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MARINE CASUALTY REPORT: M/V CHESTER A. POLING; SINKING IN THE A--ETC(U)
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16. Abstract

During the morning of 10 January 1977, the hull of the coastal tanker CHESTER A. POLING fractured just aft of the pilothouse along the bottom and side shell plating while in the Atlantic Ocean off the coast of Massachusetts. Shortly thereafter, the vessel broke in two and both the bow and stern sections eventually sank. Six of the vessel's seven crew members were rescued by Coast Guard air and sea units while the remaining crew member was lost at sea.

This report contains the U. S. Coast Guard Marine Board of Investigation report and the Action taken by the Commandant to determine the proximate cause of the casualty and the recommendations to prevent recurrence.

The Commandant has determined that the proximate cause of the casualty was the total structural failure of the hull girder in way of number 3 cargo tank due to; (a) adverse ballast configuration, (b) the combination of ship's speed versus sea conditions encountered, and (c) a reduced sectional modulus of the hull mid-ship structure due to deterioration.

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M/V CHESTER A. POLING; SINKING IN THE ATLANTIC OCEAN ON 10 JANUARY 1977 WITH LOSS OF LIFE

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.16732/CHESTER A. POLING
27 DEC 1979

Commandant's Action

on

The Marine Board of Investigation convened to investigate the circumstances surrounding the sinking of the M/V CHESTER A. POLING, O.N. 233334, in the Atlantic Ocean on 10 January 1977 with loss of life

The report of the Marine Board of Investigation convened to investigate the subject casualty has been reviewed; and the record, including the findings of fact, conclusions and recommendations, is approved subject to the following comments.

REMARKS

1. On the morning of 10 January 1977, the coastal tanker CHESTER A. POLING completed the discharging of its cargo and departed Everett, Massachusetts enroute to Newington, New Hampshire. During the vessel's transit of Boston Harbor, the master commenced ballasting cargo tanks 3 and 5. The vessel was "riding smoothly" at this time, but based on the weather reports the master decided to continue ballasting into cargo tank 4. As the vessel was proceeding northward, the weather began to deteriorate. At approximately 0830, the observed wind was about 35 knots from the east-northeast (ENE) with the corresponding seas at about 15 feet. The prognosticated weather report by the National Weather Service on 10 January 1977 called for northeasterly winds, 10 to 20 knots veering and then increasing to 25 to 35 knots. The seas were forecasted at 6 to 10 feet. The vessel, at approximately 0840, began to ship water over the starboard side, so the master ordered cargo tank 2 to be ballasted also. Cargo tanks 1 and 6 were not ballasted because, in the judgment of the master, the vessel was riding satisfactorily. At 1037, the CHESTER A. POLING's hull fractured just aft of the pilothouse along the bottom and side shell plating but the deck plating remained intact. The bow and stern of the CHESTER A. POLING were assuming an upward attitude and the center of the vessel was slowly settling beneath the sea surface.

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The master broadcasted a "mayday" message on channel 13 VHF. Several Coast Guard vessels, a Coast Guard helicopter and a civilian pilot boat responded to the distress call. The rescue of the crew members of the CHESTER A. POLING was made extremely difficult by the 55 knot winds and 25 foot seas. At about 1200, the bow section separated completely from the stern. The bow section began to list heavily with the master and helmsman in the pilothouse. The two men jumped into the water and were rescued by the Coast Guard Cutter CAPE GEORGE. Helicopter CG-1438 hoisted one of the five crew members from the stern section in a rescue basket. On the second attempt at hoisting, a crewman fell into the sea while attempting to enter the basket. He was not wearing a life preserver at this time, and he disappeared before any of the rescue craft could remove him from the water. The stern section began to list to starboard and the three remaining crew members abandoned ship. Two of the men were rescued by the Coast Guard Cutter CAPE CROSS and one man was rescued by helicopter CG-1438.

2. The Commandant concurs with the Board that the cause of the casualty was the total structural failure of the hull girder in way of number 3 cargo tank due to; (a) adverse ballast configuration, (b) the combination of ship's speed versus sea conditions encountered, and (c) a reduced sectional modulus of the hull midship structure due to deterioration.

3. It is fortunate that the Coast Guard rescue craft were on scene when the crew members abandoned the CHESTER A. POLING. The sea water temperature on 10 January 1977 was approximately 30°F. According to the National Search and Rescue Manual, CG-308, without anti-exposure suits there is 50% expectancy of death after 10 to 70 minutes of immersion time for 30°F sea water temperature. After 70 minutes of immersion, there is 99% expectancy of death. The manual states that in water temperatures of 35°F and below the survivor suffers a severe shock and intense pain on entering the water. This shock in some instances may be fatal owing to loss of consciousness and subsequent drowning. Most of the survivors were in the water for approximately 10 to 15 minutes. As documented in the findings of fact of the Marine Board Report, the crew members were experiencing this severe shock and numbness. One crew member was unconscious and near death when he was first brought on board the Coast Guard Cutter.

It is evident from this casualty that the Coast Guard should have on board its rescue craft survivor warming equipment. Also, the need for exposure suits on board any vessel which operates in cold sea water temperatures is apparent.

ACTION CONCERNING THE RECOMMENDATIONS

1. Recommendation 1: Further investigation under RS 4450 proceedings regarding Charles Burgess' alleged failure to report the employment and discharge of his crew members is recommended and was referred to the Officer in Charge, Marine Inspection, New York, New York, in whose zone the Master resides, on 19 May 1977.

Action: Suspension and revocation proceedings were conducted by the Officer in Charge, Marine Inspection, New York, New York concerning Charles Burgess' alleged failure to report the employment and discharge of his crew members.

2. Recommendation 2: Survival systems training should be provided merchant mariners within an institutionalized framework. Such could be incorporated into the curricula of merchant marine academies, upgrading schools for unlicensed members of the merchant marine and further reflected in the examinations administered by the Coast Guard. It is recommended that all examinations for merchant marine personnel include questions on rescue and survival. The uninspected towing vessel operator's examination is the only examination that at the present includes questions on this subject. It is also recommended that training in rescue and survival equipment and techniques be required at the fire and boat drill held at the time of biennial, midperiod, and annual Coast Guard inspections by vessel's personnel. This should include the design and use of EPIRB's, helicopter rescue baskets, inflatable life rafts, etcetera.

Action: Many of the training schools already include in their curricula instruction on fire fighting, lifesaving and other emergency equipment. In most of these training schools, the students have to demonstrate their proficiency with this equipment. In order to re-emphasize the importance of survival systems training, copies of this report will be forwarded to the merchant marine academies and upgrading schools for unlicensed seamen.

The publication "Manual for Lifeboatmen, Able Seamen, and Qualified Members of the Engine Department (CG-175)" is currently being revised. The new edition, to be distributed in late 1979, will discuss helicopter evacuation, the use of survival equipment including EPIRB's, helicopter rescue baskets, inflatable life rafts and various firefighting equipment. After the new manual is distributed, examination questions will be developed on these subjects.

The Merchant Vessel Personnel Division in its continuing project to upgrade the licensing examinations will reevaluate the licensing program and expand the scope of the examinations, if necessary, to include questions on EPIRB's, helicopter rescue baskets, etcetera. The recommendation to require survival systems training at fire and boat drills is not concurred with. This subject matter can be more effectively dealt with at established training schools and courses. The aforementioned project to upgrade licensing examinations in this area will act as an adequate test of such training.

3. Recommendation 3: The dependency of mariners upon timely and accurate weather and sea state forecasts should be re-emphasized, both to users and providers of the National Weather Services' broadcasts. It is recommended that the National Weather Service be requested to consider the divergency between predicted and actual sea condition as described in this report with a view toward producing a closer correlation between wind velocities and sea heights in their coastal forecasts.

Action: This recommendation has been referred to the National Weather Service for appropriate action.

4. Recommendation 4: The Marine Board of Investigation recommends further study in the following topics and areas, looking toward possible regulatory changes and requirements:

4a) That primary lifesaving equipment be fitted forward as well as aft on tankships in coastwise routes which have working spaces in the forebody usually occupied when the vessel is underway; that consideration be given to broadening the applicability of 46 CFR 33.05-2(f).

Action: This casualty does indicate that 46 CFR 33.05-2(f) currently applicable to vessels on an international voyage, might be expanded to apply to other vessels. The argument that ready accessibility to a harbor of safe refuge obviates the need to have primary lifesaving gear forward as well as aft, has certainly lost its force in light of this casualty. The Merchant Vessel Inspection Division will coordinate with the Merchant Marine Technical Division in undertaking such a regulatory project.

4b) That consideration be given to amending the current regulations concerning primary lifesaving equipment requirements, with a view toward requiring exposure suits now being manufactured under approval number 160.071 as a portion of the lifesaving equipment on board Coast Guard inspected vessels.

Action: The Merchant Vessel Inspection Division shall develop a proposal for requiring exposure suits for such vessels and submit it to the Marine Safety Council for possible regulatory action.

4c) That limited range/power battery operated radiotelephone communications equipment be provided in areas of tankships usually occupied when underway, other than the site of the main radiotelephone outfit, for survival purposes, where not now required by existing regulations. Although this would not have prevented the breakup of the ship, timely communications between the rescue helicopter and survivors on the tanker after body concerning proper use of the rescue basket could likely have saved Joao daRosa's life. A small portable transmitter receiver would also have been of assistance when the master on the forebody was trying to pass instructions to his crew, and when the Coast Guard patrol craft was attempting to float a raft to the tanker.

