PROCEEDINGS
OF THE MARINE SAFETY COUNCIL

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PROCEEDINGS

OF THE MARINE SAFETY COUNCIL

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COVERS

Front: The last members of a salvage detail abandon the sinking freighter *Silver Dove* in the Pacific southwest of Johnston Island. Eighteen hours later the vessel went down in 2,500 fathoms of water. During the previous 5 days the crew had been battling a leak in the vessel's hull and a resulting list to starboard. Investigation of the casualty revealed that the actions taken by the master to correct the list actually had decreased, rather than improved, the vessel's stability. A summary of the investigation report begins on page 4.

Back: During rescue operations a Coast Guard HH–3F helicopter hovers over the 640-foot Liberian tanker *Argo Merchant,* which ran aground on shoals off Nantucket Island on December 15. The 38 crewmembers were lifted to safety and strike force men and equipment were deployed. Twenty foot waves, however, soon made lightering impossible and eventually broke up the tanker, spilling the entire 7.6 million-gallon oil cargo.

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maritime sidelights

FIRST AID CERTIFICATE

The Federal Register of 18 October published changes to the First Aid Certificate requirements for an original merchant marine officer's license. Heretofore, applicants have been required to produce a certificate from the U.S. Public Health Service indicating satisfactory completion of the "Ship's Medicine Chest and First Aid at Sea" course.

Recognizing that Public Health Service facilities have become increasingly limited, the Coast Guard now also will accept the "Standard First Aid and Personnel Safety" course certificate from the American National Red Cross. At the same time a requirement has been added for a certificate of completion of a cardiopulmonary resuscitation course from either the Red Cross or the American Heart Association.

The changes became effective on 19 November.

It should be pointed out that these organizations deal primarily with qualified instructor training rather than student training. The student level of training is conducted by local facilities (such as rescue squads, fire departments, YMCA, etc.) under the auspices of the major organizations. When contacting the local chapter of the Red Cross or American Heart Association, those wishing to take the courses should inquire about the location of facilities providing *student level* training.

LORAN-C INFORMATION

Eight new Loran-C stations are being built to provide service to the U.S. west coast, Canadian west coast and Gulf of Alaska. All are nearing completion, and some have begun transmitting intermittently for testing. All eight new stations will be transmitting signals early this year. The signals from these stations have not been calibrated for navigation and will be subject to interruption and adjustment until all construction is complete and they are fully calibrated.

Calibration of the chains will begin this month and will be completed in phases. Fully operational Loran-C service will be available on the following approximate schedule:

(1) U.S. west coast rate 9940 (SS6)—April 1977;

(2) Canadian west coast rate 5990 (SH1)—May 1977;

(3) Gulf of Alaska, rate 7960 (SL4)—June 1977.

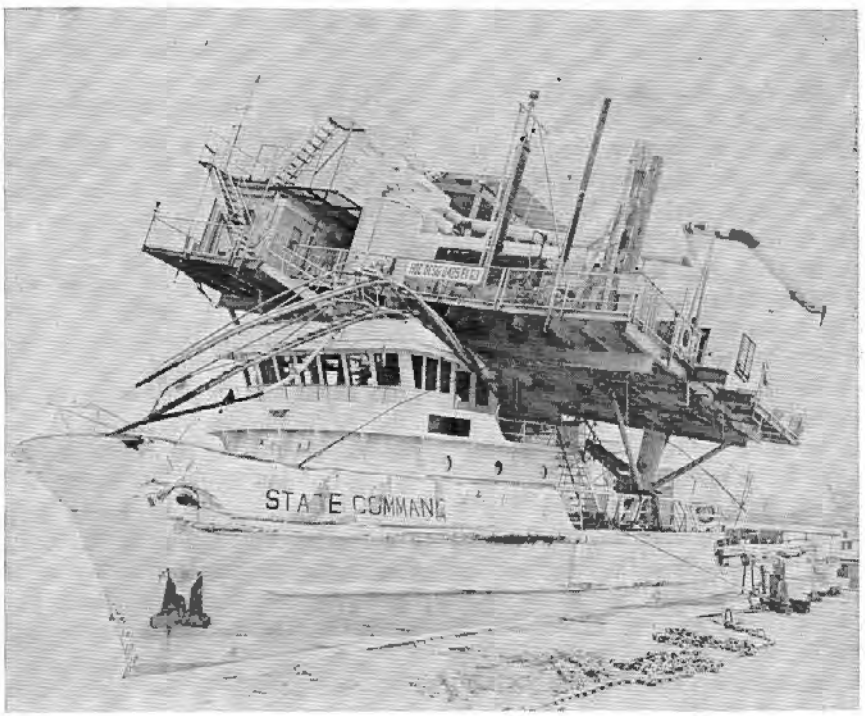
Navigation charts for west coast and Alaskan offshore and coastal waters are expected to be available this month from the National Ocean Survey, and should be procured by mariners who wish to use the new chains as soon as they are declared operational.

More detailed information on the new Loran-C service for west coast and Alaskan waters will be issued in local Notices to Mariners in the near future.

NO COMMENT

In the wee hours of a morning last August, the MV *State Command* struck a *manned* oil company platform in the Gulf of Mexico. At the time the vessel was en route from Eugene Island to Morgan City, La., with an unlicensed person in charge of the vessel's navigation.

There were no reported injuries. Nor, we might add, were the immediate comments of any of the participants recorded.



The Silver Dove

The following narrative account was extracted from the Marine Casualty Report (No. USCG/NTSB–MAR–76–1) released 28 November 1976. Single copies of the complete and detailed report may be obtained without charge by writing to the Commandant (G–MMI–1/83), U.S. Coast Guard, Washington, D.C. 20590. Multiple copies may be purchased by mail from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22151.

Early in the morning of 2 April 1973, the break-bulk freighter SS *Silver Dove*, while en route from Guam to the Panama Canal with a bulk cargo of raw sugar, sank in the North Pacific Ocean approximately 180 miles southwest of Johnston Island.

The vessel previously had developed a hull failure behind the refrigerated space on the starboard side of the No. 3 lower tween deck. All attempts of the crew to restrict the inflow of water were futile, and the vessel proceeded to Guam where temporary repairs were made. Eight days later water was found coming in the adjacent frame space immediately behind the area of the temporary repair. The next day while attempts were being made to control this new leak and to correct an increasing starboard list, the vessel suddenly developed a 22-degree port list. The master immediately sent an SOS message and the crew, with the exception of a nine-man salvage team, abandoned ship. The *Silver Dove* remained afloat for a period of 41 hours, during which time the crew was rescued by the Coast Guard Cutter *Northwind* which was en route from the Antarctic to Seattle.

The Ship

The SS *Silver Dove*, a standard C3 cargo vessel was built in 1947 at Ingalls Shipyard, Pascagoula, Miss. Originally christened the *Mormacsaga*, the *Silver Dove* measured 469 feet in length, 69 feet in width, and drew approximately 30 feet when fully loaded. The gross tonnage of the vessel was 7,667 tons with a net tonnage of 4,544 tons. She had steam turbine propulsion with a horsepower of 8,500. Prior to the sinking she had last undergone a Coast Guard bien-

nial inspection in the port of New York on 9 June 1971, and a reinspection on 25 May 1972 in New Orleans, La. In addition to the reinspection conducted in New Orleans, the vessel at the same time underwent a drydock examination and inspection (special periodical survey No. 5) by the American Bureau of Shipping.

The vessel had one deckhouse midships and five holds (three forward of the deckhouse and two aft). She was also a shelter-type vessel with the second deck being the freeboard deck and the transverse bulkheads above the second deck fitted with nonwatertight tonnage openings. This upper tween deck was also fitted with cargo side ports in Nos. 2, 3, 4, and 5 holds, both port and starboard. These side ports were double doors that opened outward and were dogged closed from the inside. A single storing port, opening inboard, was installed on each side of the upper tween deck above the machinery space.

The largest hold on the vessel was the No. 3 cargo hold (where the hull failure occurred) which was capable of accepting 147,330 cubic feet of bulk cargo. The lower tween deck space of the No. 3 hold was fitted with four refrigerated cargo boxes, two of the boxes located longitudinally in the wings and two smaller boxes located aft of the hatch opening. The diffuser (fan) rooms were located at the after outboard corners of the hatch. Inboard of these diffuser rooms and adjacent to the smaller refrigerated boxes were small lobbies which had inclined ladders leading up to the upper tween deck. The lobbies provided access to either the adjacent diffuser room or the inboard small refrigerated box.

The diffuser rooms were approximately 13 feet long and about 5 feet wide and extended from frame 96½ aft to frame 103. The after boundaries of the diffuser rooms were the port and starboard fuel oil settler tanks and the outboard boundaries were formed by the insulated hull of the vessel. Marine plywood sheathing was attached to the inboard flanges of the 8-inch-deep web frames and the area between the hull plating and the sheathing was filled with insulation. The decks of the diffuser room and the reefer boxes were also insulated. This deck insulation consisted of cork, a lead pan, and layers of concrete reinforced with wire mesh extending outboard to the wood sheathing, creating a 14- to 18-inch-deep by 8-inch-wide trough between the wood sheathing and the hull plating. The starboard diffuser room, lobby, and refrigerated boxes had a common drain line which emptied into a sump located below the deck of the lobby. A similar drainage system existed on the port side. These sumps were designed to empty into the engineroom bilges.

Below the lower tween deck the No. 3 lower hold was completely open except for a short centerline grain bulkhead extending from the after transverse bulkhead forward almost to the square of the hatch. This bulkhead was fitted with limber holes at the deck level and a manhole opening for personnel access. The after transverse watertight bulkhead of the hold was offset 12 feet inboard of the side shell with the center portion of the bulkhead extended 5 feet forward of the outboard portions.

The bilge system for the No. 3 lower hold consisted of two bilge wells outboard of the offset of the after bulkhead which were recessed below the deck level into the double bottom tanks. The bilge wells were about 24 inches deep and fitted with "high hat" box-like, dome-type perforated strainers which protruded up into the lower hold. A short sounding tube for the bilge wells passed through the after bulkhead into the machinery space.

