impression that the correct procedure was to hook the boat onto the falls and then reset the hook locking mechanisms. When the hooks are attached to the fall block it would be extremely difficult to ensure that the pawls had engaged correctly on the hook locking mechanism. The play in the cables could lead to the impression that the hooks were locked in position, when only the quadrant was in the reset position.

There is a warning in one of the instruction manuals provided by the builder of the "IOLCOS GRACE" which states:

Caution, Don't inching the remote control wire because it causes the swinging of the boat.

In August 1997 Shigi Shipbuilding issued an advisory regarding a similar accident with detailed corrective measures for proper re-setting of the release gear on the same type of lifeboat. The advisory did not reach the owners of the "IOLCOS GRACE".

Post-Occurrence Inspection of the Lifeboats

The starboard lifeboat was checked while it was in the stowed position in the davits and with the tricing wires secured in place. Beneath the floorboards, the safety locking pin in the quadrant was in the resetting position and the quadrant was free to move with vibration or by someone accidentally touching it. Also, the forward cam lever at the end of the inner bowden cable was incorrectly adjusted and thus the pawl was not fully engaging the hook to lock it in place. The after hook was only slightly out of adjustment. Canadian Port State Control Officers detained the vessel until the cables and locking mechanisms were correctly adjusted and proven to be operating. This was done by consultants from ashore.

An inspection of the port lifeboat was carried out two days after the occurrence, with the boat afloat. The hull was found to have been holed on the starboard side under the hook release quadrant. The hole had been made by the adjuster from the aft hook release cable that had tipped down into the hull. An examination of the under-deck hook securing mechanisms revealed that, with the forward cam lever in the position in which it was found, the pawl would only be partially engaged on the hook, while the after mechanism was found fully released with the adjuster on the inner end of the release cable down against the hull. The clevis pin connecting the forward cable adjuster to the quadrant under the floorboards did not have a split pin to secure it and prevent it from falling out. The forward hook had wear marks on only 25 percent of the pawl engagement area. Normally the pawl would engage for approximately 25 mm, but the marks indicated a long-term engagement of less than 6 mm at the tip. The after hook had no wear marks on the contact area and appeared to have had full contact on the pawl. The safety pin that should have secured the quadrant in the locked position was missing, while the pin that held the operating lever folded on the cabin sole was still securing that lever in its stowage bracket.

When the port boat was removed from the water it was found that the area in way of the hole in the hull had been recently repaired, as new paint had been applied. The master had discovered the hole two weeks before the occurrence and had directed the engineers to repair it. The repair method used was to sand off the outside of the boat hull and apply a patent plastic steel repair compound from the outside the hull. Neither the master nor the engineers repairing the hull looked inside the boat to find out what had caused the hole, they all assumed that it was made from the outside. The lifeboat manual supplied with the boat described and illustrated the correct method for repairing the glass-reinforced plastic boat hull. The correct method involves a full penetration patch repair that requires a backing support for the repair material being used. To effect a full penetration repair, the engineer would have had to have entered the boat and put a backing support inside the hull where the adjuster was found at the post-occurrence inspection.

Lifeboat Drills

Records on board the vessel show that a lifeboat drill exercise was carried out on 26 August 1998. On September 8 a fire and boat drill are noted as having been carried out, but there is no notation of the boats being lowered on either August 26 or September 8. On October 3 there was a boat drill and it is noted that the lifeboats were lowered to the boat deck, and the engines tested. On November 2 there was a boat drill and again the boats were noted as lowered to the boat deck, and the engines tested. Under the ISM, records with respect to the master's evaluation of the boat, fire and emergency drills were maintained aboard the vessel. The master's evaluation indicated that the crew were not familiar with the emergency procedures and that more training was required to address this shortfall.

The 1978 Protocol relating to the *International Convention for the Safety of Life at Sea 1974* (SOLAS), for all vessels on an international voyage, Regulation 18 (Emergency Training and Drills) Section 3.6 states:

Each lifeboat shall be launched with its assigned operating crew aboard and manoeuvred in the water at least once every three months during an abandon ship drill.

During the boat drill on November 9, reportedly all the boat crew were wearing lifejackets and hard hats and the survivors insist they were also using the seat belts. The hard hats were not provided with chin straps.

Lifeboat Maintenance Records

The records on board the vessel indicate that the weekly and monthly checks of the lifeboat stores and equipment were carried out. Also, the records show that the release mechanisms, the davit blocks, wire falls and internal fittings of the boats were greased monthly. No reference is made to the repairs carried out to the port lifeboat hull nor is reference made to the bowden cables being incorrectly adjusted. Instead, the entries in the "Life-Saving Appliances Maintenance Log/Check List" for hooks and release mechanism indicate that they were in good condition.