Action: This recommendation is not concurred with. The complete structural failure of the main hull girder neither justifies nor warrants regulations which require additional radiotelephone communication equipment in spaces usually occupied when underway. Adequate liferafts in separated work areas could obviate the need for resolution of this communication problem.

4d) That vessels be fitted with a suite of elementary instruments, such as anemometers, barometers, pitch and roll indicators to enable officers to better comprehend the natural environmental conditions to which their ships are exposed. As noted in conclusion 3, the master's perception of the impending storm, and consequently his opportunities to take early and adequate countermeasures for the safety of his ship, was considerably influenced by misleading weather forecasts. A barometer, thermometer, and anemometer could have afforded Captain Burgess quantifiable verification of the forecast and an opportunity to respond earlier (perhaps to return to port) when he realized the true situation; he would not have had to rely on "seamans eye" with the storm already upon him.

Action: This recommendation is not concurred with. As evidenced in this case the measurements made by "seaman's eye" were not much different than actual conditions.

5. Recommendation 5: a) The Marine Board recommends that a method be devised to mark or label Coast Guard helicopter rescue baskets with essential user information. In particular, distressed persons unfamiliar with hoisting requirements and procedures need to have impressed upon them the desirability of landing the basket on unobstructed surfaces and that guide lines are to be tended to accomplish this. This simple assistance should be independent of any instruction which could be imparted by radiotelephone communications.

Action: Pictures of the proper use of the rescue basket are being drawn. The pictures will be distributed to all air stations that have helicopters. Instructions will be provided for the attachment of the pictures to the basket. The Aviation Life Support Systems Manual (CG-429) will be amended to include these instructions.

A new placard will be made for display on merchant vessels which will illustrate and provide instructions for rescue helicopter operations.

Some publications already exist which could assist the training of crew members in helicopter rescue procedures. A paragraph entitled "Assistance by SAR Aircraft and Helicopters" is contained in Defense Mapping Agency Publications 117A and 117B, Radio Navigational Aids and the Merchant Ship SAR Manual CG-421. These publications should be carried by all sea-going merchant vessels and fishing vessels.

Additionally, a plastic card with instructions for rescue by helicopter is published by National Oceanic and Atmospheric Administration (NOAA) for use on fishing vessels. An article will be published in the Marine Safety Council Proceedings informing seamen of the existence of these publications.

5b) Though space and weight constraints limit the type and amount of rescue and medical equipment which can be stowed aboard small Coast Guard search and rescue craft, the experience of this casualty supports a recommendation that cutters with freeboard such as the 95' patrol boat be equipped with scramble nets to assist retrieving distressed persons from the water. Such equipment compared favorably with the less useful block and tackle, and flexible metal jacobs ladder also used in this case by the cutter not outfitted with a scramble net.

Action: The need for scramble nets on Coast Guard rescue vessels is recognized. The nets afford more area for the survivors to grab and cling to, and, therefore, increase the chances of a successful rescue. Scramble nets are now and were at the time of the casualty included on the allowance list for large patrol craft (WPB's). The Search and Rescue Division has reminded all commanding officers and officers in charge of the WPB's to insure that the nets are stowed on board and ready for deployment should their use become necessary.

5c) One of the men rescued by the responding Coast Guard cutters was brought aboard unconscious and displayed a marked degradation of vital signs, believed due to shock and hypothermia. It is recommended that body core (torso) warming equipment be developed for Coast Guard use to enhance the first aid treatment administered to persons in need of it.

Action: Present plans call for the inclusion of survivor warming equipment in SRR aircraft being procured to replace the HH-52 helicopters. Ongoing hypothermia studies are addressing the problem of providing such warming equipment on board existing Coast Guard vessels and aircraft.

6. Recommendation 6: More specific guidance to Coast Guard marine inspectors and vessel operators than is presently available in existing Coast Guard documents and publications should be promulgated concerning the conditions required to satisfactorily inspect the interior of cargo tank areas on older ships in clean product trade. In particular, uncoated tanks should be carefully inspected at about the fifth Coast Guard biennial inspection for recertification, and lighting, cleanliness and accessibility to remote reaches in tanks should be a required precondition to assure quality results of visual inspection efforts. It should also be emphasized that thickness gagings must be compared with data previously tabulated to reduce the chances of accepting information which seems plausible but can be actually erroneous.

misleading or inaccurate. Such verification will also result in developing trend information useful for evaluating the condition of the hull in the future.

Action: This recommendation concerning the promulgation of more guidelines for the inspection of cargo tank areas is not concurred with. Present guidelines are considered adequate. NVC 7-68 provides detailed guidelines regarding inspection and repair criteria applicable to steel vessels. Inspection personnel possess inherent authority to require that vessels be made ready to the extent that an adequate inspection can be completed. The most effective check to insure accurate gagings is to have the gaging equipment tested for accuracy in the presence of the marine inspector. Where equipment accuracy is suspect, readings can be confirmed by drilling.

7. Recommendation 7: In this casualty, the currently prescribed maximum hull steel corrosion limits in the midships area, up to 20% to 25%, appears to have a causal connection with an unacceptable risk level having been reached. Although the original ship's design exceeded the required minimum scantlings, and improper ballasting was a principal factor in this casualty, the hull plating had deteriorated in certain areas to borderline tolerances, as noted in the findings of fact, paragraph 33. A re-evaluation of this standard should be made, particularly as concerns vessels of similar characteristics, age and employment as the CHESTER A. POLING. Under separate cover the Marine Board of Investigation is forwarding to Commandant, U. S. Coast Guard, a compilation of names of such ships.

Action: This recommendation is not concurred with. There is considerable experience which indicates that the present corrosion guidelines are sufficient. The Board determined that the vessel exceeded the required minimum scantlings by 40% at the time of the casualty and that the vessel was overstressed from improper ballasting. The Coast Guard will, however, undertake a review of those vessels submitted by the Board to insure that the corrosion guidelines are being applied.

8. Recommendation 8: The inter-related elements which comprise the concept of the special services coastwise loadline assignment, and certain assumptions included within this framework, should be reexamined in the light of the loss of this tanker. Risk levels have been accepted which may either not be well defined, or not established upon sound empirical data. For example, the stress levels imposed upon the CHESTER A. POLING during its last voyage clearly exceeded those contemplated by the American Bureau of Shipping section modulus and scantling standards, and loadline regulations. The Board of Investigation recommends that a review and analysis of the empirical basis for the coastwise limited services loadline be undertaken. It is also recommended that an

information transfer system be established whereby the American Bureau of Shipping will upon issuance of each loadline assignment, disclose to the Coast Guard the extent of its hull strength evaluation and review.

Action: The concern of the Board leading to a recommendation to review the empirical basis for coastwise limited loadlines is understandable. However, the technical basis for such a review will not be available for two years and such a review because of climatological data collection would extend at least two years beyond that. Even if that were accomplished, there is nothing in this casualty to indicate that the results of such a study would be significant to the point of regulation change.

The Board's findings indicate that the empirical risk level for structures is not, at this time, under serious question since the stress levels "clearly exceeded those contemplated" and it is known that this resulted from an improper ballasting procedure. This problem is immediately solvable by a requirement to provide loading information for the Master on some existing tankships.

In June 1977, the tankship regulations (46 CFR 31.10-32) were changed to require all vessels 300 feet in length and above, construction of which began after September 5, 1977, to have loading information on board. This action was taken upon determination that the American Bureau of Shipping Rules requirement for loading information could be lowered from vessels 400 feet in length and above to all vessels 300 feet in length and above.

The CHESTER POLING casualty has demonstrated that some existing vessels and some vessels under 300 feet in length may also benefit by having loading information on board for the information of the master and crew. Since there are few new and existing coastal tankships less than 300 feet in length, we will examine these vessels individually to determine if each needs loading information. If our examination of these ships shows a need for loading information, the owners will be notified of such findings and regulatory action will be undertaken to require the information.

The Coast Guard does not concur with the recommendation that ABS be required to describe its structural evaluation upon each issuance of loadline assignment. There is no indication that ABS improperly evaluated this vessel for loadline. It is current policy between ABS and Coast Guard to discuss any vessels with unique problems and ABS is already responsible to Coast Guard to reveal its evaluation on any ship Coast Guard believes needs special investigation.

9. Recommendation 9: Had ballasting been carried out in a different sequence of tanks, it is likely that this casualty might not have occurred. Under current regulations, 46 CFR 31.10-30, 31.10-32,

42.15-1 and 44.05-20, this tanker was not required to have a trim and stability booklet or a loading manual prepared to prevent over-stressing of a ship by improper loading. The principal hull stress of a ship lying in still water is created by the longitudinal distribution of the ship's weight, stores, cargo (or ballast, in this case) and buoyancy resulting in a midship bending moment. The trim and stability booklet affords a simplified indirect means of arriving at a stress numeral for any condition of loading, which is not to be exceeded. However, the computations required are normally calculated on the basis of a full (original) scantling hull sectional modulus, and further are completed prior to the commencement of a voyage. Therefore, while it is recommended that the requirement for a trim and stability booklet or loading manual be extended to include tank vessels such as the CHESTER A. POLING, it is also recommended that the peculiar characteristics of the short coastwise trade voyage be taken into consideration. To be of maximum utility and accessibility, the method of deriving a stress numeral should be such that the ship's master or mate will not be overburdened by repetitive, laborious or time-consuming arithmetical calculations. The manning scale for this tanker permitted the two deck officers on board, Mr. Burgess and Mr. Lord, to alternate watches on a six hour rotation. Each would thus normally work twelve hours in every twenty-four, in port and at sea. Under normal circumstances, but one seaman (plus a "dayworker") was available for assistance in cargo handling, steering, navigating, etcetera. Further, voyages of short duration involved continual operations entering and departing port and navigating in coastal waters, close in shore, with concommitant demands upon the crew. Therefore, it is suggested that any regulatory change should encourage development of devices such as an electronic, pre-programmed on board computer which can readily enable a master to make informed and timely decisions concerning his vessel's loading under varying voyage conditions. This rapid problem-solving mechanism would parallel, for example, the modern trend to computer assisted radar collision avoidance systems.