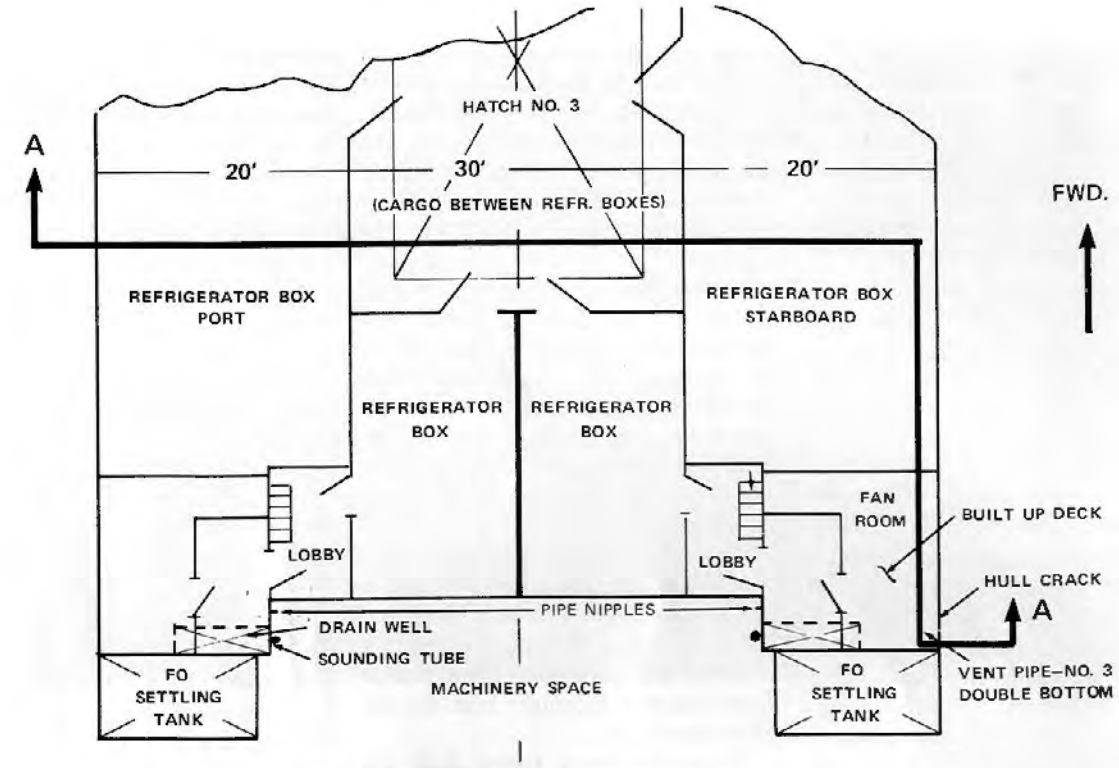
Last Voyage

The master involved in the casualty reported aboard the *Silver Dove* on 20 December 1972. After inspecting the vessel, including all the cargo holds, he was satisfied that the ship was in all respects seaworthy. Before the scheduled sailing the *Silver Dove* sustained a boiler casualty which was repaired under Coast Guard and American Bureau of Shipping supervision.

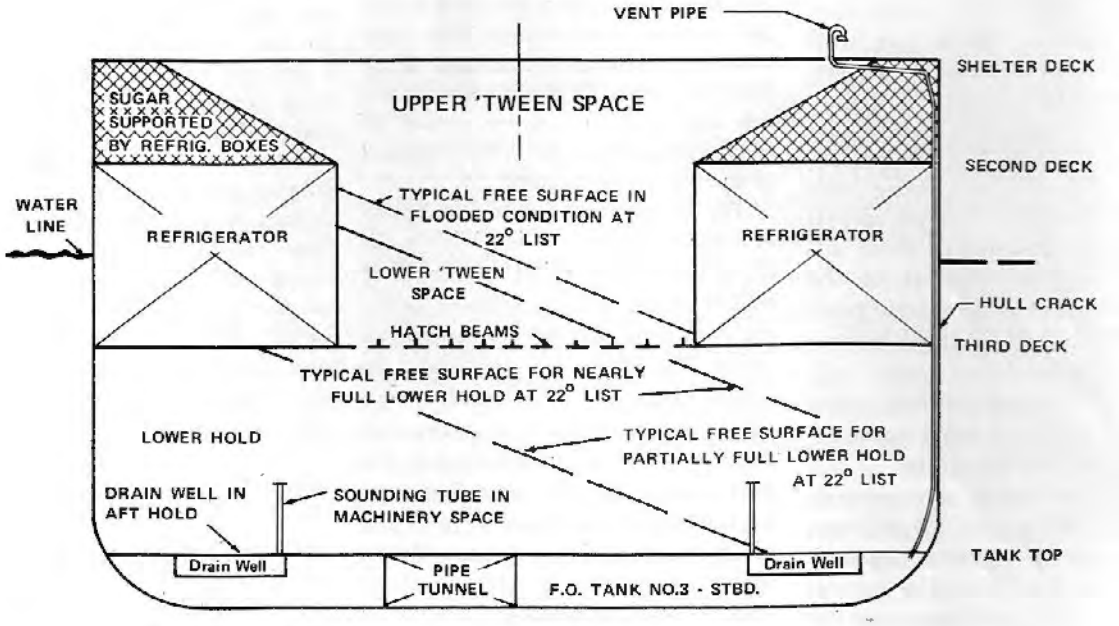
The vessel finally sailed for Charleston, S.C., on 20 December 1972. While in Charleston the vessel was loaded with 80 long tons of bagged urea and then sailed for Corpus Christi, Tex, on the 22nd. While en route, water, assumed by the master to be rainwater which had collected in the open hold in New York, was pumped from the No. 3 lower hold. In Corpus Christi the *Silver Dove* was loaded to the summer load line with an adidtional 11,000 long tons of bagged urea.

On 13 January 1973, the *Silver Dove* sailed for Saigon, Vietnam, via the Panama Canal. The westward voyage across the Pacific was routine until 25 January. The weather had been deteriorating for several days and the vessel was shipping seas over the main deck. Water was observed in the engineer's storeroom on the starboard side of the upper tween deck between the No. 3 and No. 4 holds. The next day water was discovered in the port and starboard lobbies and diffuser rooms of the No. 3 hold. Soundings of the No. 3 lower hold indicated a rapid rise in the water level, particularly concentrated on the port side. The port and starboard lobbies were not interconnected and water which accumulated on one side could not flow to the opposite side.

Because water was observed dripping from the ventilation ducting in the engineer's storeroom in the upper tween deck and in the diffuser rooms, cargo vent trunks on the main deck were suspected as the source of the leakage. Inspection of these ventilation trunks disclosed that the blank



PARTIAL PLAN VIEW OF THIRD DECK



SECTION VIEW – A-A LOOKING FORWARD

cover on one was blown off because the holding bolts had wasted away and the vertical section of the ducting was open, permitting water to enter when seas were shipped on the main deck. Upon closer inspection it was noted that the sides of the trunks next to the deckhouse also were deteriorated and there were some additional holes where water could enter. Some of these ventilating systems passed through the engineer's storeroom and into the No. 3 hold. Since these cargo vents were no longer required, the decision was made to crop them off flush with the deck when the weather permitted and to seal the openings with welded plates. Prior to the vessel's arrival in Saigon, six of the seven deteriorated vent trunks were sealed in this manner.

Throughout the remainder of the trip was No. 3 bilge wells were pumped each watch, but the water in the hold could not be completely pumped out. It was assumed by the officers that the bagged urea cargo acted as a dam that allowed water to seep into the bilge wells at a slow rate.

The *Silver Dove* arrived safely in Saigon on 20 February and moored in the harbor where cargo was discharged into barges on both sides of the vessel. The cargo in the No. 3 lower hold was water-damaged up to a level of about 5 feet.

The master, chief mate, and chief engineer were still concerned about the source of the water in the No. 3 cargo hold even though they felt it came from the ventilation system. The chief mate made several trips in a small boat to look at the exterior of the hull, but due to the barges alongside the inspection was rather cursory. The chief engineer examined the port side of the hull and the overboard clapper valves. He noted the clapper in the overboard valve to the port settler tank was wasted. This line was later blanked off from the inside of the hull. The chief mate removed some sheathing and insulation in each of the diffuser rooms in the No. 3 hold and in the refrigerated boxes. No accumulation of water was noted alongside the hull behind the sheathing.

A thorough visual inspection of the interior of the No. 3 hold was made and water was noted dripping from the overhead of the after portion of the lower hold. The chief engineer reported that the entire after portion of the lower tween deck was wasted. A pipe tunnel passing longitudinally through the No. 3 hold was flooded to test for leaks and was found to be sound. No evidence of any source of water other than the ventilation system was discovered.

While the vessel was in Saigon the exterior of the hull above the 16 foot level line was painted by native workers. Additionally, all holds were cleaned, including a washdown of the No. 3 lower hold to remove the residue of wet urea. The *Silver Dove* received 2,674 barrels of bunkers on 27 February and sailed for the Philippines on 4 March.

In the morning of 7 March the *Silver Dove* anchored in Bantangas Bay, Philippine Islands, awaiting a berth at the fueling dock. While at anchor the first assistant engineer installed two extra heavy pipe nipples in the bulkhead between the No. 3 lower hold and the machinery spaces about 1½ inches above the double-bottom tank tops to provide an additional check for any water that might enter the No. 3 lower hold. The nipples were threaded and capped in the machinery space and welded flush to the cargo hold bulkhead.

In the morning of 8 March the *Silver Dove* shifted moorings to the fuel pier. While the vessel was fueling, cargo surveyors inspected the holds in order to determine their readiness to receive a cargo of raw sugar. At noon on 10 March the loading of the sugar commenced at the Batangas Bay Terminal. The chief mate had been given a stowage factor for the sugar of 41 cubic feet per ton. The vessel was loaded with approximately 1,717.4 long tons of fuel, 478 long tons of fresh water, and, according to shore measurements, a total of 10,300 long tons of raw sugar cargo.

The *Silver Dove* sailed on the morning of 16 March, for an undesignated gulf coast or east coast port of discharge via the Panama Canal, with a speed of advance of 14 to 14.5 knots. Shortly after departure, a routine fire and boat drill was held and the vessel's log indicated that the engine in the No. 1 lifeboat and the fleming gear in the No. 2 lifeboat operated.

Deteriorated Hull

For the next 5 days the vessel experienced winds in the range of force 4 to 5 from the northeast with a moderate swell.

On 17 March at approximately 6:00 p.m. the chief mate entered the No. 3 hold diffuser rooms on a routine inspection. He found the port diffuser room and lobby dry but there was water on the deck in the starboard lobby. Upon entering the starboard diffuser room he found the area where the sheathing had earlier been removed filled with water up to the built-up deck level. Seaching for the source of water, he placed his hand under water near frame 100 and felt water flowing in through the hull plating.