Lifeboat Winch Brakes

The winches have two brakes, one manually actuated and one an automatic, centrifugal, speed-governing brake. The manual brake holds the lifeboat at any position and is released by raising a lever at the side of the winch. This brake is also controlled by remote wire pulls, one from forward of the davits on the boat deck and the other from inside the boat. When the boat is lowered, the centrifugal speed-governing brake controls the rate of descent, which is contingent upon the loaded mass of the boat. This brake is adjustable and can be altered to suit different loads. The brake shoe has five fulcrum holes to provide different pivot points for the shoe. The revolutionary speed at which the brake shoe is thrown outwards to engage the brake drum changes with the pivot point.

Class Inspection

The vessel was in possession of a valid full term Cargo Ship Safety Equipment Certificate, issued by the Korean Register of Shipping under the authority of the Government of the Republic of Panama on 17 August 1998. The Safety Equipment Periodical Survey by a Class surveyor was carried out on 14 April 1998. Ship's records showed that the lifeboats had been lowered and recovered as part of the survey; this being the last recorded official full boat drill.

ISM Certification

The International Chamber of Shipping publication *Guidelines on the application of the IMO International Safety Management Code* are designed to assist companies in the development of a safety management system. Article 6 deals with Resources and Personnel. The guidelines suggest that records of crew certification be maintained by the owner and that in assigning crew to a vessel, consideration be given to the following:

- that the crew is capable of safely executing tasks, be they normal operations or emergency-related;
- that the crew are given proper familiarization of the vessel and its equipment; and
- that training needs of the crew are identified.

Following an ISM Audit by Nippon Kaiji Kyokai (NKK), the vessel was issued an ISM Certificate on 27 September 1998, some six weeks before the occurrence. Some of the crew had been on this vessel for a minimum of six weeks, while others had been on for some six months. Neither the second officer nor the third officer was aware of the correct procedures to set the hooks.

Other Occurrences

This is not an isolated occurrence. Lack of maintenance and/or lack of knowledge of the release and retrieval procedures for totally enclosed lifeboats has been identified as a factor in a number of occurrences. These include occurrences involving the vessels "KAYAK" and "MAERSK POMOR" that were investigated by the office of the Inspector of Marine Accidents, Canberra, Australia, and other occurrences, investigated by the TSB, involving the "FARANDOLE" (TSB Report No. M96L0043), "SIR WILFRED GRENFELL" (M92N5015), "TAVERNER" (M93N5017), and "OCEANIC MINDORO" (M93W1021). The Board is concerned that the improper functioning of the release mechanism, be it maintenance-related or procedures-related, has the potential to compromise the safety of the crew, either during routine drills or during emergencies. In August 1992, following an occurrence involving the Canadian Coast Guard vessel "SIR WILFRED GRENFELL", the Board issued a Marine Safety Information letter (MSI 22/92) which urged the Canadian Coast Guard to ensure that the crew are familiar with the maintenance and operating procedures. In February 1994, following the occurrence involving the coastal passenger/cargo vessel "TAVERNER", the Board issued a Marine Safety Advisory (MSA 01/94) to Transport Canada highlighting the need both to promote increased awareness among shipowners of the importance of preventative maintenance procedures for lifeboat release mechanisms, and to ensure that adequate procedures for inspecting lifeboat release mechanisms are being followed by its surveyors.

Analysis

The vessel was under new owners from April 1998 and, although few of the crew had previous experience with totally enclosed lifeboats, the record of lifeboat drills since the change of owners does not show that the boats had actually been in the water and manoeuvred—as required under the regulations.

From the descriptions of the rate of descent of the starboard boat given by the crew, it would appear that the brake was set up for an empty boat. The starboard boat carried less than the nominal six man “rescue boat” crew, with a mass of 450 kg, and the additional weight of crew members made the boat’s descent alarmingly rapid. The speed-governing brake is adjustable and the standard adjustment should be for the maximum weight when the boat is used as a lifeboat, i.e., with the estimated 1875 kg mass of a 25-person crew.

The operating lever for the release mechanism of the port boat was found secured (by the safety pin) in its stowage bracket, indicating that it was not used by the boat’s crew. The forward hook prematurely released at the same time as the lifeboat swung against the ship’s side while it was being lowered. The violent swing could have been precipitated by the interruption in the initial lowering of the boat, which is cautioned against in the builder’s instructions; but this hesitation in lowering the boat was not the intent of those attempting to lower the boat. From the position of the under-deck securing mechanism for the forward hook of the port boat, it is likely that the hook released because the cam lever was incorrectly adjusted, and the securing pawl not completely engaged, the last time the lifting hooks were reset. The after hook subsequently released when it was subjected to the full weight of the boat.

The deck officers responsible for stowing the boats did not understand the sequence of operations required to reset the hooks in the boats. Also, they did not know that, before attempting to hook onto the falls, the hooks should be reset. The lack of knowledge regarding the operation of the release mechanism is confirmed by the operating quadrant of the starboard boat having been left secured in the resetting—instead of the lifting—position when the boat was recovered and returned to its stowed position in the davits. As the records indicate that the boats had not been released from the falls since the change of ownership, it is likely that the improper setting of the boat release mechanism occurred when retrieving the lifeboat during the survey in April 1998. Also, the shipboard inspection of the lifeboat was less than thorough; it did not detect that the bowden cables had been incorrectly adjusted, nor did it detect the wear marks on the forward hook of the port lifeboat, wear which had taken place over a period of time. This permitted an unsafe condition to go unnoticed for at least seven months, until the occurrence.