Action: The general intent of this recommendation is concurred with. The Merchant Vessel Inspection Division and the Merchant Marine Technical Division will review the "ease of calculation" problem when making regulations for loading information and will encourage any solution which is feasible and workable.

J. B. HAYES
Admiral, U.S. Coast Guard
Commandant

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

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•16732/CHESTER A. POLING
18 May 1979

From: Marine Board of Investigation
To: Commandant (G-MMI)

Subj: M/V CHESTER A. POLING, O.N. 233334; sinking in Atlantic Ocean on 10 January 1977, with loss of life

FINDINGS OF FACT

1. The coastal tankship CHESTER A. POLING broke in two in the North Atlantic Ocean approximately 6 miles southeast of Cape Ann, Massachusetts on 10 January 1977 at 1037 eastern standard time, during an intensifying winter storm having winds estimated to be in excess of 60 knots and seas averaging 20 to 30 feet in height, while on a voyage from Boston, Massachusetts to Newington, New Hampshire in ballast. Six persons were saved by surface and air Coast Guard units, and one seaman, lost during rescue operations, is still missing and presumed dead. The after portion of the hull eventually sank in approximately 80' charted depth 21°T 930 yards from Eastern Point Light (LL No.29) and consists of cargo tanks number 3, 4, 5 and 6, the fuel tanks, engine room and accommodation areas. Some three months subsequent to the accident, a slight residue of light petroleum product continued to escape in minor quantities from this section of the ship. Chart 13279, Ipswich Bay to Gloucester Harbor, covers this area. The forward half has not been positively identified or located but its final resting place is thought to be in position 42°-33.9'N, 70°-37.1'W, in approximately 200 feet of water. This is the site of an underwater object meeting the physical dimensions of the bow as sonically defined by Coast Guard side scanning sonar search equipment.

2. Vessel Data

Name:	CHESTER A. POLING
Official Number:	233334
Service:	Tankship
Gross Tons:	1546

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Net Tons:	1033
Length:	281 ft.
Breadth:	40'
Depth:	17'2"
Propulsion:	Motor - twin diesel
Horsepower:	2160
Where built:	Mariner's Harbor Staten Island New York
Date built:	1934
Lengthened:	1956
Owner and Operator:	Motor Vessel Poling Bros. No. 1 70 Pine Street New York, New York 10005
Capacity:	21,000 barrels Grade B
Master:	Charles H. Burgess
License:	Master, Steam and Motor Vessels, any gross tons, upon Oceans, 484064, Issue 4-5

Certificates and Inspections:

Last drydock Inspection:	date	April 1976
	port	New York, New York
Last Inspection for Certification:		
	date	8 April 1976
	port	New York, New York
Date cargo tanks internally examined:		April 1976
Loadline Certificates:		Coastwise, Special Service,

SS-11,952-7
GL-11,952-7

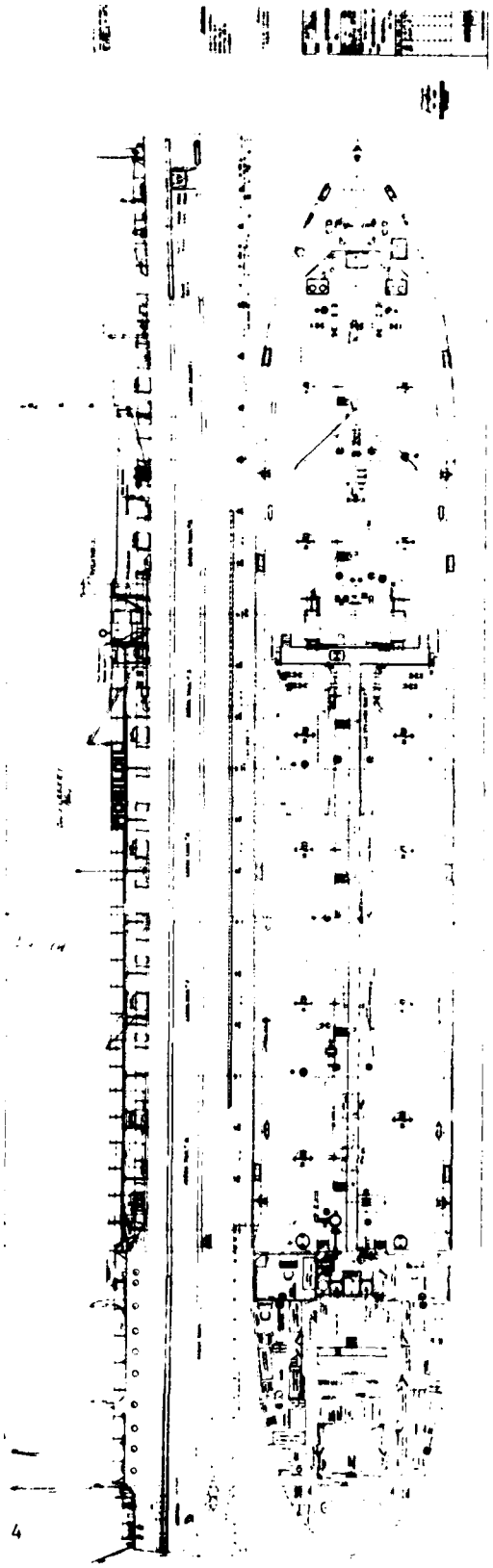
between Hampton Roads, VA and
Eastport, ME; Great Lakes;
Issued 1 Dec 1976

Classification: Unclassed

3. The keel of the CHESTER A. POLING (ex MOBIL ALBANY, ex PLATTSBURGH SOCONY) was laid on 15 February 1934 at United Dry Docks, Inc., Mariner's Harbor, Staten Island, New York, and the ship was launched on 29 June 1934 for the Socony Vacuum Oil Co., Inc. A twin screw, diesel propelled ship, it was constructed of steel to American Bureau of Shipping Maltese Cross A1(E) Oil Carrier Standards, and issued a Great Lakes, Canals and Special Services Coastwise Loadline assignment. The length between perpendiculars was 252', and it could carry 16,977 barrels of Grade B cargo in 7 tanks, port and starboard. The PLATTSBURGH SOCONY was re-engined in 1956 when the original 400 BHP (each) engines were replaced by (2) General Motors 12-567A models rated at 1080 BHP. At the same time, Avondale Marine Ways of Harvey and Westwego, LA, also lengthened the ship 29'4" by replacing the entire midbody from a point 12 inches aft of then existing frame 29 to a point 6 inches forward of frame 110. (The vessel's frames were numbered from aft to forward). Steel plate over 1/2 inch thick was manufactured by Tennessee Coal & Iron Works to American Bureau of Shipping 1948 rule Class B specifications; cargo tanks then were re-numbered 1 through 6. The ship continued to operate under the same name and ownership until 1962, when it was renamed the MOBIL ALBANY. In 1968, on 14 June, ownership was transferred from Mobil Oil Co. to Poling Bros. No. 1 Inc., and the ship renamed the CHESTER A. POLING. It did not have, (nor was it required by current regulations to have) a trim and stability booklet or loading manual.

4. When viewed in profile, the tanker displayed a very low flush decked silhouette, having been originally designed to negotiate inland canals where a ship with a high superstructure would not clear low bridges, figure (1). The wheelhouse deck level was 6.5 feet above the main deck. The designation for loadline administration purposes was self-propelled tank barge; it was withdrawn from American Bureau of Shipping class by owner's request in January 1976. The most recent Loadline Certificate for vessels on special service coastwise voyages established a winter freeboard of three feet, eleven and one quarter inches below the main deck. Records reflect a relatively unremarkable life history. There were no significant structural casualties suffered during the tanker's long service. A pump room fire and explosion in Narragansett Bay in May 1972 was relatively minor and resulted in no major structural damage;

Figure 1.



subsequently two deep well cargo pumps were installed aft on deck over number 5 port and starboard tanks and the forward pump room no longer used. Automated propulsion engine control and monitoring machinery was installed in 1973; and the ship's manning schedule for coastwise voyages of less than 400 miles from port of departure to destination required a seven man complement. On the last voyage, the crew roster was as follows:

1 Master and First Class Pilot	Charles Burgess
	Z 382294
1 Chief Mate	Charles Lord
	Z 390098
3 Able Seamen	Gojko A. Crnosija
	Z 1255867
	Harry Selleck
	Z 106-22-2919
	Joao da Rosa
	Z 1127240 019-32-8848
1 Ordinary Seaman (cook)	Joao J. Gilmete
	Z 933457
1 Chief Engineer	Phil Becker
	Z 071-24-4664

All were steady employees with the Poling Transportation Company, the Master having joined the Poling organization in 1959.