The master and chief engineer were immediately notified and came to the scene. Initial attempts to remove the water with a bucket were unsuccessful, so the general alarm was sounded and all hands turned to forming a bucket brigade. Upon further inspection an 8-inch hull failure, variously described as either a series of small holes or a crack, was located approximately 8 inches above the steel deck. This crack was generally horizontal, centered on frame 100, and passed through a half-round scallop in the frame.

The chief mate manufactured a patch out of rubberized material backed by 2- by 6-inch planks wedged in place with steel wedges. He then poured concrete around this patch,

effectively reducing the flow of water to a point where the bucket brigade was able to remove most of the water from the area. It was the opinion of those present that some of the water entering the diffuser room was flowing down into the No. 3 lower hold through the previously noted wasted deck area in the after end of the third deck.

The next morning, 18 March, the weather was still moderate with force 4 to 5 winds. It became apparent that the patch aft of frame 100 was inadequate although the part forward of the frame seemed to be holding. More sheathing and insulation were removed, exposing the frames on either side and up to about 4 feet in height. The concrete patch after frame 100 was torn out and replaced with a canvas bag filled with sealing putty which was shored and wedged into place. The drain line connecting the starboard sump tank with the engineroom was clogged by debris from the removed insulation. As a result, water flowing from the refrigerated spaces into the sump tank could not be emptied into the engineroom. Attempts were made to pump out the sump tank using a small portable air-driven pump which had a capacity of approximately 15 gallons per minute. Due to the limited supply of ship's air, this pump could only operate for about 15 minutes at a time. The master sent a message to the owners of the *Silver Dove* advising them that the vessel had sustained an 8-inch crack at the 24-foot-draft level, and inquired about the possibility of diverting to Guam for repairs.

On the evening of 19 March the engineering watch officer routinely removed the cap from the starboard nipple in the forward bulkhead of the engineroom to check for water. A stream of granular sugar under pressure was forced out of the nipple, followed by a strong stream of brown-colored water shooting out across the deck some 15 feet. The force was such that the cap could not be replaced on the nipple and the flow continued for several minutes. Although small flows of sugar or syrup were later encountered, there was no repetition of this high-pressure flow of liquid. On one later occasion, granular sugar flowed from the starboard nipple for several hours. No flow of cargo or liquid was ever encountered from the port nipple. The sugar on the port side, as sampled through the nipple, was found to be of the same consistency as when it was received in Batangas.

Diverted

Further messages were exchanged with the owners indicating the inability of the crew to stop the flow of water through the crack. Consent was given to divert the vessel to Guam where an independent marine surveyor would represent the owners and assist in making repairs. During the next 2 days while the vessel was en route to Guam, water continued to flow through the crack in spite of the patches. The vessel was stopped twice while unsuccessful attempts were made to place canvas patches on the outside of the hull. When the ship stopped the flow rate through the crack greatly decreased. An attempt was made to drill a hole through the side of the vessel using a 5/8-inch bit and an air drill in order to bolt a steel plate over the crack on the outside of the hull. This attempt was unsuccessful because, as the master related, "the hull in that area was so sound."

At approximately 9 a.m. on 21 March the *Silver Dove* anchored in Apra Harbor, Guam. A representative of a ship repair facility in Guam went aboard around noon. He and several of the ship's officers went to the diffuser room and examined the fractured area. There was approximately 6 inches of water over the built-up deck and shoring was in place over an area immediately adjacent to frame 100. The shoring forward of frame 100 was removed in order to examine the fracture. A very decided flow of water was entering the vessel and the reflection of the sunlight passing through the hull seemed to mirror a series of holes rather than a continuous fracture.

Prior to the arrival of the owners' representative, the No. 4 port deep tank was ballasted to give the vessel a list to port of approximately 6 degrees, thereby raising the crack closer to the surface of the water. The master, chief engineer, and first assistant engineer put a piece of plastic held in place by magnets over the crack to reduce or stop the ingress of water. The master and the chief mate did not note any unusual condition of the hull plating around the crack. The first assistant engineer felt a slight indentation around the hull plating in the area of the fracture.

That evening at approximately 8:15 p.m. the owners' surveyor, the repair facility representative, the vessel's agent, the Commanding Officer of the Coast Guard Marine Inspection Office at Guam, and a Coast Guard inspector boarded the *Silver Dove*. After briefly discussing the casualty in the master's cabin, they went directly to the starboard diffuser room. The sheathing and insulation had been removed from about 6 inches forward of frame 99 to 6 inches aft of frame 101 and from the steel deck level to a height of 4 feet. A little water was noted in the area between the built-up deck and the hull. A section of frame 100 from the deck to a height of approximately 22 inches had been removed. An 8- by 12-inch steel plate had been jacked against the hull with a gasket seal, effectively stopping the inflow of water. This patch was not removed for inspection because the OCMI was satisfied with the description of the crack and he did not want to cause any further flooding.

After returning to the master's cabin the inspectors discussed the type of repair to be made. Since no commercial drydock facilities were available at Guam, it was agreed that a temporary repair would be acceptable, consisting of a concrete patch inside a fabricated steel box between frames 99 and 101.

The possibility of drilling the ends of the fracture to prevent enlargement was also discussed. The fact

that the drilling would have to be done below the existing waterline, thereby admitting more water into the vessel, was a primary influencing factor in the decision not to drill the ends of the crack. It was also decided not to attempt fairing the hull plating in this area because it was considered wasted. The fact that the crack was horizontal instead of vertical and located approximately on the neutral axis of the hull girder influenced the OCMI to believe it was a localized deterioration rather than a stress fracture.

Early in the morning of 22 March the task of effecting repairs was undertaken in earnest. Two scuba divers were directed to locate the crack and put a temporary patch over it to prevent water from entering the vessel during the construction of the concrete patch on the inside. Upon initial inspection the divers felt that the crack extended only about 10 inches. However, as they scraped and chipped rust off the side of the vessel to effect a good seal, they found that the crack extended further forward, so that the total appeared to be approximately 14 inches. The crack appeared to start at a dent in the shell plating of the vessel which was about 4 inches long, an inch deep, and several inches from top to bottom, the widest point being in the center of the indented area where it was open approximately one-quarter of an inch.

The divers sealed the crack with lead wool and a putty-like substance. Approximately 4 or 5 inches below the crack they noted another wasted area which appeared to be a 4- or 5-inch section of horizontal weld missing from a seam. The shell expansion plan did not indicate a plate seam in this area. The divers plugged this new section and reported this to the repair supervisor and the owner's surveyor. The OCMI was not apprised of the missing weld from the wasted seam nor of the observed length of the original fracture.

During this same time, the local nonexclusive ABS surveyor came aboard and examined the area of repair. The surveyor made no additional repair requirements and his report of survey verifying the inspection was subsequently sent to the owners. His report required that the area be examined at the vessel's port of discharge by an ABS surveyor and repaired to his satisfaction.

Inside the diffuser room preparations were underway for fabricating the steel box enclosure which would hold the concrete patch. The water in the diffuser room was removed and the remainder of the 22-inch section of frame 100 was cropped, leaving less than one-eighth inch protruding from the shell plating. A steel enclosure measuring 60 inches wide, 2 feet high, and 8 inches deep was formed with an open top which was bounded by the steel third deck, frames 99 and 101, the hull plating and the steel plates between the toes of the frames.

Around noon the OCMI returned to the *Silver Dove* and examined the steel box which was being fabricated. Concrete, utilizing bagged portland cement and coral sand, was mixed on deck and the first pour of about 1 foot in depth was made about 5 o'clock in the afternoon. The OCMI returned at approximately 6:45 p.m. and inspected the box which was being filled with concrete. He issued a written Coast Guard requirement that permanent repairs be made before 1 June 1973. The OCMI also requested that the master delay sailing until after midnight so that the concrete would have an opportunity to set up, which repair personnel estimated would take 6 to 8 hours. The concrete form required more material than was originally estimated and the final pour was not made until 9:00 p.m.

Underway

The *Silver Dove* sailed from Guam at 12:48 in the morning of 23 March, less than 4 hours after the final pour. The No. 4 port deep tank was partially deballasted to remove the port list prior to sailing, leaving approximately a 5 foot 6 inch sounding in the tank. No new stability calculations were made upon sailing.

During the first day at sea, the wind was from the east building up from force 4 to force 6. Seas were moderate and the vessel was pitching and rolling moderately while proceeding at full speed on an approximate due east course heading directly into the swells. At 4:30 in the morning the second mate on watch had the patch inspected and reported to the master that a small amount of water was flowing out between the hull and the top of the patch. In the evening the master checked the patch and found it to be solid. There was, however, a dribble of water observed coming out of the top of the concrete as the hull appeared to pant in the area of the patch. The caps on the pipe nipples through the after bulkhead of No. 3 lower hold were removed and there was no indication of water.

During the period 24 through 26 March, the vessel continued heading easterly into ever-increasing seas with the winds rising to force 7. On 26 March the sounding of the No. 4 port aft deep tank increased 7 inches to 6 foot 1 inch. The No. 4 port forward deep tank showed a sounding of 21 inches. The vessel started to develop a slight starboard list.

Starboard List

On 27 March the winds increased to a full force 7 from the east and the vessel continued pitching heavily in northeasterly seas and swells. The master, chief engineer, and chief mate discussed how to remove the starboard list of approximately 5 degrees which the vessel had gradually acquired. The chief engineer preferred not to move any fuel oil, so the chief mate fully ballasted the No. 4 port aft deep tank. At approximately 7:35 p.m. a problem developed in the No. 3 forced draft blower motor, necessitating a reduction in speed from 13 knots (79 rpm) to 40 rpm while the motor was replaced. The winds moderated to force 5 from the east on 28

March and the vessel continued pitching and rolling moderately in the head seas. The logbook indicated that the No. 4 port forward deep tank had a sounding of 3 feet, an increase of 1½ feet from the previous day. The sounding of the No. 4 starboard forward deep tank showed an increase of 2½ feet. The cause of the changes in soundings was undetermined.

At noon, when fuel oil suction was shifted from the port to starboard settling tank, the vessel lost fires in both boilers due to water in the fuel oil. The fires were restored in the boilers and the vessel got underway again at 1 p.m., making 50 rpm as repairs continued to the forced draft blower motor. The source of the water in the starboard settling tank was not immediately identified. However, the last transfer of fuel was taken from the No. 3 starboard double-bottom tank. Two 300 barrel draws of fuel had been taken from the No. 3 starboard double-bottom tank and soundings indicated the tank was down only 300 barrels, instead of the expected 600 barrels. The tank was checked and water was found, but the source could not be identified.