The maintenance records on board the vessel were inaccurate, in that they mentioned neither that the port lifeboat had been holed nor that the bowden cables had been incorrectly adjusted, while the entries for inspection of the hook and the release mechanism indicated that they were in good condition. The information contained in the ISM Manual is for general launching and recovery of a lifeboat, and makes no reference to the manufacturer’s operating and maintenance manual. Information contained in the manufacturer’s “operating and maintenance manual” is unclear, and may be difficult to comprehend, e.g., item 7 of the launching procedure reads: “To be adjusted lowering speed by remote control wire before the boat launch to the sea surface, and to be waterborne slowly.” The manual also lacks information as to when the hooks should be set or how the boat is to be secured to the fall.

Findings

1. The speed-governing brake for the starboard lifeboat winch was improperly set, resulting in the boat's alarmingly rapid descent.
2. In the starboard boat, which had been recovered before the attempt to lower the port boat, the quadrant safety pin had been left in the resetting position and the cams and pawls were not properly adjusted to firmly lock the hooks in the lifting position.
3. The adjuster for the operating cable to the port boat after hook had pierced the hull below the quadrant when the cable deflected as a result of the hook being incorrectly reset. This had occurred some time earlier but had not been investigated by the crew.
4. The crew were not aware of the correct procedure for repairing the hole in the lifeboat, nor did they follow the manufacturer's instructions.
5. The port lifeboat forward lifting hook had not been correctly reset by a previous crew when the boat was last released from the falls.
6. Proper adjustment of the port lifeboat release mechanism was not carried out to firmly lock the hooks in the lifting position.
7. The manufacturer's instruction manuals on board the vessel for the lifeboat launch and retrieval operations are incomplete and difficult to comprehend. The owners ISM manual deals with general lifeboat launching and recovery practices and no reference is made to the manufacturer's operations manuals.
8. The vessel had received an ISM Certificate some six weeks before the occurrence, and the current personnel were not familiar with the procedure to reset the lifeboats' lifting hooks.
9. Neither the inspection by the Class surveyor nor that by the ship's crew detected the improper setting of the release mechanism, allowing the unsafe condition to go unnoticed for at least seven months.
10. Records of the lifeboat and fire drills on the vessel indicate that the lifeboats had not been completely released from the falls since the vessel changed owners in April 1998, some seven months before the occurrence.
11. Five out of a crew of six persons crewing the boat sustained injuries and one person lost his life.

Causes and Contributing Factors

The Board determined that while the port lifeboat was being lowered, the forward lifting hook prematurely released because the hook had not been correctly reset into the locked position the last time the boat was released from the falls. Records of the lifeboat and fire drills on the vessel indicate that the lifeboats had not been completely released from the falls since the vessel changed owners in April 1998. Contributing to the occurrence was the fact that the crew were unfamiliar with the procedures for resetting hooks, the manufacturer's instruction manual for the lifeboat launching and retrieval operations was incomplete and difficult to comprehend, and the inspection by Class and shipboard personnel was less than thorough.

Safety Action Taken

1. The starboard lifeboat hook release mechanism was inspected by a Canadian Port State Control Officer and the "IOLCOS GRACE" detained pending repairs. Independent marine surveyors were hired to oversee the repairs done by shore-side contractors. The cable adjustments were reset to the correct settings and the cams and pawls checked for operation. After a demonstration of the operation of the release and resetting of the hook locking mechanism, the vessel was released by Port State Control. A liferaft, approved by the Flag State Inspector was substituted temporarily for the damaged lifeboat.
2. Transport Canada issued *Ship Safety Bulletin No. 05/00* on 17 April 2000, outlining the importance of following proper procedures in releasing and re-securing lifeboats during and following drills.
3. Transport Canada, Marine Safety notified the manufacturers of Canadian-approved lifting devices to review:
 - a) their existing designs; and
 - b) their maintenance, operation and training manuals, with a view to writing procedures in simplified language or using pictorials to enhance understanding and compliance, especially where the language of communication of the ship's crew may not be English.
4. Transport Canada has prepared a paper which is being processed for submission as an agenda item at the 44th Session of the Sub-Committee on Ship Design and Equipment of the IMO. The submission notes the actions recommended in item No. 3, above, and suggests that other administrations may wish to follow these actions.
5. Under the Port State Control Inspection Program, Marine Safety inspectors are being instructed to ensure that special attention is given to this aspect of life-saving equipment and that if a deficiency is detected it must be dealt with, or the vessel detained.
6. Discussions are ongoing between Marine Safety headquarters and representatives of all regional offices, regarding SOLAS 1974 Chapter 3, Regulation 18, Section 3.6 (the frequency of

abandon-ship drills). The operation and maintenance of free fall lifeboats, including the mandatory securing of such boats with a restraining strop, is also being discussed.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 8 August 2000.



Appendix A - Photographs