5. Mr. Joao A. daRosa, age 41, of 53 Hendricks Street, Central Falls, Rhode Island, an able bodied seaman aboard the CHESTER A. POLING was last seen by observers floating face downward, motionless, drifting away from the stern of the ship at 1335 on the date of the accident.

His widow Maria D. daRosa, resided at the time of his death at the same address. Mr. daRosa's Merchant Mariner's Document was not recovered.

The following persons were injured and incapacitated more than 72 hours as a result of this casualty:

a. Charles BURGESS, 56, of P.O. Box 2173, G.P.D., New York, New York 10001, Master of the M/V CHESTER A. POLING, Z-382294, license number 484064, was incapacitated for eight days as a result of exposure and a broken finger.

b. Philip G. BECKER, 44, of 111 Old Post Drive, Hauppauge, New York 11787, Chief Engineer of the M/V CHESTER A. POLING, Z-071-24-4664, license number 484152, was incapacitated for eight days as a result of exposure.

c. Charles LORD, 52, of 5 East Columbia Street, Wrightsville Beach, North Carolina 28480, Chief Mate of the M/V CHESTER A. POLING, Z-390098, license number 461845, was incapacitated for eight days as a result of exposure.

d. Harry SELLECK, 45, of 15 State Street, New York, New York, Able Bodied Seaman aboard the M/V CHESTER A. POLING, Z-106-22-2919, was incapacitated for eight days as a result of exposure.

e. Gojko A. CRNOSIJA, 43, of 293 Adriana Street, Saddle Brook, New Jersey 07662, Able Bodied Seaman aboard the M/V CHESTER A. POLING, Z-1255867, was incapacitated for eight days as a result of exposure.

f. Joao J. GILMETE, 47, of 28 Elizabeth Street, Jersey City, New Jersey, Cook aboard the M/V CHESTER A. POLING, Z-933457, was incapacitated for eight days as a result of exposure.

g. William CAVANAUGH, Seaman Apprentice, USCG, assigned to CG-41353, Coast Guard Station Gloucester, Massachusetts, was incapacitated for 39 days due to a back injury.

6. Last Voyage

A cargo of kerosene had been delivered to the Exxon Terminal, Everett, Massachusetts, and the transfer was nearly completed at 0600 on 10 January 1977. Chief Mate Charles Lord had, during the uneventful midnight to 0600 watch, monitored a National Weather Service broadcast which he recollected forecast winds from the east-northeast at 20 - 30 knots, veering southeast to south. Captain Charles Burgess also heard a similar broadcast shortly after he relieved the Mate. Anticipating a need for ballast on the ensuing voyage, he ordered Harry Selleck to begin filling cargo tank No. 3 as the last of the cargo was stripped from No. 6 port tank. Preparations for getting underway completed, the CHESTER A. POLING departed Everett at

about 0615 with about 14,000 gallons of diesel fuel in its bunker tanks. Vital ship control and bridge equipment, listed below, was operating normally, as well as the main propulsion and auxiliary machinery:

2 Triton Modar VHF radio telephone sets
1 Single sideband radio telephone set
2 Decca radar sets
1 Decca gyro automatic steering system
1 Loran "C" set
1 Magnetic compass
1 Sperry gyro compass
2 Shaft RPM indicators

During the transit of Boston Harbor, the ship was generally in the automatic steering mode, as the Master performed navigation duties and the two able bodied seamen, Harry Selleck and Guy Crnosija, alternated as wheelhouse lookout and supervised the ballasting operation on deck. Visibility was about one-quarter mile in snow and mist, air and sea temperatures about 30°F. The empty inbound coastal tanker, HAROLD REINAUER, O.N. 251600 was encountered shortly before reaching the sea buoy, and passing signals were exchanged over the radio.

There was little discussion of sea or weather conditions. Upon reaching North Channel Buoy (LL No. 430) at about 0720, numbers 3 and 5 cargo tanks had been almost fully ballasted. Draft was about 4 feet to 5 feet forward and 11 feet six inches aft, the Master estimated, as an easterly swell was encountered. Although the ship was apparently handling normally, he decided to continue ballasting, based on further weather reports he had received. As with the 0600 broadcast, he noted only wind speed and direction (ENE 25-30 knots) and directed that number 4 tanks be filled. The CHESTER A. POLING's speed over the ground at this time was about 7 to 8 knots, and the ship was rolling about 5° to port and starboard. A routine radio telephone transmission to the Poling Company's dispatcher in New York was made at about 0735 to revise the tankship's estimated time of arrival at Newington, New Hampshire. Neither the Master nor the dispatcher discussed aborting the voyage and returning to port. Appendix (A) illustrates the area.

7. Having taken departure from NC Buoy, the normal track line to Cape Ann, 048°T, was found untenable as rolling increased to about 10° and the CHESTER A. POLING began pounding slightly. Ballasting continued into number 4 tanks, the Master steering 050° to 060°T and adjusting the engines from 1/2 to 3/4 full speed (about 6 to 8 knots) in response to sea conditions, as well as to compensate for the wind and sea setting the ship toward the leeward shore. Number 4 tanks were filled at about

0820, and a short time later, when abeam DG buoy (LL No. 35), Captain Burgess briefly altered course to 341 T to experimentally determine the ship's motion and handling characteristics on this heading. This is the course normally followed by the CHESTER A. POLING, after rounding Cape Ann, Massachusetts and when steering for Newington, New Hampshire. As he had expected, the ship seemed to handle well, and its motion was eased with a following quarter sea. The course for Cape Ann was again resumed, with wind-driven seas coming from about 080°T, and the ship now rolling and pitching fairly constantly. Twenty minutes beyond DG buoy, the Master estimated (no anemometer available) that the wind intensity seemed to be increasing to about 35 knots from the ENE, and the seas were correspondingly higher -- about 15 feet from trough to crest. Visibility remained about 1/4 to 1/2 mile in snow and fog. At about 0840, with the ship located about 2 miles to eastward of the normal trackline, Captain Burgess ordered Guy, the dayworker, to ballast number 2 cargo tanks. Although solid seas were not being shipped, sufficient spray and water was breaking over the starboard side to warrant the Master's reducing speed to engine clutch r.p.m.'s whenever Guy or Harry Selleck went out on deck to operate the starboard deep well pump during ballasting operations. Tanks 2, 3, 4 and 5 were eventually filled, or nearly so, at about 0945, and since the ship was, in the Master's judgment, riding satisfactorily, numbers 1 and 6 tanks were not filled with sea water. According to the Master, this ballasting sequence was customary practice. The tanks' liquid level was visually estimated by observation through the dome vent; Selleck noted also that some flame screens were being dislodged by ballast sloshing against them as the ship rolled.

8. Weather and Sea Forecasts

Sea conditions had become progressively worse as wind velocity increased between 0740 and 1030. At 0600, 10 January, the Master had obtained some information through the meteorological forecasts broadcast on the VHF radio telephone marine weather channel. In particular, he had noted wind direction and speed predictions and had also been told by Mate Lord, when relieving him, that the tankship POLING BROS. No. 7, O.N. 223670 at 0130 on 10 January had reported weather that wasn't "too bad" at Cape Ann. On 9 January, at 1700, the National Weather Service Forecast Office, Boston, Massachusetts had issued a marine warning as follows:

> "Marine warnings for the Massachusetts and Rhode Island coastal waters. Gale warnings issued at 5 pm (1700) for increasing winds late tonight and Monday. Winds veering to northeasterly late tonight, becoming east to southeast 35 to 45 kts Monday."

Chief Mate Lord, while on watch enroute Boston, had received this broadcast. The following forecast was transmitted by the same office on January 10, 1977 at 0316, and by the Coast Guard at 092150Z, 092225Z and 100839Z January 1977:

> "5 am (0500) Merrimac River to Block Island, Gale Warnings in effect. A developing low pressure along the Carolina coast will move rapidly northward into New England early tonight intensifying into a gale by this afternoon. Gale weather center will continue northward into the St. Lawrence Valley Tuesday. Northeasterly winds to 10 to 20 kts veering to the east this morning and increasing to 25-35 kts. Southeasterly winds 35-45 kts and gusty this afternoon, veering to the southwest to west tonight continuing 35-45 kts. Tuesday westerly winds 25 to 40 kts. Snow changing to rain this morning continuing heavy at times before ending this evening...Seas building to 6 to 10 feet over exposed waters by late afternoon subsiding to 5 to 8 feet tonight and Tuesday. The above forecast covers the coastal waters within 25 miles of the shore."

Chief Mate Lord also monitored this forecast on the radiotelephone while offloading cargo during the midwatch on 10 January, but did not relay it to the Master.

9. In an analysis of meteorological factors pertinent to this casualty, a National Transportation Safety Board meteorologist reported after the casualty that based on data collected on the 10th of January,

> "Moderate to heavy snow and strong gusty easterly winds would have prevailed at the time and place of the accident...the wind speed would have been about 35kts with peak gusts to 45 to 50 kts, and the height of the waves would have been 3 to 5 feet...The existing winds at the time of the accident probably were slightly stronger than forecast. The fact that the forecast started the morning with lesser speeds could have led the Captain to attempt the trip before the stronger winds were expected."