The chief mate, in checking the starboard diffuser room, found more water bubbling up at the top of the patch between the hull plating and the concrete. He wedged small pieces of wood between the concrete and the plating and caulked the area with a plastic sealant. Shoring was placed in position to hold the caulking, and the inflow of water was almost eliminated. Repairs were completed to the forced draft blower and the vessel increased speed to about 12 knots (70 rpm) at approximately 8:30 in the morning on 29 March. The noon soundings indicated that the No. 3 hold starboard bilge well was being pumped.

During the day the weather started to make up, with the winds backing slightly to the northeast and increasing to force 8 to 9. The vessel encountered large swells and shipped broken seas over the port bow. The course was changed at 2 p.m. in the afternoon from 105° T to 077° T. Additionally, a routine fire and boat drill was held, at which time the No. 1 lifeboat engine was run.

The *Silver Dove* crossed the International Date Line the following morning and a second 29 March, or Meridian Day, was logged. The inspection of the starboard diffuser room, lobby, and inboard adjacent refrigerated box disclosed an increased accumulation of water. The lobby had 8 to 10 inches of water over the deck, and water in the inboard refrigerated box apparently was entering by way of the drain common to the starboard refrigerated spaces in the No. 3 lower tween deck. The vessel's personnel broke out additional areas of the built-up deck in the diffuser room and removed sheathing and insulation from the hull between frames 101 and the after bulkhead in an attempt to locate the source of the increased flow of water. Oil sludge was found on the deck behind the insulation in the after outboard corner of the compartment, indicating a possible wasted vent line from the No. 3 starboard double-bottom tank.

At noon, the deck log indicated the starboard bilge of No. 3 hold was again being pumped and the No. 4 starboard deep tank had an unexplained sounding of 5 feet 3 inches. The vessel still had approximately a 5-degree starboard list.

The weather during the day continued rough, with large swells and seas being shipped as the vessel rolled and pitched heavily. Gale winds, force 8 to 9, continued throughout the day from the east-northeast. The course was changed to 082° T at noon. The same weather conditions prevailed throughout the next day with the vessel continuing to carry a 5-degree starboard list.

The master and chief engineer discussed various methods of recovering the fuel remaining in the No. 3 starboard double bottom. It was decided to transfer some of the fuel and water to the starboard settling tank where heat could be applied to separate the water and fuel. The water could then be drained from the bottom of the settling tank and the salvaged oil transferred to the No. 5 after port deep tank. Due to the size of the settling tank—only 400 barrels—this operation had to be repeated several times. By 9:30 p.m. approximately 400 barrels of recovered oil had been transferred to the No. 5 aft port deep tank.

Another Leak

During the day a new hull leak had been discovered between frame 101 and the after bulkhead in the starboard diffuser room when the sheathing, insulation, and decking were removed. This new defect was described either as pinholes in the hull plate through which water could be felt flowing, or as an intermittent crack some 14 to 16 inches long, in approximately the same horizontal plane as the previous crack. The fuel oil vent line was found to be heavily deteriorated near the deck, and on the outboard side some 2 inches above the steel deck there was a small hole into which water was flowing. This was considered to be the source of the water which had contaminated the fuel in No. 3 starboard double bottom.

In the afternoon, the chief mate patched the hull plating with canvas bags filled with sealing putty, but he did not consider that the patches were very effective. The air pump was used intermittently and could keep up with the waterflow which entered the starboard diffuser room. In the evening, the chief mate told the chief engineer that the sealing putty patches were not holding, so the chief engineer fabricated a 12-by 18-by ⅜-inch steel plate with rubber gasket material fastened to it to patch the area. The patches were removed and the plate placed behind the vent and jacked against the hull plating.

No water could be felt flowing in through the hull plating when the new patch was installed. The chief engineer did feel with his hand what

he characterized as a crack near the steel decking. The water was about 2 feet deep above the steel deck in the area of the new crack. Even though he could not identify the source, the chief engineer felt that the flow of water along the outboard edge of the compartment was coming from somewhere other than the area he had just patched, and the concrete patch did not appear to be that source. The vent line to No. 3 starboard double bottom was cut off above the water level in the diffuser room with the intention that it would be cropped off the next day flush with the deck level in order to allow the water to drain freely into the No. 3 starboard double-bottom tank from which it could be pumped overboard. The portable pump, which was operated only intermittently, no longer had any effect on the water level. In spite of the obvious flow of water into the compartments, the level did not increase and it was felt that the water was probably flowing into the lower hold.

The officers continued working in the diffuser room until about midnight. They were exhausted and, although realizing that water was still flowing into the vessel, they left with the intention of making further examination and temporary repairs the following morning. At that time, the air-driven pump was secured.

During the night, the fuel in No. 5 port forward deep tank was transferred to the No. 3 port and starboard double bottoms and the remaining contaminated fuel, about 800 barrels from No. 3 starboard double bottom, was transferred to the No. 5 forward deep tank. The watch engineers had been instructed to sound the bilges of No. 3 hold every watch and to pump them if warranted. The bilge piping to the starboard bilge well was clogged with residue from a previous cargo of bulk corn. The pumping of the starboard bilge well was done through a hard rubber hose connected between the sounding tube and the bilge pump suction. Pumping of the bilge wells in the No. 3 hold took no more than 15 minutes, and the liquid from the bilge wells varied from a very thick to a very watery syrup. The maximum sounding noted in the No. 3 starboard bilge well was 18 inches shortly after the first hull crack was discovered.

The weather abated in the early morning hours of 31 March. The wind dropped to force 6 and the seas moderated, so that by 8 a.m. only spray was being taken over the main deck and vessel was proceeding at a speed of about 11.4 knots. Shortly after midnight, a 3-degree starboard list developed. By 6:30, transfer from the No. 3 starboard double bottoms was completed and a 2-degree starboard list was logged on the bridge at approximately 7 a.m. Shortly before 8 a.m. the third assistant engineer relieved the engineroom watch officer. The engineroom logbook indicated that the previous watch had pumped the No. 3 bilge wells. A check of the soundings shortly after 8 a.m. showed 5 inches in the port bilge well and 7 inches in the starboard bilge well, which was not sufficient to warrant pumping again. The bilge pump was lined up to take suction on the shaft alley to remove 4 or 5 feet of bilge water. No other transfer of liquids was taking place. At 8:15 a.m. the watch officer noted the rate of water dripping from the deck above the No. 1 generator had increased and he called the chief engineer in his room to report the change. At 8:30 a.m. the engineroom clinometer showed the vessel on an even keel.

The engineering watch officer awakened the chief engineer at 8:15 a.m. to report the increased dripping of water over the generator. The chief engineer dressed and went to the engineroom, and while he was there the dripping stopped. At that time there was very little list and the vessel was not rolling as much as it had the previous day. He talked with some of the watch personnel and then went up to his office.

At this time the condition of the patch and the degree of flooding in the starboard diffuser room had not been checked by any crewmembers since midnight.

On the bridge the third officer relieved the watch about 8 a.m. and noted the vessel was on an even keel. He took his first sun line at about 8:25, and as he went out to take his second sun line at about 9:25 he felt the vessel starting to take a port list. At approximately the same time the master, chief mate, and the chief engineer also became aware of the increasing list. The master immediately ordered the chief engineer to begin pumping the No. 4 port after deep tank overboard and to stop the engine. He then ran to the bridge and ordered the rudder swung 15 degrees to each side of midships. The vessel responded sluggishly and continued listing further to port. The third mate, looking at the bridge clinometer, informed the master that the vessel was passing 15 degrees. The master rang up stop on the engine order telegraph, sounded the general alarm to get everyone up on deck, and ordered an SOS broadcast. By around 9:37 a.m. the vessel was steadying at about 22 degrees port list, with rolls between 12 and 27 degrees.

The chief engineer called the engineroom and told them to start deballasting the No. 4 port after deep tank. Because of the list, great difficulty was encountered in moving about the engineroom, and before anything of consequence had been done the abandon ship alarm sounded and the chief engineer secured the fires and the boilers.

The master ordered most of the crew to leave the vessel when the list had reached 22 degrees. During the launching process, the electrical power to the winch failed and the crew raised one of the boats by use of the hand crank to free it from the davit hook. The starboard boat became fouled on the deck rail and the crew had to free the boat using planks before it could be successfully launched. The No. 1 motor lifeboat with 21 people was launched at 9:55 a.m. with the second mate in change; the No. 2 boat with 10 people was

launched at 10:10 with one of the third mates in charge. Swells at the time of the launching were about 8 feet. The master, chief mate, one third mate, chief engineer, first assistant engineer, both third assistant engineers, one boatswain mate, and an able seaman remained on board as a salvage detail for possible relighting of the powerplant and damage control. In order to keep the lifeboats near the vessel, they were secured to a trailing 900 foot line buoyed with life rings. Portable radios were used to maintain communications between

the vessel and both lifeboats. The radio auto alarm activated on 500 kHz was left on to assist rescue units in obtaining RDF bearings. The chief engineer manually started the emergency generator which ran for a while but then developed fuel problems.

Rescue

The U.S. Coast Guard Cutter *Northwind*, en route from the Antarctic to Seattle, heard the SOS broadcast about 9:47 in the morning. At that time the vessels were approximately 225 miles apart, and the *Northwind* immediately diverted to the scene of the distress. The British tanker SS *Arianta* also responded to the SOS and was en route to the scene. A Coast Guard aircraft from Honolulu arrived and had the *Silver Dove* in sight at approximately 1:50 p.m.

Early in the afternoon the master decided to send two of the salvage party, the third mate and one of the third assistant engineers, into the boats. The crew on the No. 1 lifeboat was unable to start the engine because of a dead battery, and all attempts to start the engine with a hand crank failed. In the No. 2 boat, the men had difficulty coordinating the fleming gear, due either to lack of experience or to malaise, as most of the crewmembers in both boats were seasick from the 7 to 8 foot swells. Additionally some of the crew were apprehensive about going alongside of the vessel for fear it would capsize or that the lifeboat would be damaged by the seas smashing it against the side of the ship.

The pickup of the two officers eventually was accomplished by the No. 1 lifeboat which came along the windward side. The third assistant engineer, wearing a lifejacket, climbed down a jacobs ladder into the water and was picked up a few minutes later. The third mate also entered the water, but the lifeboat and vessel drifted away from him. He finally reached the trailing line and hung on until being picked up approximately 25 minutes later by the No. 1 lifeboat. Two crewmembers in that boat were logged for disobedience of the second mate's orders for refusing to row back to the ship.