The three men working and on watch topside on the CHESTER A. POLING, however, agreed unanimously that the ship endured more severe wind and sea conditions after 0740 than had been forecast, and especially so as regards the height of seas. Their opinions were based solely upon visual observation, without benefit of recording or measuring instruments. Coast Guard rescue unit personnel, without exception, confirmed the merchant mariners' impressions when they later arrived on scene - and further, related that the storm intensified for some hours after the tanker broke in two, with wind gusts peaking at about 60 kts and seas over 30 ft. in height.

10. The ship was again temporarily brought about to a heading of 341°T when the Newcomb Ledge buoy (LL No.32) was abeam to port, and Captain Burgess concluded that the ship's handling and sailing characteristics would be satisfactory whenever he could make the change to this course permanently. He had found that the steep sea conditions necessitated continual engine speed adjustments, from "clutch" position, about 4 to 5 kts, to 1/2 to 3/4 speed, as well as helm corrections to accommodate larger seas and minimize pounding, which occurred occasionally. In order to expeditiously get the ship into position where he could begin steering a 341°T heading as soon as possible, Burgess changed course to 080°T, endeavoring to reach a point about 6 miles east southeast of Cape Ann. Consequently, seas which appeared to be regularly in excess of 20' in height, and about 150' between crests, were impacting upon the tanker from 000° relative to 010° relative. This required proceeding at clutch to half speed ahead constantly to keep the CHESTER A. POLING from slamming into the waves and ease pounding. Some consideration had been given to terminating the voyage, but since the ship had successfully endured worse weather and sea conditions in the same coastal region under Captain Burgess' command on earlier voyages, he elected to continue toward Newington, instead of returning to Boston, as he felt no other safe haven was available nearby. The Master had concluded that optimum evasive action consisted of making a final alteration to course 341°T as soon as possible.

11. Harry Selleck was in the wheelhouse on watch with the Master at about 1000, and Guy Crnosija was in the galley on the stern getting coffee and a change of dry clothing. It was expected that the final course change to 341°T, clearing Cape Ann for Newington, New Hampshire, could be made "in about 20 minutes". Sometime between 1000 and 1015, a banging noise was heard by Burgess, and Selleck went out on deck for several minutes to search for something that might have come adrift and account for the noise. Selleck claims he saw nothing amiss, and reported so to the Master when he returned to the pilothouse. The Master recollected that a fender was found striking a wheelhouse support member. At 1020, Captain Burgess established the ship's position by radar bearing and range on Cape Ann lighthouse (LL No. 27) as 42°32.6'N, 70°32.3'W and confirmed his chartwork by loran. The main propulsion engines were operating between clutch speed and half ahead, when at about 1035 Selleck saw through a forward porthole,

"a sea of enormous proportions...pick the ship up. The bow came down and buried...into a wall of sea which was twice the size of the normal seas that had been reported. The ship vibrated. She shook as she was coming down as if someone was pulling her back and forth like sea-sawing. She shook and then she came up...that is when the Captain, who was doing some work either on the chart or at the chart table..., slowed her down. The stern had been up and then when she came back I heard a large bang like a piece of steel hitting the deck."

Having placed the engine controls at clutch speed, Captain Burgess again waited while Harry Selleck reconnoitered for the source of the noise. Selleck saw nothing out of place on deck after a brief look, and engine speed was increased to about one half ahead. When the next wave was encountered, a loud crunching, grinding reverberation occurred, the ship lurched, and the hull broke in two just aft of the wheelhouse, in way of no. 3 cargo tank, forward of web frame 39. The time was approximately 1037.

12. As the hull girder sagged, the deck plating remained intact, and the two men in the wheelhouse could see that both bow and stern were assuming an upward attitude, though the center of the ship was slowly settling beneath the sea surface. All shipboard machinery quickly ceased operating, except electrically powered equipment drawing current from battery powered sources. The general alarm sounded, and was heard by the five crewmen aft in the accommodation and engine spaces where emergency electrical lighting aided the engineer, Phillip Becker, who was trying to restart a ship's service generator. In the pilothouse, Charles Burgess found that the VHF-FM radiotelephone was still operational, as it was energized by storage batteries installed on the pilothouse roof. He broadcast a "mayday" message on channel 13, which was received by, among other stations, U.S. Coast Guard Cutter CAPE GEORGE (WPB 95306) at approximately 1040. As the cutter prepared to get underway from its berth at the State Pier, Gloucester, Massachusetts, Burgess and Selleck saw, through the after port holes on the POLING'S pilothouse, all of their fellow crewmembers emerge on the ship's after deckhouse. Life preservers were donned by all hands within moments after the accident, without any orders having been given. Selleck's attempts to communicate with the men on the afterbody via a battery operated megaphone (which became inoperative after a short while) were frustrated by the high noise levels caused by the wind and sea. The Master and the A.B. realized that they were marooned on the bow, which remained attached to the stern by the deck plating, without any primary lifesaving equipment such as a lifeboat or raft. They decided that they would stay in the wheelhouse as long as the bow retained buoyancy, and await Coast Guard assistance. At the direction of the CAPE GEORGE channel 16 was utilized for communications in order to disseminate the radiotelephone information being generated to all parties involved in the rescue.

Eventually, this included: Coast Guard Rescue Coordination Center, Boston; Coast Guard Group Boston; Coast Guard Station Gloucester; Coast Guard Air Station Cape Cod; Coast Guard Cutters CAPE GEORGE and CAPE CROSS (WPB 95321); Coast Guard utility boats CG-41353; CG-44317; CG-44307; CG-44315 and CG-44325, and Coast Guard helicopter CG-1438; USCGC FIREBUSH (WLB 393) and USCGC DECISIVE (WMEC 629); and Gloucester Pilot Boat CAN DO, O.N. 281812. Of these, the CAPE CROSS, CAPE GEORGE, CG-41353 and CG-1438 eventually arrived on scene, while the remaining small craft coxswains were forced to abort their missions due to damage to their boats or other difficulties encountered under the adverse operating conditions.

13. Although limited in the resources available to them, Selleck and Burgess made an effort to assist the rescue forces proceeding toward them. The Master anticipated that the wreck would drift for some distance from the position he had relayed to the Coast Guard during the forty minutes or more before they could arrive on scene. Therefore, an Electronic Position Indicating Radio Beacon (EPIRB) was given to Selleck to lash to the bridge railing, because Burgess believed that the equipment was designed to emit a direction-finding radio frequency signal for shipboard as well as helicopter reception. Selleck was unable to rig it because he feared being washed overboard as seas broke on the bridge level and invaded the pilothouse. The Leigh Vespir EPIRB was held by Selleck until the first cutter arrived on scene; then he discarded it, not knowing whether it had activated or not. Before the Coast Guard Cutter CAPE GEORGE arrived, the Master of the tanker requested that the initial rescue effort be directed to his crewmembers on the stern, because the two men in the wheelhouse expected they could be saved only by jumping into the sea.

14. Rescue Efforts

LTJG James R. LOEW, USCG Commanding Officer of the CAPE GEORGE, had his unit underway within five minutes after receiving Burgess' distress message at 1040. As he departed Gloucester Harbor, he noted that Coast Guard Station Gloucester utility boat CG 41353 was also outbound ahead of him, while pilot boat CAN DO was astern of the 95 footer. Twenty foot seas from the southeast were encountered at the breakwater, and the cutter's speed was reduced to 11 knots for vessel safety. The pilot elected to return to his berth. Meanwhile, Cutter CAPE CROSS, although on a reduced readiness status for maintenance purposes and not required to respond, also made preparations to get underway.LTJG Gary Krizanovic, USCG, Commanding Officer, volunteered his unit's services, and departed the State Pier, Gloucester at 1115. The CAPE GEORGE, first on scene, found the broken CHESTER A. POLING at 1130 about five miles southeast of Eastern Point, Massachusetts. Wind velocities were in the vicinity of 55 to 60 knots, as indicated by the CAPE GEORGE's anemometer, seas at least 25 to 30 feet. On board the CHESTER A. POLING, Captain Burgess estimated 50 knot winds and 20 to 25 foot seas. Visibility remained limited to a quarter mile or less in heavy rain and wind-driven spume; air temperature had risen to about 40°F. The Master also saw that personnel on the stern, which was still joined to the bow, had launched the fifteen man inflatable life raft, but that it had gotten out of control and was lodged out of reach of the crew in the midships deck area over number 5 and 6 cargo tank.

15. The CHESTER A. POLING was observed lying in the trough of the seas, oscillating erratically, but generally portside to windward. An attempt to communicate by electric loud hailer with the men on the stern was unproductive, and Mr. Loew found that he could not safely bring his vessel alongside the after body to take the men off due to the rapidly changing relative motion of the two ships. The second strategy devised consisted of firing a shoulder line throwing gun projectile with a light messenger line attached across the hulk, and to then guide an inflatable life raft from the rescue craft to the POLING. Two projectiles failed to reach the target, due, in the opinion of the Coast Guardsmen, to the 60 knot winds affecting the flight trajectory and the unstable firing platform which was rolling 40 to 50 degrees from the vertical, complicating the rifle's aim. Mr. Loew informed Captain Burgess by radiotelephone that he would next try to float a liferaft to them with only a tending line attached to it from the cutter, but without a line secured to it from the tanker. Before this could be accomplished, however, the weakened steel deck plating in way of number 3 tank finally parted at about 1200, and the bow with its two occupants in the wheelhouse swung about 180° relative to the stern, so that the ship's two halves were now pounding upon one another, starboard to starboard, connected only by a segment of starboard sheer strake.

16. Some three to five minutes of working was sufficient to break the bow completely free, and it drifted over the submerged forward end of number three and four cargo tanks, and then cleared the afterbody. Listing heavily and bow canted skyward, seas began pouring into the portside wheelhouse portholes. With some difficulty, the starboard wheelhouse door was pushed open against the weight of the rising water, and the Master made his last radiotelephone transmission to the Cutter CAPE GEORGE, about 100 feet distant, informing them that they were abandoning ship. Mr. Loew quickly maneuvered to the downwind side of the bow and the cutter's port and starboard scramble nets were made ready to retrieve the two merchant seaman who had jumped into the water (Selleck first), heavily clothed and still wearing personal floatation devices. Between the Master's efforts and Mr. Loew's shiphandling, Charles Burgess was brought alongside the cutter within three to five minutes, and although unable to help himself due to exhaustion, the weight of waterlogged clothing and hypothermia, he was hoisted aboard with his arms entwined in the starboard scramble net. A medical examination later revealed that his sole injury consisted of a broken finger on the right hand, suffered sometime between leaping into the sea, and his rescue. Harry Selleck, however, was too cold and tired to swim when he entered the ocean, and after kicking off his sea boots, he rolled over and floated face upward, drifting downwind from the submerged bow. He didn't have sufficient energy to grasp the nearby ring buoys and heaving lines thrown by the cutter's deck force, and at one point drifted so close alongside the patrol boat's stern that the conning officer stopped the engines until Selleck was clear of the propellers. After this unsuccessful first attempt, the able bodied seaman drifted away and lost sight of his rescuers. Although in despair, he felt

> "the only thing that kept me alive was that I knew the Cutter CAPE GEORGE knew that they had missed me and that I was still out there.

> There were times when I was going to give up. I was going to take off my life jacket and forget it, but...they came back and threw heaving lines and I couldn't grab the heaving lines because my hands were pretty well frozen and I didn't have the strength. I got hold of the net they had over the side. I grabbed it the first time and let go, and then I grabbed it the second time...they dragged me aboard."

The time was about 1225. Both men had been administered first aid treatment for exposure and shock as soon as they were onboard the cutter; Selleck responding more slowly to treatment because he had been in the sea for ten to fifteen minutes.

17. Petty Officer John T. Burlingham, BM1, USCG was coxswain in charge of CG 41353 on the 10th of January and piloted his craft to the sinking ship in sea and weather conditions which he initially believed far exceeded the craft's capabilities. The utility boat had a total crew of five men on this mission, including two who were in training status. After getting underway, and the two 320 horsepower diesel engines had developed normal operating temperatures, Burlingham increased speed rapidly and at 1050 was proceeding at about the boat's limit, 23 to 24 knots, when abeam Gloucester Harbor Buoy 13 (LL No. 40430). Outside the harbor breakwater he immediately encountered 15 to 20 foot seas which appeared to be growing in height. His crew had donned survival wet suits, but as the boat was being rather violently buffeted by the seas, the coxswain reduced speed to 15 knots. Shortly thereafter, the 41353 toppled sideways off a wave top and when it landed in the trough, about 40 feet below, Seaman Apprentice William Cavanaugh USCG incurred a back injury. The boat's speed reduced again and Burlingham discussed returning to Coast Guard Station Gloucester with his parent command over the radiotelephone. However,

> "...I couldn't turn around...the seas were out of the southeast with an occasional freaky sea coming in from the side...I am getting into deeper water, and the seas are getting bigger...I elected to keep going, because I didn't feel it was safe to turn around...I got out there as best as I could to see if I could do anything...all my crew was sick. I had lost my radar, I had been buried four times in the seas. Just completely buried. I lost my boat hooks, windshield wiper, lines over the side, life raft had broken loose...the seas then were a good 30 feet, occasionally you would get that big one, 40, 45 feet. I went across.

> ..under the tanker's stern and it seemed she was coming right down on me, she seemed to be gyrating on the surf...I found a good spot, and I turned around and I reported (to the station) that my injured man was losing feeling in his legs, and my intentions were to return to station...On the way back in, I took water through the starboard window, (which was open) because...I didn't have any windshield wipers...the wind was really increasing, blowing 50 steady...the radar antenna pedestal was damaged, pushed back,...from the seas coming over."

Although Petty Officers Burlingham and MK3 James A. Vedrani USCG received minor injuries during this sortie, neither was seriously affected and both remained on duty. Seaman Cavanaugh was not fit for duty for thirty-nine days.

18. The CAPE CROSS arrived on scene approximately 1300 and found the CAPE GEORGE standing by the POLING'S afterbody, but preparing to return to Gloucester with the two survivors who required medical evaluation. Coast Guard helicopter 1438, which had been launched from Coast Guard Air Station Cape Cod at 1242, under marginal flying conditions, was also approaching and expected to arrive in five to fifteen minutes. By 1300, the CHESTER A. POLING's stern had drifted west northwest to within approximately 2000 yards of Eastern Point--a distance of 6.5 miles in 2.5 hours. Radiotelephone communications between the three Coast Guard units were good on Channel 16 FM, the helicopter using this frequency with the CAPE GEORGE for radio direction finder homing purposes. The aircraft commander, Lt. James B. Wallace USCG, did not, however, receive an electronic signal on the EPIRB frequency which he was tuned to also. It was agreed that the best strategy for rescuing the five remaining merchant seamen would be to evacuate them by helicopter hoist. The CAPE GEORGE departed and the CAPE CROSS maneuvered slowly in the vicinity until the helicopter arrived at 1315.

19. As the ship's general alarm bell reverberated through the after deckhouse when it split in two at 1037, Mate Charles Lord, Engineer Philip Becker, Joao daRosa, Guy Crnosija and Joao Gilmete mustered in the area of the after-passageway, near the exit to the deck. All had dressed in heavy warm clothing and wore their life preservers. Phil Becker had gone topside immediately after the ship's bottom plating fractured and saw Harry Selleck lean out of the wheelhouse door with an electric megaphone, and thus learned that the Coast Guard was responding to the ship's distress radiotelephone broadcast. Then, while the Chief Mate had gone below momentarily to check the condition of the forward engineroom bulkhead, Becker, Guy Crnosija and Joao daRosa had begun launching the ship's inflatable liferaft. The raft, a fifteen person R.F.D. model, serial 509 (last serviced in March 1976), was mounted on top of the starboard forward corner of the after-deckhouse.

Almost directly athwartships, on the port side, an eighteen person capacity oar propelled metal lifeboat was cradled under Welin quadrantal davits fitted with rope falls. Guy, the dayworking able bodied seaman who was reported to be most familiar with the equipment, triggered the raft's hydrostatic release, and the trio lifted the container out of its cradle and launched it off the starboard side. At this time, the ship was wallowing portside to wind and seas. About 40 to 50 feet of sea painter was withdrawn from the container, and Guy began to feel resistance against the line at this point, but the raft did not inflate and open its container. Neither daRosa nor Crnosija was able to succeed after repeated attempts. Heaving on the sea painter simply resulted in bringing the raft and container back in alongside the ship. The weight of the container and its contents, combined with the action of the seas, seemingly did not provide sufficient resistance to overcome whatever was restraining the sea painter from paying out, since it did not appear to Guy to have been withdrawn for its full length. (Phil Becker thought that only about 20 feet or so of line had been pulled out of the container). They abandoned their efforts then to inflate the raft, and next turned to the vessel's lifeboat on the port side. But as Chief Mate Lord, Phil Becker and Joao da Rosa released the boat tackle and began to work on the crank-operated davits, a substantial sea boarded the after deck house and nearly washed them all over the side. They returned to try again, but were again driven away from their work by waves breaking over the ship. Chief Mate Lord concluded that the boat could not be launched against the heel and list of the ship, as well as the adverse sea conditions; and that even if the boat were put in the water, lack of fendering would cause it to be demolished against the ship's side in short order. This avenue for survival also frustrated, the men were temporarily at a loss and huddled together in the weather deck passageway doorway, seeking shelter from the seas and rain. From time to time, Becker and Lord checked again the condition of the engineroom, feeling that the stern would float as long as the cargo tank, bunker tank and engineroom bulkheads remained intact. Lord also went topside on the after deck, and punctured seven or eight 55 gallon drums of lube oil stowed there, hopefully to achieve a calming affect on the seas. During this period, the inflatable liferaft had somehow floated around the stern of the ship and was observed by Lord to have inflated and lodged itself in the wreckage of the torn catwalk and deck gear on top of 5 and 6 cargo tanks, portside. Lord attempted to make his way forward over the after-deckhouse; again the seas broke over him, and he was unable to get close enough to retrieve the raft. Charles Lord, with Crnosija's assistance, then made an attempt to bend some buoyant 6" circumference polypropelene hawser to an empty oil drum, intending to stream this over the side of the stern, and thus have something available for the men to hang onto if they had to go overboard.

20. At this juncture, the crew paused in their attempts to deploy survival equipment, and various individuals began to return to their rooms to exchange wet for dry clothing. The first rescue vessel, CAPE GEORGE, soon appeared out of the fog and rain, attracting their attention. The men were unable to decipher the cutter's intentions or understand the instructions being passed to them by electric loudhailer. They witnessed the bow break away from their portion of the hull and saw with some relief their Master and shipmate being rescued.