The Coast Guard aircraft was unable to establish communications with the vessel and dropped three portable radios, none of which was retrieved. At approximately 1:30 in the afternoon the *Silver Dove*'s master, a licensed radio operator with knowledge of morse code, successfully communicated with the *Northwind* on 500 kHz, and indicated that the *Silver Dove* was taking water in the holds and bunker tanks. In answer to an inquiry concerning the possibility of a tow the master expressed doubt that the vessel could withstand a tow in the existing weather conditions.

The crew remaining onboard secured all watertight doors and portholes on the main deck except for one porthole in a locked room on the port side. Waves were coming over the deck edge on the port side as the vessel rolled in the sea.

A slick of sugar and oil which formed to windward during the day appeared to be coming from the port side of the midships area. In the evening, the able seaman went in the upper tween deck area between hatches 3 and 4 and observed no evidence of flooding or sugar on the port side. The engineroom was free of water and not flooding. During the night, the master timed the period of the rolls with a stopwatch and found them to be approximately 11 seconds. It was his opinion that the vessel was gradually sinking deeper in the water. At approximately 6 p.m. the Coast Guard aircraft deployed a data marker beacon transmitting on 240.6

MHz. An Air Force rescue craft relieved the Coast Guard aircraft as On-Scene Commander at 10:22 p.m. Flares were dropped periodically after dark, and at 1:29 a.m. on 1 April the *Northwind* sighted one of these flares. By 5:30 in the morning the rescue of the 33 crewmembers in the lifeboats was accomplished without incident, using the CGC *Northwind's* 26-foot motor lifeboat. Direct communications between the *Silver Dove* and the *Northwind* were established utilizing one of the portable radios recovered from the lifeboats.

At about 6 a.m., the chief engineer entered the upper tween deck area between the No. 3 and No. 4 holds. He noted sugar and water along the port side up to the overhead along the hull. Looking down the ladder leading to the port diffuser room lobby he saw that the water level was up to the second step. The seven remaining persons in the salvage party aboard the *Silver Dove* were removed by 7 a.m. At the time of the rescue the swells were about 8 feet in height and winds 10 to 20 knots. The SS *Arianta* arrived on scene at 10:26 a.m., received medical advice for a sick passenger from the *Northwind's* medical officer and was released from rendering further assistance.

Examination of the *Silver Dove* from the *Northwind* did not disclose any signs of hull failure, and all hatch covers appeared secured. The period of the vessel's roll was timed at approximately 11 seconds and increased during the day to about 15 seconds. Sugar and oil that appeared to be coming from the midships area also increased during the day. By afternoon the port list had increased to 30 degrees and it was considered imprudent to place a salvage crew onboard. Conversations with the master regarding salvage attempts indicated there were no suitable pumps available and that any dewatering would have to take place from deep within the vessel. Placing the vessel in tow was considered impractical due to the apparent loss of stability, as she was becoming increasingly sluggish in the return from port rolls.

That evening, the *Northwind* kept track of the drifting hulk by running on parallel courses close to the ship. At approximately 2:55 a.m. on 2 April, the radar pip of the *Silver Dove* disappeared from the scope. The vessel sank in 2,500 fathoms of water at 14°4′ N, 171°25′ W. Two lights were seen in the vicinity and at daylight they were identified as the two inflatable liferafts from the *Silver Dove*. The *Northwind,* standing by with 40 survivors, recovered both of the liferafts and sank both lifeboats by gunfire. She then proceeded to Honolulu, where the survivors were disembarked.

Conclusions

The Marine Board of Investigation concluded that the *Silver Dove* capsized and sank after developing hull failures in way of plate SG–12. The 22-degree port list was caused by a sudden shift of flooding water and dissolved sugar cargo from the starboard side to the port side of the No. 3 hold. Additional flooding water entered the hull through submerged hull fittings in or above the upper tween (freeboard) deck, resulting in a total loss of righting moment.

The entry of water into the vessel after the initial 22-degree port list probably occurred through one or more leaking 2-inch scupper check valves located in the overboard drains for Nos. 2, 3, and/or 4 cargo holds. The drains serving both the upper tween deck and the cargo port drain wells were cemented over prior to loading the bulk cargo; however, it is concluded that the failure of one or more of the scupper valves would have subjected the concrete drain seals to sufficient hydrostatic pressure when the vessel listed to dislodge the seals, permitting water to enter the vessel at a restricted rate.

Additionally, some leakage into the hull could also have occurred in way of the upper tween deck cargo side ports located in Nos. 2, 3, 4, and 5 holds and the storing ports located amidships. The storing port, which opened inboard, was most susceptible to leakage when subjected to external hydrostatic pressure. It should be noted that cargo and storing ports were required to meet only a weathertight closure criterion since they were located above the freeboard deck. The flooding water having entered the upper tween deck was then able to progress throughout the length of the vessel between the forepeak and afterpeak bulkheads by way of the shelter deck tonnage openings.

When the flooding water in the upper tween deck reached sufficient height, down flooding occurred through the open cargo hatches in each hold along the freeboard deck. The lack of any effective means of securing the drains or the cargo side ports, which were blocked by the sugar cargo in the upper tween deck, prevented the crew from taking any effective action to reduce the additional flooding.

A major contributing factor was the failure of the vessel's officers or the inspection and repair personnel to accurately assess the nature of the failure and the condition of the hull in the area adjacent to the leak when the vessel was at Guam for temporary repairs. The failure of the vessel's officers and inspection personnel at Guam to remove or require removal of additional insulation or sheathing in order to permit further examination of the hull in the adjacent frame spaces before establishing the extent of the temporary repair precluded an adequate evaluation of the degree of deterioration in the adjacent frame spaces.

Another major contributing cause of the casualty was the failure of the vessel's officers to fully recognize the adverse effects on stability created by the unsymmetrical liquid loading of the vessel's tanks to counteract the starboard list and by the free surface effect of liquified sugar cargo. This was evidenced by the failure of the officers to continue their efforts to reduce the inflow of water throughout the night of 30–31 March.

The exact cause of the hull failures is unknown. The testimony provided conflicting descriptions of the faults; however, heavy deterioration was observed by many who were directly involved with the repairs. The probable cause of the deterioration was localized corrosion in the trough formed by the deck plate on the bottom, the built-up deck insulation on the inside and the shell plate on the outside where moisture from condensation, water, and brine spills could collect. This corrosion resulted in reduction in plate thickness and severe pitting near the deck.

The plate thickness near the deck was probably reduced to a point where the combination of plate stress plus stress concentration factors associated with pits resulted in a number of plate penetrations connected by a fracture line. Since the exposure to a corrosive environment would be essentially identical in the three after frames spaces, it is conceivable that the plate failure would occur in several places over a short timespan. Additionally, an indentation existed in way of the original failure in plate SG–12. Such an indented condition in way of deteriorated plate would have a decided influence on the location and extent of the original hull failure.

The crew made every attempt to locate the source of leakage into the No. 3 lower hold after the westward voyage to Saigon, and concluded that the main source of water was the deteriorated vent trunks on the main deck, which they blanked off. The master and other officers still were not satisfied and removed sheating and insulation, drilled test borings into the No. 3 lower tween deck refrigerated box insulation, and made external examination of the hull plating to find other possible sources of leakage. The hull failure in way of the starboard diffuser room may have existed on the westward voyage in addition to the leaking vent trunks, and the amount of leakage was such that it could drain into the lower hold without detection behind the refrigerated box insulation. Since the examination of the No. 3 lower hold was not made until the vessel was partially offloaded and the affected portion of the hull was above the existing waterline, detection of a small hull leak at Saigon or during the voyage to Batangas would have been difficult.

The *Silver Dove* was built to essentially a one-compartment standard of subdivision below the freeboard deck, which exceeds the current ABS classification rules for construction of cargo vessels. The flooding below the freeboard deck in No. 3 hold was confined to the limited section of the vessel only because of these additional subdivision bulkheads. The extension of these watertight bulkheads above the freeboard deck to the weather deck would have prevented progressive longitudinal flooding. The down flooding in No. 3 hatch still would have occurred because of the open cargo hatch in the freeboard deck. The freeboard deck drains were ineffective once the vessel listed to an angle where the freeboard deck edge was below the existing waterline, and there were no alternate provisions for the rapid removal of the entrapped water.

Prior to foundering, little significant water entered the vessel through the weather deck openings into the deckhouse and hull. All openings were secured except for one porthole on the main deck which could not be closed. The surface slick of oil and sugar noted after abandonment was probably due to disolved sugar cargo which lay against the cargo side ports and seeped out of the underwater openings as the vessel rolled in the seaway.

The marine board noted that the abandonment of the vessel was timely and efficient. Using the portable radios to maintain contact between the salvage detail and the lifeboats proved to be very effective. The tethering of both lifeboats to the *Silver Dove* materially contributed to the quick recovery of all survivors. However, the continuous activation of the radio auto-alarm after abandonment, although it could assist rescue units to home on the signal, appears to have unnecessarily disrupted communications on the 500 kHz distress frequency.

The accuracy of the results of the ultrasonic testing conducted during the last drydocking in New Orleans on which both the Coast Guard inspector and the ABS surveyor relied is subject to serious doubt. The gagings show some plate thicknesses, including plate SG–12, in excess of the original scantlings to which the vessel was constructed. Testimony indicated that the exterior of the plating, as well as the exposed portions of the interior plating in No. 3 lower tween decks, showed evidence of scaling which ordinarily is associated with a reduction of plate thickness. That some of the plates gaged may have been renewed is probable; however, the overall gagings did not determine either the minimum or the average thickness of the shell plating or the reduced thickness of the plate SG–12. No attempt was made to insure that readings were taken in way of areas subject to unusual internal corrosion.

The use of ultrasonic gaging without either outlining the places to be gaged, conducting test drillings, inspecting both sides of the plate for localized corrosion, or otherwise verifying the readings provides an uncertain survey of the hull condition. The procedures for the ultrasonic testing outlined in Navigation and Inspection Circular 7–68 are adequate and, if followed during the drydock inspection, would have resulted in readings that were more truly representative of the vessel's actual hull condition. The inspection procedures used during the last drydocking period to evaluate the hull condition of a 26-year-old vessel were according to accepted marine practice. Still, they were inadequate in providing a reasonable assessment of the vessel's actual hull condition, especially in way of the refrigerated spaces, without removal of sufficient insulation to expose sections of the

hull which were subject to accelerated corrosion.