The CAPE CROSS also arrived, followed by Coast Guard helicopter CG 1438 at 1315. Although there was very little clear, open space available on deck, because paint and storage lockers, railings, ventilator trunks, oil drums, after mast and guys, etcetera, obstructed the after deck area, the aircraft lowered a guide line attached to a rescue basket to the ship. The cook, Joao Gilmete was designated by the Chief Mate to be the first man taken off. Meanwhile, Crnosija, Becker and daRosa, assuming that the helicopter crew was having difficulty due to the deck clutter, began lowering the 70' high aftermast. Charles Lord tended the rescue basket, which had landed on the port after corner on top of empty oil drums, while Gilmete, still wearing his life preserver, entered it. The aircraft commander found that the 50 knot winds, gusting to 60 knots were presenting a real challenge in maintaining altitude while trying to hover on station over the rapidly moving ship. Hoisting began as soon as Gilmete was in the basket, but instead of ascending vertically, the conveyance failed to clear a deck awning pipe framework and tripped over the ship's side. The cook and rescue basket entered the sea, but re-emerged, and Gilmete was quickly brought aboard the helicopter unharmed.

21. Lowering the aftermast was a drawn out and complicated process due to the deck's incline. Although the guy wire shackles released readily, the forward list of the ship forced a pin in the mast heel fitting to bind, and it was finally worked out with hand tools by Phil Becker and Guy Crnosija. Joao daRosa had gone to the Chief Mate, as the helicopter rescue basket was lowered the second time, and it was agreed that the A.B. would be the next man lifted off. Mr. Lord recollects that he was very heavily dressed in warm, bulky clothing but did not appear to be wearing a life preserver at this time. He had seen Mr. daRosa change into dry clothing just before the cook, Gilmete, was rescued, and formed the impression that the life preserver was discarded by daRosa at that point. Mr. daRosa had clambered atop the oil drums stowed aft of the lifeboat; the rescue basket at this point was outboard of the ship's hull at deck level and swung away just as he began to step into it. He appeared to Mr. Lord, some ten feet or so away, to be clinging to the outside of the ship's railing. At this moment, Lord was distracted by the descent of the ship's aftermast; when he next looked for the A.B.,daRosa had disappeared over the ship's side. Mr. Lord, the last person to associate with daRosa, was uncertain whether the man jumped, slipped or fell, but was of the opinion that he had never actually managed to get into the basket. Within seconds, daRosa surfaced in the sea next to the ship, took three or four strokes toward the basket, and again disappeared from sight. He reappeared for the last time, floating face downward with arms spread-eagled and then drifted away in a breaking sea.

22. Shortly after this traumatic experience, Mr. Lord attempted to enter the rescue basket himself when CG 1438 lowered it to the ship a third time. It was, again, outside the ship's railing, resting momentarily against the hull at deck level, with Phil Becker trying to tend the trail line or hold onto the basket. The combined motion of the tanker hull and helicopter was such, however, that it was violently jerked away, and Guy grabbed the mate just as he too was about to leave the deck and go over the side. The trio then realized that the afterbody

was listing more than 45° to starboard, and that the hull was less buoyant and beginning to roll sluggishly, with only the aft 40 to 50 feet still above water. Charles Lord then suggested that they now abandon ship; the helicopter appeared to have winched in the rescue basket and for the moment at least, rescue by air evacuation appeared to recede. Lord and Guy Crnosija jumped over first, the latter taking a ring buoy with him, with Phil Becker directly behind them. Aside from the life preservers they wore, this was the sole ship's survival equipment they brought with them when they entered the cold stormy waters, now lashed by 50 to 60 knot winds. Lord, a non-swimmer, floated near the forward end of the wreck, while Becker and Crnosija, fearing that it would overturn on top of them, kicked and swam away together as strongly as they could in the direction of CAPE CROSS, their arms hooked into the ring buoy.

23. Aboard CG 1438, Lt. James Wallace, the pilot, had attempted to maintain a 70-foot hover altitude during hoisting operations. His craft and the CHESTER A. POLING were rapidly changing motion relative to one another, surging in response to turbulent wind and sea conditions. He judged the situation to be quite hazardous, but accepted the risk because of the dangerous situation the seamen were in. When daRosa was seen to have gone over the ship's side by Petty Officer Reginald Lavoie, USCG, the hoist operator, Lt. Wallace ordered that the rescue basket be put in the water to try to snag daRosa. The aircraft commander saw daRosa float by the helicopter at a distance of about 20 feet from the ship, face down and arms outspread, wearing a dark outergarment. There was no life preserver visible. DaRosa could not be retrieved and LT Wallace maneuvered his aircraft back over the stern to aid the three remaining men just as the ship began to roll over to starboard. The CAPE CROSS was contacted by radiotelephone and requested to proceed toward Becker and Crnosija, about 50 yards away from the stern. The helicopter then flew slowly over Lord, towing the basket in the water. The aircrew was successful in dragging the basket under Lord on the third pass, and he was hauled up and into the helicopter. Lord had been afloat in the North Atlantic Ocean about ten to fifteen minutes. The helicopter radio man assisted Lavoie in wrapping the inert Chief Mate in blankets, and shortly thereafter, Gilmete and Lord were delivered to Coast Guard Station Gloucester for further transport to Addison Gilbert Memorial Hospital.

24. The CAPE CROSS, under the command of LTJG Gary Krizanovic, USCG, had begun searching to no avail for daRosa when informed by CG 1438 that the seaman had been lost. A fruitless attempt was also made at LT Wallace's direction to instruct the shipwrecked seaman by electric loudhailer from the cutter about the recommended method of tending the rescue basket and trail line. The 95 footer's metal jacobs ladder and ring buoys attached to heaving lines were made ready when Becker and Crnosija were seen jumping into the sea. Multiple approaches were made to steer the pitching vessel alongside the two swimmers, who were rapidly becoming exhausted and immobilized. They were unable to swim toward the heaving lines which were thrown toward then repeatedly until, on the fifth try, after about 10 to 20 minutes immersion, a line and buoy were successfully gotten to them.

Becker then managed to put his arms through the Jacobs ladder, which was hauled aboard CAPE CROSS with him clinging to it. Crnosija also could not climb the flexible ladder, due to hypothermia and lack of control over his limbs, and he too was similarly hauled up on deck with the ladder, Both were given first aid treatment immediately by the crew, who were considerably concerned for Becker's well-being, as he appeared to be unconscious and near death when first brought into the cutter's wheelhouse. Wet clothing was removed from the men, and they were wrapped in blankets. A cutter crewmember was bundled up in the blankets with Phil Becker to provide a source of body heat and hasten his return to consciousness. They responded to medical treatment on the cutter and in the hospital and were ultimately found to have been uninjured.

25. Pollution

The sunken stern of the CHESTER A. POLING continued to emit a light sheen of petroleum product for some time after the foundering. Divers were retained by the vessel's owner to survey the wreck, and a report filed by the Coast Guard Captain of the Port, Boston, Massachusetts, in whose jurisdiction the incident occurred, indicated that all diesel oil in the fuel tanks had escaped. It was concluded by him that the sheen was dissipating rapidly, and no cleanup was required. The site was marked by a wreck buoy placed on station immediately after the accident.

26. Manning

Review of records on file with Commandant, U.S. Coast Guard during the course of the investigation, pertaining to the tanker's crewmembers, revealed an absence of any documentation concerning the shipment or discharge of personnel manning the vessel, as required by federal regulation.

27. Equipment

During the post-casualty investigation, it was discovered that the Leigh Vespir EPIRB had never been issued final Coast Guard approval, although Leigh Systems of Syracuse, New York represented and marketed their product as holding approval number 161.011/8/0. The installation instructions required that the Vespir be installed vertically in a float free tube type mount on board ship. When readied for operation, a toggle switch is set to "auto-set" position, which arms the transmitter housed in a 2 1/2" x 50" buoyant cylinder. Normally stowed with the cylinder and whip antenna oriented downward, the transmitter package rights itself and automatically emits a radio frequency signal as soon as released from the tubular container. The same results can be achieved by holding the transmitter upright. The Leigh Corporation's literature states that a test lamp located on the barrel of the transmitter will be illuminated if the unit is functioning properly. Neither Captain Burgess nor Harry Selleck testified that they knew of these operating requirements and in fact had the EPIRB on a settee in the wheelhouse to protect it from salt spray and moisture during the last voyage.

28. Since it appeared that Leigh Systems, Inc. had manufactured, promoted and sold the device and claimed Coast Guard approval for it, Commandant, U.S. Coast Guard initiated

further investigation into an apparent violation of 14 USC 639. This inquiry confirmed that Leigh Systems Inc. had been selling the unit as Coast Guard approved for quite some time, although not authorized to do so. This was due to a misunderstanding of Coast Guard instructions concerning submission of an F.C.C. type approval certificate, and not because of design, operating, or material shortcomings in the equipment itself. Incomplete paperwork was the only thing that had blocked issuance of a Coast Guard certificate of approval.