The vessel's personnel were unable to determine the extent of flooding in the No. 3 hold since the recorded bilge well soundings did not change significantly. The fact that only a small amount of flooding water/cargo mixture found its way into the starboard bilge well or the test nipples after the second leak had developed cannot be explained, especially in view of the circumstances which permitted a significant volume of water to shoot out of the test connection after the first leak was discovered. The fact that wet sugar flowed from the test connection and that a syrup-like substance was pumped from No. 3 starboard bilge well indicates that the bulk cargo sugar in the bottom of the hold at that location had a thick, viscous consistency. The flow of the thick water/cargo mixture to the bilge well most probably was restricted by the burlap covering over the perforated bilge well cover.

Since the vessel's personnel did not periodically check on the flooding condition in the No. 3 lower tween deck throughout the early morning hours of 31 March, they were unaware of any changes in the degree of flooding or other conditions which may have occurred. A large portion of the volume of water necessary for the transverse weight shift and resulting 22-degree list most probably entered the vessel between midnight and the time of the sudden list.

Although there is no evidence of willfull misconduct or actionable negligence on the part of shipboard, inspection, and repair personnel involved in the temporary repair in Guam which contributed to this casualty, the evidence does indicate a lack of diligence on the part of those involved in determining the extent of deterioration in the areas adjacent to the temporary repair.

The immediate response by Coast Guard and Air Force aircraft led to the rapid location of the stricken vessel. The continued air coverage was effective in reducing search time by surface units and provided an invaluable morale boost to the survivors. The rescue by the USCGC *Northwind* of the crewmembers in the lifeboats and the subsequent removal of the seven men in the salvage team without mishap in the face of adverse sea conditions and the vessel's listed condition is worthy of special recognition.

Commandant's Action

Upon review of the Marine Board Report and all related material, the Commandant concurred with the Board's conclusion that the *Silver Dove* capsized and sank after developing hull fractures in way of, or near, plate SG–12. The ingress of water through these fractures caused the vessel to take on a starboard list due to the combined effort of the added weight of water and the shifting of the sugar cargo, which became fluid due to the flooding water. To alleviate the increasing starboard heeling moment, the vessel was counterballasted to port. A sudden shift of the sugar cargo and flooding water to port combined with the ballasting caused a 22° list to port. Additional water probably entered through hull fittings in or above the upper tween deck (freeboard deck), and progressed longitudinally through the tonnage openings in the transverse bulkheads flooding the remaining cargo holds and machinery spaces until the vessel sank.

In responding to recommendations by the Marine Board of Investigation concerning mandatory requirements for periodic inspection of selected areas of vessels and specific inspection of areas where brine spills or condensation drainage can collect, the Commandant stated that the Coast Guard is continually searching for methods of improving the commercial vessel inspection program. A computer-based *Vessel Inspection Information System* is presently being designed that will predict inspection needs and their specific locations from the history of vessels, class of vessels, and other related data determined at previous hull and equipment inspections. This system will be oriented toward anticipating problems rather than reacting to the consequences of materiel and personnel failures. The information will be available to the Coast Guard Marine Inspector prior to the arrival of the vessel for inspection. The VIIS program will be underway on a test basis in 1977.

The Commandant did not concur with the Board that a specific periodic interval be established for the removal of insulation for inspection of inaccessible areas. The present regulations give the Coast Guard the necessary latitude to require the removal of insulation for inspection purposes. Circumstances vary considerably from vessel to vessel, making such a hard-and-fast rule unreasonable. The Coast Guard will issue amplifying instructions to field personnel alerting them to the consequences of brine and condensation accumulation in inaccessible areas of the hull. These instructions will reiterate the Coast Guard's policy to take whatever measures are necessary to insure that inaccessible hull areas, especially those showing signs of water or moisture accumulation, are fully and adequately inspected.

The Commandant agreed with the Board that a damage stability criterion for certain cargo vessels would be desirable. A major decision necessary for development of such a criterion is the selection of a level of safety which will be effective and not overly restrict the flexibility of vessel design. Since the vast majority of these vessels are oceangoing and on international voyages which are of a competitive (U.S. vs. foreign flag) nature, the Coast Guard has opened this subject at the Inter-Governmental Maritime Consultative Organization (IMCO), by placing the topic on the agenda of the Subcommittee on Subdivision, Stability, and Load Lines. At the latest meeting of the subcommittee, the Coast Guard presented the results of a recent research project on permeability of

cargo holds. Such research is necessary preliminary to setting a damage stability criterion.

The Coast Guard next intends to suggest that calculations be required to show the capability of each cargo ship to resist flooding. This would provide the master with valuable information on the ability of his vessel to withstand flooding and will be another step toward international development and acceptance of a damage stability criterion.

For several reasons, the Commandant did not concur with a Board recommendation that weathertight standards be required on all closures in the freeboard deck of shelter-type vessels to preclude down flooding within the hull structure. First, the recommendation did not address a circumstances of this casualty, since down flooding was not a contributing factor. Second, the vessel was not truly an open shelter-deck vessel but was a closed vessel operating at a reduced draft, similar to that of a shelter-decker in which the primary means of repelling the entry of seawater is the tightness of the exposed weather deck. Since by regulation (46 CFR 97.15–20) all exposed cargo hatches and other openings must be closed and made watertight there is little reason to do likewise with decks within the watertight envelope. Further, to do so would introduce high and low zones for the restriction of flooding. In the event water was trapped in the high zone (shelter deck) a loss of stability would occur which would be detrimental in two ways, first by the addition of high weight, and second by the free surface effect of the trapped water.

The Commandant did not concur with a recommendation that standards be developed requiring a means of discharging water which may be introduced and confined above the freeboard deck of shelter-type vessels in a listed condition. The bilge pumping system installed in the SS *Silver Dove* was not effective in discharging the sugar-water mixture in the No. 3 cargo hold. There is no practical means of dewatering the shelter deck area under the same conditions of list and cargo consistency.

The Commandant concurred with a recommendation aimed at promoting wider recognition of the hazards associated with adding water to "dry" cargoes. Since the IMCO "Code of Safe Practice for Bulk Cargoes" is a publication based on intact stability, modification of this publication is considered inappropriate. The Coast Guard will, instead, recommend to IMCO that a resolution be adopted which would require that information regarding the dangers of shifting weights after damage be provided to the master. Additionally, the Coast Guard will issue a Navigation and Vessel Inspection Circular regarding the hazards of shifting weights or counterflooding in emergency situations.

The Commandant concurred with the Board's recommendation that consideration be given to including motion sickness medication in lifeboat and liferaft survival equipment. Motion sickness medication is presently required in liferafts fitted for ocean service and regulations will be promulgated requiring motion sickness medication in lifeboats fitted for ocean service.

The Commandant noted that investigation under R.S. 4450, as amended, was initiated by the appropriate Officer in Charge, Marine Inspection, looking toward suspension or revocation of the documents of the two crewmembers who were logged for misconduct.

NTSB Recommendations

The National Transportation Safety Board, as a result of its analysis of this casualty, submitted the following recommendations to the Commandant:

(1) Develop or adapt existing crack detectors to provide marine inspectors with a reliable means of detecting small cracks in ship hulls and utilize such detectors once developed.

(2) Develop detailed procedures to be followed in making hull thickness measurements during periodic Coast Guard inspections. These procedures should insure that reliable ultrasonic readings are obtained, that low readings are highlighted as potential origins of cracks or leaks, and that areas covered by sheathing or insulation are measured by more reliable means such as drill gaging.

(3) Conduct a one-time special inspection of all certificated U.S. seagoing break-bulk vessels constructed before 1965 to detect wastage of hull plating that is covered by insulation and sheathing and wastage of ventilation systems and piping systems that have openings outside the hull. This special inspection should be completed within 2 years.

(4) Develop, with the assistance of the Portland Cement Association, guidelines for the use of cement for making watertight temporary repairs aboard ship and for inspection of such repairs, and issue these guidelines in a Navigation and Vessel Inspection Circular.

(5) Develop standards for and require portable pump(s) with the necessary ancillary equipment to remove seawater which may leak into the cargo holds of ships which carry bulk cargoes.

(6) Identify those "dry" bulk cargoes which can threaten a ship's stability when water is added and publish this information with a description of the hazard in a Navigation and Vessel Inspection Circular.

(7) Establish, with the assistance of the National Cargo Bureau, Inc., procedures for detecting water infiltration into bulk cargoes while the vessel is at sea.

(8) Establish a means to provide rapid technical advice to vessel masters and to Coast Guard field personnel regarding vessel stability and the effects of water entry into bulk cargo.

(9) Advise masters of vessels that carry bulk cargoes that may affect ship stability adversely when water is added to alert the Coast Guard immediately if water leaks into the cargo. ⚓

COAST GUARD RULEMAKING

(Status as of 1 December 1976)

	Notice of proposed rulemaking	Public hearing	Deadline for comments	Awaiting final action	Withdrawn	Published as rule	Effective date
BOATING SAFETY							
Lifesaving devices on white water canoes & kayaks (CGD 74–159) comment period extended 6–12–75	2– 4–75		7–15–75	X			
Standards for flotation (CGD 75–168)	4–29–76		7–30–76	X			
Safe loading and flotation standards (CGD 75–176)	5– 6–76		6–21–76	X			
Low- and non-powered boat capacity (CGD 74–268)	6–24–76		8–24–76	X			
Safety standards for boat gasoline fuel systems (CGD 74–209)	9–30–76		12– 1–76	X			
Visual distress signals on boats (CGD 76–183); Advance notice	9–27–76		2– 1–77				
Standards for electrical systems (CGD 73–217). Corrected 11–11–76	10– 4–76		12– 1–76	X			
BRIDGE REGULATIONS							
Fox River, WI (CGD 75–035)	2– 6–75		3– 7–75	X			
Mystic River, MA (CGD 75–053)	3–27–75		4–29–75	X			
West Palm Beach Canal, FL (CGD 75–070)	3–27–75		4–29–75	X			
Norwalk River, CT (CGD 75–216)	11–21–75		12–31–75	X			
Lake Champlain, VT (CGD 75–222)	12– 8–75		1– 9–76	X			
Missouri R. IA (CGD 75–244)	2–26–76		3–12–76	X			
Mitchell River, MA (CGD 76–014)	2–19–76		4– 5–76	X			
Menominee River, WI (CGD 76–069)	4–22–76		5–25–76	X			
Bayou Lafourche, LA (CGD 76–077)	6–14–76		7–20–76	X			
Sabine Lake, TX (CGD 76–112)	6–24–76		7–26–76	X			
Dodge Island, FL (CGD 76–139)	8– 2–76		9– 7–76	X			
Presumpscot River, ME (CGD 76–135)	8– 2–76		9– 7–76			11–4–76	12– 6–76
Black River, MI (CGD 76–138)	8–23–76		9–28–76	X			
Atchafalaya River, LA (CGD 76–168)	8–30–76		10– 1–76	X			
Coffee Pot Bayou, FL (CGD 76–177)	9– 2–76		10– 5–76	X			
Columbia River, WA (CGD 76–172)	9– 2–76		10– 5–76			11–29–76	12–31–76
Curtis Creek, MD (CGD 76–176)	9– 2–76		10– 5–76	X			
Mokelumne River, CA (CGD 74–140)	9– 2–76		10– 5–76			11–29–76	1– 1–77
Weymouth Fore River, MA (CGD 76–175)	9–23–76		10–29–76	X			
Oakland Inner Harbor Tidal Canal, CA (CGD 76–119)	10–28–76		11–30–76	X			
Cheboygan River, MI (CGD 76–160)	10–28–76		11–30–76	X			
Niantic River, CT (CGD 76–167)	11– 1–76		12– 3–76				
Niagara River, NY (CGD 76–210)	11–18–76		12–20–76				
St. Johns River, FL (CGD 76–178)	11–18–76		12–20–76				
Dutch Kills, NY (CGD 76–216)	11–29–76		12–31–76				
Lake Washington Ship Canal, WA (CGD 76–117)	11–29–76		12–28–76				
MARINE ENVIRONMENT AND SYSTEMS (GENERAL)							
Pipelines, lights to be displayed (CGD 73–216). Corrected 10–16–74	9–19–74	10–21–74	11– 4–74	X			
Visual identification of tank barges (CGD 75–093). Corrected 2–23–76	2– 5–76		3–16–76	X			
Anchorages, Boston Harbor, MA (CGD 76–40)	3–29–76		5–14–76	X			
Navigation safety regulations (CGD 74–77)	5– 6–76 Corrected 5–13–76	6–11–76 Wash. 6–17–76 San Fran.	8– 6–76	X			
Tug assistance (CGD 76–025); Advance notice. Corrected 5–13–76	5– 6–75		8– 6–76	X			
Minimum net bottom clearance (CGD 76–051); Advance notice. Corrected 5–13–76	5– 6–76		8– 6–76	X			

Coast Guard Rulemaking—Continued

	Notice of proposed rulemaking	Public hearing	Deadline for comments	Awaiting final action	Withdrawn	Published as rule	Effective date
MARINE ENVIRONMENT AND SYSTEMS (GENERAL)—Continued							
Regulated navigation areas, Apra Outer Harbor, Guam (CGD 74-281)	5-17-76	.....	6-16-76	X	.....	.....	.....
New Orleans Vessel Traffic Service (CGD 75-112)	6-17-76	.....	9- 3-76	X	.....	.....	.....
Anchorage ground, Hampton Roads, VA (CGD 76-037)	8- 8-76	.....	8-23-76	X	.....	.....	.....
Naval anchorage grounds, Waimea, HI (CGD 74-187)	8- 8-76	.....	8-23-76	X	.....	.....	.....
Anchorage, Lahaina, Island of Maui, HI (CGD 74-191)	8-16-76	.....	10- 1-76	X	.....	.....	.....
Disestablishment of special anchorage, San Diego Harbor, CA (CGD 76-185)	11-18-76	.....	1- 3-77	....	.....	.....	.....
MERCHANT MARINE SAFETY (GENERAL)							
Bulk Dangerous Cargoes, Inspection of Barges (CGD 73-271)	3-11-74	4-15-74	4-30-74	X	.....	.....	.....
First Aid Certificates (CGD 73-272)	4- 2-74	.....	6-15-74	....	.....	10-18-76	11-19-76
	Supp. Notice 12- 1-75	.....	1-16-76	X	.....	.....	.....
Metal boring, shavings, turnings, and cuttings (CGD 75-133)	8- 1-75	.....	9-15-75	X	.....	.....	.....
Marine occupational safety and health standards (CGD 75-101); Advance notice; comment deadline extended 12-11-75	8-11-75	.....	1-15-76	X	.....	.....	.....
Tank vessels; air compressors, cargo handling room bilges (CGD 75-017)	8-13-75	.....	9-29-75	X	.....	.....	.....
Vessel inspection regulations (CGD 75-074)	9-16-75	.....	10-31-75	X	.....	.....	.....
Unmanned barges carrying certain bulk dangerous cargoes (CGD 75-226)	3-15-76	.....	4-29-76	X	.....	.....	.....
Elevators and dumbwaiters, ANSI Code (CGD 75-001)	4- 5-76	.....	5-21-76	X	.....	.....	.....
Vapor recovery systems in cargo transfer operations (CGD 75-208); Advance notice	4- 5-76	.....	6-21-76	X	.....	.....	.....
Towing vessel stability (CGD 76-018); Advance notice	4-12-76	.....	7- 1-76	X	.....	.....	.....
Tank vessels carrying oil in international trade (CGD 75-240)	4-15-76	5-20-76	6-12-76	X	.....	.....	.....
Measurement of vessels (CGD 75-078)	4-22-76	.....	6- 7-76	X	.....	.....	.....
Segregated ballast, certain existing tank vessels (CGD 76-075)	5-13-76	.....	6-30-76	X	.....	.....	.....
Lifesaving equipment for Great Lakes vessels (CGD 76-033); Advance notice	6- 7-76	.....	9- 7-76	X	.....	.....	.....
Bulk dangerous or extremely flammable liquid cargoes (CGD 73-096)	6-24-76	8- 3-76	8-20-76	X	.....	.....	.....
Commercial diving occupational safety and health standards (CGD 76-009); Advance notice	7-15-76	.....	8-16-76	X	.....	.....	.....
Semi-portable CO_2 systems testing (CGD 75-225)	7-26-76	.....	9-10-76	X	.....	.....	.....
Integral diesel fuel tanks, small passenger vessels (CGD 75-184)	7-26-76	.....	10-26-76	X	.....	.....	.....
Damage stability standards for hopper dredges (CGD 76-080); Advance notice	8- 2-76	.....	9-16-76	X	.....	.....	.....
Small passenger vessels, first aid kit (CGD 75-042)	8-19-76	.....	10- 5-76	X	.....	.....	.....
Fees for duplicate documents or licenses (CGD 76-124)	9- 2-76	.....	10-18-76	X	.....	.....	.....
Foreign flag tank vessels, shipping papers (CGD 76-081)	9- 2-76	.....	10-18-76	X	.....	.....	.....
Self-propelled vessels carrying bulk liquefied gases (GCD 74-289)	10- 4-76	11-15-76	12-15-76	....	.....	.....	.....
Tank vessels; loading information (CGD 75-041)	10-12-76	.....	11-29-76	X	.....	.....	.....

NOTE: This table which will be continued in future issues of the Proceedings is designed to provide the maritime public with better information on the status of changes to the Code of Federal Regulations made under authority granted the Coast Guard. Only those proposals which have appeared in the Federal Register as Notices of Proposed Rulemaking will be recorded. Proposed changes which have not been placed formally before the public will not be included:

Merchant Marine Personnel Statistics

Merchant Marine Officer Licenses (Engineer)

Grade	Fiscal year ending 30 June 1976		July through September 1976	
	Original	Renewal	Original	Renewal
STEAM				
Chief engineer:				
Unlimited	137	1,240	26	288
Limited	07	120	00	32
1st assistant engineer:				
Unlimited	133	477	43	87
Limited	04	30	01	08
2d assistant engineer:				
Unlimited	240	754	67	166
Limited	01	11	00	03
3d assistant engineer:				
Unlimited	538	1,073	52	272
Limited	07	00	01	02
Total	1,075	3,713	190	858
MOTOR				
Chief engineer:				
Unlimited	89	301	22	77
Limited	69	321	10	89
1st assistant engineer:				
Unlimited	39	88	12	13
Limited	25	101	04	26
2d assistant engineer:				
Unlimited	50	109	17	25
Limited	11	13	01	03
3d assistant engineer:				
Unlimited	508	1,229	48	321
Limited	09	08	00	06
Total	793	2,240	114	560
Uninspected vessels:				
Chief engineer	202	110	45	25
Assistant engineer	76	21	18	08
Total	278	131	63	33
Grand total	8,230		1,818	

Merchant Marine Officer Licenses (Deck)

Grade	Fiscal year ending 30 June 1976		July through September 1976	
	Original	Renewal	Original	Renewal
Master:				
Ocean	280	1,001	76	287
Coastwise	14	54	02	15
Great Lakes	62	200	07	27
B.S. & L	15	76	00	09
Rivers	18	68	10	35
Chief mate:				
Ocean	136	221	42	68
Coastwise	03	12	00	02
Great Lakes/B.S. & L	00	04	00	00
Rivers	00	08	01	00
2d mate:				
Ocean	180	298	33	63
Coastwise	04	05	00	01
3d mate:				
Ocean	337	459	22	96
Coastwise	12	12	01	01
Pilot:				
Great Lakes	53	123	12	12
B.S. & L	312	383	76	108
Rivers	242	421	71	110
Uninspected vessels:				
Master	388	195	95	49
Mate	83	20	24	00
Radio officer	13	316	04	140
Motorboat operators	3,971	2,951	928	538
Total	6,123	5,827	1,404	1,561
Grand total	11,950		2,965	

Certificates of Registry as Staff Officers

Staff officer	Fiscal year ending 30 June 1976					July through September 1976				
	Atlantic coast	Great Lakes region	Pacific coast	Gulf coast	Total	Atlantic coast	Great Lakes region	Pacific coast	Gulf coast	Total
Chief purser	1	0	9	0	10	0	0	1	0	1
Purser	1	0	1	0	2	0	0	2	0	2
Senior assistant purser	1	0	2	0	3	0	0	0	0	0
Junior assistant purser	2	0	23	1	26	2	0	6	0	8
Surgeon	0	0	7	0	7	0	0	1	0	1
Professional nurse	3	0	3	0	6	1	1	1	0	3
Total	8	0	45	1	54	3	1	11	0	15

Towboat Operator Licenses

Period	Operator		2d class operator		Endorsements	
	Candidates	Passed	Candidates	Passed	Candidates	Passed
Fiscal year ending 30 June 1976	559	253	176	81	188	181
July through September 1976	264	124	133	83	103	90

NOTES.—Total passed in all classes: 812; total licenses (including renewals) for 15-mo period: 20,695.

Original Merchant Mariners Documents

	Atlantic coast	Great Lakes region	Pacific coast	Gulf coast	Totals
July through September	1, 211	423	834	1, 103	3, 571
October through December	1, 080	241	580	872	2, 773
January through March	1, 114	445	777	1, 044	3, 380
April through June	988	481	749	1, 277	3, 495
Total	4, 393	1, 590	2, 940	4, 296	13, 219
July through September 1976	999	512	1, 199	1, 029	3, 739

NOTE.—Total documents issued during 15-mo period: 16,958.

Original and Additional Endorsements

Type	Fiscal year ending 30 June 1976					July to September 1976				
	Atlantic coast	Great Lakes region	Pacific coast	Gulf coast	Total	Atlantic coast	Great Lakes region	Pacific coast	Gulf coast	Total
AB—any waters, unlimited	354	50	137	133	674	53	7	33	37	130
AB—any waters, 12 mo	194	162	110	262	728	51	46	26	47	170
AB—Great Lakes, 18 mo	6	33	77	44	160	2	12	7	17	38
AB—other	108	9	151	107	375	31	4	25	22	82
Lifeboatman	845	170	265	320	1, 600	92	3	58	33	186
Electrician	70	1	79	15	165	7	2	11	6	26
Oiler	210	75	117	65	467	34	22	32	12	100
Fireman-watertender	155	70	104	38	367	29	13	20	8	70
Other QMED ratings	660	16	300	149	1, 125	121	9	87	34	251
Tankerman	331	548	97	666	1, 642	69	167	44	127	407
Entry and steward	3, 830	1, 184	2, 587	3, 728	11, 329	962	364	872	961	3, 159
Totals	6, 763	2, 318	4, 024	5, 527	18, 632	1, 451	649	1, 215	1, 304	4, 619

Nautical Queries

The following items are examples of questions which are included in the First Assistant Engineer and Second and Third Mate multiple choice examinations.

Deck

1. When launching a lifeboat, the tricing pennants should be released
   A. before the boat is lowered from the stowed position.
   B. as the boat fall blocks break clear of the davit head.
   C. before the boat is lowered from the embarkation level.
   D. after the boat is released into the water.

2. Your vessel has a forward draft of 26 feet 11 inches and an after draft of 29 feet 07 inches. How many tons of cargo can be loaded before the vessel reaches a mean draft of 28 feet 06 inches if the TPI is 69?
   A. 204 tons.
   B. 207 tons.
   C. 210 tons.
   D. 213 tons.

3. Which of the following best indicates how many tons of cargo a vessel can carry?
   A. Bale cubic.
   B. Deadweight.
   C. Loaded displacement.
   D. Gross tonnage.

4. A petroleum liquid has a flashpoint of 85° F. This liquid is classed as a grade
   A. B inflammable liquid.
   B. C inflammable liquid.
   C. D combustible liquid.
   D. E combustible liquid.

5. Galvanizing would not be suitable for protecting wire rope which is used for
   A. shrouds.
   B. cargo runners.
   C. stays.
   D. mooring wires.

Engineers

1. With both ends of a three-conductor cable disconnected and arranged so the conductors do not touch each other, an ohmmeter reading of zero ohms between the ends of a conductor will indicate that the conductor
   A. resistance is infinity.
   B. has a partial ground.
   C. is not short circuited.
   D. has continuity.

2. A zener or reference diode is rated at 10 volts, 50 milliwatts. What do the 10 volts indicate?
   A. Forward bias voltage.
   B. Regulated output voltage.
   C. Unregulated output voltage.
   D. Reverse bias voltage.

3. Flooding of any compartment in a ship that results in a serious loss of reserve buoyancy will always
   A. increase the trim.
   B. increase ship stability.
   C. cause a serious list.
   D. decrease the heeling moment.

4. A grade A petroleum product is
   A. a combustible liquid.
   B. jet fuel.
   C. lubricating oil.
   D. a flammable liquid.

5. Carbon deposits on the floor of a watertube auxiliary boiler may be caused by
   A. a faulty ignition electrode.
   B. projections in the furnace opening.
   C. the burner cycling on and off.
   D. too much excess air.

Answers

Deck
1. C 2. B 3. B 4. C 5. B

Engineers
1. D 2. D 3. D 4. D 5. D

MERCHANT MARINE SAFETY PUBLICATIONS

The following publications of marine safety rules and regulations may be obtained from the nearest marine inspection office of the U.S. Coast Guard.* Because changes to the rules and regulations are made from time to time, these publications, between revisions, must be kept current by the individual consulting the latest applicable Federal Register. (Official changes to all Federal rules and regulations are published in the Federal Register, printed daily except Saturday, Sunday, and holidays.) The date of each Coast Guard publication in the table below is indicated in parentheses following its title. The dates of the Federal Registers affecting each publication are noted after the date of each edition.

The Federal Register will be furnished by mail to subscribers, free of postage, for $5.00 per month or $50 per year, payable in advance. The charge for individual copies is 75 cents for each issue, or 75 cents for each group of pages as actually bound. Remit check or money order, made payable to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

CG No.	TITLE OF PUBLICATION
*101	Specimen Examinations for Merchant Marine Deck Officers (Chief Mate and Master) (1–1–74).
101–1	Specimen Examinations for Merchant Marine Deck Officers (2d and 3d Mate) (5–1–75).
108	Rules and Regulations for Military Explosives and Hazardous Munitions (4–1–72). F.R. 7–21–72, 12–1–72, 11–14–74, 6–18–75.
*115	Marine Engineering Regulations (6–1–73). F.R. 6–29–73, 3–8–74, 5–30–74, 6–25–74, 8–26–74, 6–30–75, 9–13–76.
*123	Rules and Regulations for Tank Vessels (1–1–73). F.R. 8–24–73, 10–3–73, 10–24–73, 2–28–74, 3–18–74, 5–30–74, 6–25–74, 1–15–75, 2–10–75, 4–16–75, 4–22–75, 5–20–75, 6–11–75, 8–20–75, 9–2–75, 10–14–75, 12–17–75, 1–21–76, 1–26–76, 2–2–76, 4–29–76, 9–30–76.
169	Rules of the Road—International—Inland (8–1–72). F.R. 9–12–72, 3–29–74, 6–3–74, 11–27–74, 4–28–75, 10–22–75, 2–5–76, 3–1–76, 6–10–76.
*172	Rules of the Road—Great Lakes (7–1–72). F.R. 10–6–72, 11–4–72, 1–16–73, 1–29–73, 5–8–73, 3–29–74, 6–3–74, 11–27–74, 4–16–75, 4–28–75, 10–22–75, 2–5–76.
*174	A Manual for the Safe Handling of Inflammable and Combustible Liquids (6–1–75).
175	Manual for Lifeboatmen, Able Seamen, and Qualified Members of Engine Department (3–1–73).
176	Load Line Regulations (2–1–71). F.R. 10–1–71, 5–10–73, 7–10–74, 10–14–75, 12–8–75, 1–8–76.
182	Specimen Examinations for Merchant Marine Engineer Licenses (Chief Engineer and First Assistant) (1–1–74).
182–1	Specimen Examinations for Merchant Marine Engineer Licenses (2d and 3d Assistant) (4–1–75).
184	Rules of the Road—Western Rivers (8–1–72). F.R. 9–12–72, 12–28–72, 3–8–74, 3–29–74, 6–3–74, 11–27–74, 4–16–75, 4–28–75, 10–22–75, 2–5–76, 3–1–76, 6–10–76.
190	Equipment Lists (5–1–75). F.R. 5–7–75, 6–2–75, 6–25–75, 7–22–75, 7–24–75, 8–1–75, 8–20–75, 9–23–75, 10–8–75, 11–21–75, 12–11–75, 12–15–75, 2–5–76, 2–23–76, 3–18–76, 4–5–76, 5–6–76, 6–10–76, 6–21–76, 6–24–76, 9–2–76, 9–13–76, 9–16–76 10–12–76, 11–1–76, 11–4–76, 11–11–76.
191	Rules and Regulations for Licensing and Certification of Merchant Marine Personnel (11–1–76).
*200	Marine Investigation Regulations and Suspension and Revocation Proceedings (5–1–67). F.R. 3–30–68, 4–30–70, 10–20–70, 7–18–72, 4–24–73, 11–26–73, 12–17–73, 9–17–74, 3–27–75, 7–28–75, 8–20–75, 12–11–75, 5–6–76.
227	Laws Governing Marine Inspection (7–1–75).
239	Security of Vessels and Waterfront Facilities (5–1–74). F.R. 5–15–74, 5–24–74, 8–15–74, 9–5–74, 9–9–74, 12–3–74, 1–6–75, 1–29–75, 4–22–75, 7–2–75, 7–7–75, 7–24–75, 10–1–75, 10–8–75, 6–3–76, 9–27–76.
*257	Rules and Regulations for Cargo and Miscellaneous Vessels (4–1–73). F.R. 12–22–72, 6–28–73, 6–29–73, 8–1–73, 10–24–73, 12–5–73, 3–18–74, 5–30–74, 6–24–74, 1–15–75, 2–10–75, 8–20–75, 12–17–75, 4–29–76, 6–10–76, 8–5–76, 9–30–76.
258	Rules and Regulations for Uninspected Vessels (5–1–70). F.R. 1–8–73, 3–2–73, 3–28–73, 1–25–74, 3–7–74.
*259	Electrical Engineering Regulations (6–1–71). F.R. 3–8–72, 3–9–72, 8–16–72, 8–24–73, 11–29–73, 4–22–75.
268	Rules and Regulations for Manning of Vessels (12–1–73).
293	Miscellaneous Electrical Equipment List (7–2–73).
*320	Rules and Regulations for Artificial Islands and Fixed Structures on the Outer Continental Shelf (7–1–72). F.R. 7–8–72.
*323	Rules and Regulations for Small Passenger Vessels (Under 100 Gross Tons) (9–1–73). F.R. 1–25–74, 3–18–74, 9–20–74, 2–10–75, 12–17–75, 9–30–76.
329	Fire Fighting Manual for Tank Vessels (1–1–74).
439	Bridge-to-Bridge Radiotelephone Communications (12–1–72). F.R. 12–28–72, 3–8–74, 5–5–75.
467	Specimen Examinations for Uninspected Towing Vessel Operators (10–1–74).

CHANGES PUBLISHED DURING NOVEMBER 1976

CG–190, Federal Registers of November 1, 4, & 11.

*Due to budget constraints or major revision projects, publications marked with an asterisk are out of print. Most of these pamphlets reprint portions of Titles 33 and 46, Code of Federal Regulations, which are available from the Superintendent of Documents. Consult your local Marine Inspection Office for information on availability and prices.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