29. Underwater Survey

On the 16th of January 1977, the Marine Board of Investigation began efforts to obtain material evidence from the sunken afterbody of the tanker off Gloucester, Mass. Underwater TV photography supplemented by divers' reports was initially utilized to assess the ship's condition as it lay upright on the seabed. Damage to the hull as a consequence of its impact with the ocean bottom appeared confined to the forward starboard chine plating which was caved in and overladen with gravel and rock. The Board's divers reported that the CHESTER A. POLING had fractured irregularly across the bottom plating, but quite unidirectionally above the turn of the bilge to the main deck, in both sides, as well as across the main deck. Failure around the girth was within a few inches forward of transverse web frame 39 on both sides and deck in virtually a straight line. The path of fracture across the bottom and into both chines, however, varied fore and aft from immediately adjacent to frame 39 to about five feet forward of the frame. This bottom plating and the connected internal members exhibited extreme buckling and distortion, with many longitudinal plate stiffeners torn away and twisted, in some cases apparently pulling out bottom plating in way of welded connections. Over the course of the next three months, steel plating and associated internals were salvaged from the port and starboard shell as well as a section of the centerline longitudinal bulkhead in way of the fracture zone. Seven major panels were recovered, consisting of portions of strake A-6 starboard, FK-3, A-6 port, D-6 port (with web frame 39 attached) and centerline bulkhead for full height. (The plating nomenclature utilized in this investigation is that which was developed at the 1956 lengthening. "B" strake was not so labeled in the new mid body). The Board did not obtain sections of the deck for testing, since underwater recovery efforts were terminated by adverse operating conditions before this segment could be brought to the surface. Deck plating was lowest in priority because the prime area of interest was the hull bottom, as the deck had hinged the bow and stern together for about an hour and a half after fracture. Secondly, it was thought that the severe distortion of this steel caused by violent movement would have masked the original condition of the deck plate and any test results of damaged samples would be too speculative to be of value.

30. Scantlings and Standards

American Bureau of Shipping records of the CHESTER A. POLING contain the following statement:

> "For Drilling Analysis of tank space, following scantlings are minimum rule scantlings for the vessel and should be used with 25% reduction: (See ABS letter of 5-23-55 to Socony-Vacuum Oil co.)

Flat Keel - .60"
BTM shell - .49"
Side Shell - .48"
Long Bulkhead - lower strake .44"
middle strake .375"
top strake .34"

The current Coast Guard policy (NVC 7-68) regarding the maximum average reduction in thickness permitted in the midships half length, is about 20%. For this tanker, these minima, based on either a 25% or 20% reduction for the midship area are, respectively: FK strake, .450", and bilge strakes and bottom shell .367"; FK strake, .480", bilge and bottom shell, .392". Subsequent to this casualty, the Bureau communicated to the Board that another formula could be used as well:

> "A method of judging the vessel's strength in way of the No. 3 cargo tank is a comparison of the remaining area of the bottom plating with the rule required area of 134.3 sq. inches for the bottom half breadth...maximum allowable loss below rule required area is 20% for this vessel."

31. Complete shell plating sonic thickness gagings of the tanker had been made under American Bureau of Shipping auspices in 1968, 1972, and 1976, in connection with class and loadline surveys. These records were reviewed by the Board in February 1977, prior to retrieval of steel samples, and compared for the purpose of determining the trend of deterioration over time. It was found that the 9 August 1968 measurements were a second attempt ordered by Bureau officials because an earlier report drafted 18-24 June 1968 was considered inaccurate. There were no internal structural members included in these readings. The attending surveyor certified all gagings to be representative of the actual average condition, and all plating was considered satisfactory and thicknesses to be in excess of minimum ABS scantling standards. The June 1972 ABS gagings at Special Survey No. 10 included transverse and longitudinal bulkheads, stiffeners, and web frames as well as shell plating. The results were again considered satisfactory and representative. From March 15 to March 19, 1976 the entire ship, including internals, was again regaged sonically, and at the conclusion of the drydock inspection in April 1976, representatives of the owners, U.S. Coast Guard, and the classification society had completed an internal inspection of all cargo tanks and other spaces, as well as the vessel's exterior. The majority of hull plating repairs was concentrated in the original (retained) ends. By letter dated 26 April 1976, the Bureau required certain deck plating to be renewed, but testimony taken during the investigation as well as American Bureau of Shipping file correspondence indicated that the owners requested regaging of the main deck, which was completed on 3 May 1976. Less extensive renewals were thereupon completed in way of number 1 and number 2 cargo tank main deck two months later, subsequent to which the ship was again certified to be in compliance with American Bureau of Shipping scantling standards and loadline requirements.

32. By recapitulating the three quadrennial reports in columnar format and comparing them to develop the rate and extent of side and bottom steel plating wastage, it became evident that the 1976 side and bottom shell gaging records were inconsistent with previous reports, see figure (2). Thirty-nine out of a total of sixty-four measurements were higher than those recorded in 1972 and ten were identical to 1972; that is, in the former case, the steel had ostensibly increased in thickness from 1972 to 1976, and in the latter, no deterioration had occurred. (There are no records in either American Bureau of Shipping or Coast Guard files which document any plating renewals which might tend to explain this situation). Examination of the remaining fifteen pairs of 1972-1976 gagings discloses that the average decrease of port plate thickness over four years is .031 inches, and starboard plating, .028 inches. By contrast, the average thickness decrease from 1968 to 1972 for thirty pairs of port plate gagings is .061 inches; while two pairs showed an increase in thickness of .015 inches each, and one set was unchanged. The average wastage in the starboard plate gagings from 1963 to 1972 is .063 inches for thirty-three points. A symmetrical distribution of deterioration was observed by comparing individual strake plating measurements for 1968 and 1972. For example, both port and starboard F-4 strakes (near the tops of the cargo tanks) exhibit apparent accelerated corrosion between 1968 and 1972, ranging from .110 to .165 inches, as compared to somewhat less than half of that in strakes A,C,D and E. This pattern is not evident for American Bureau of Shipping readings between 1972 and 1976 but is replicated if the 1977 gagings of plating recovered from the wrecked afterbody of the tanker is compared with the 1972

Figure 2

Chronological Comparison of Side and Bottom Shell Plate Gagings
CHESTER A. POLING New Midbody

Orig Tks.	Plate	1968 Port	1968 Stbd	1972 Port	1972 Stbd	1976 Port	1976 Stbd	Salvaged Plate Port	Salvaged Plate Stbd
.750	FK1	.500	.500	.685	.690	.600	.600		
	2	.500	.490	.620		.640	.640		
							.630		
	3	.500	.500	.600-615-610		.630	.660	.586	
	4	.500	.480	.610-670-675		.650	.660		
	5	.460	.480	.650-660-595		.660	.680		
						.590	.580		
.50	A4	.475	.480	.380	.390	.460	.450		
				.430	.410				
	5	.470	.500	.445	.425	---	---		
				.445	.435				
	6	.500	.470	.450	.445	.450	.460	.413	.407
				.435	.430				
	7	.490	.495	.435	.435	---	---		
				.430	.440				
	8	.415	.475	.430	.435	.460	.460		
				.450	.435				
	C3	.435	.445	.380	.380	---	---		
	4	.460	.460	.390	.370	.420	.420		

Figure 2

Chronological Comparison of Side and Bottom Shell Plate Gagings
CHESTER A. POLING New Midbody

Orig Tks.	Plate	1968 Port	1968 Stbd	1972 Port	1972 Stbd	1976 Port	1976 Stbd	Salvaged Plate Port	Salvaged Plate Stbd
	5	.490	.490	.430	.420	---	---		
				.450	.415				
	6	.460	.440	.420	.415	.410	.420	.392	
				.430	.420				
	7	.480	.500	.425	.430	---	---		
				.440	.430				
	8	.480	.500	.425	.430	.420	.430		
				.415	.450				
	9	.470	.480	.440	.440	---	---		
.625	D3	.570	.580	.540	.550	.570	.580		
				.550	.560	.570	.580		
				.560					
	4	.580	.600	.575	.580	.590	.580		
	5	.605	.595	.600	.590	.570	.580		
	6	.600	.605	.590	.590	.570	.570	.502	
				.580	.600	.580	.580		
	7	.590	.605	.580	.595	.580	.580		
				.575	.585	.590	.600		
	8	.595	.605	.580	.590	.600	.600		
				.580	.585				
	9	.585	.605	.600	.600	.550	.580		
.50	E4	.460	.470	.420	.410	.480	.480		
				.415	.415		.470		
	5	.480	.480	.480	.440	.480	.470		
	6	.500	.480	.470	.445	.470	.470		
	7	.500	.480	.460	.450	.470	.470	.430	
				.460	.440				
	8	.500	.490	.450	.435	.480	.480		
				.460	.450				
	9	.490	.490	.460	.430	.470	.460		
				.440	.450				
	10	.480	.470	.450	.440	.470	.470		
.625	F4	.590	.570	.440	.430	---	---		
	5	.600	.580	.460	.450	.460	.450		
				.465					
	6	.600	.585	.465	.465	---	---		
				.445	.475				
	7	.610	.600	.445	.480	.470	.470		
				.460	.465				
	8	.600	.610	.460	.475	---	---		
				.465	.470				
	9	.580	.590	.470	.465	.470	.470		
				.450	.470				
	10	.570	.590	.460	.470	---	---		

gaging record. The 1968 plate gagings do, however, appear to be erroneous as concerns the FK strake, since (a) wastage in the vicinity of 25% from original is reflected in all these plates, but not adjacent strakes, and (b) the 1972 dimensions do not indicate renewals of keel plating, nor do American Bureau of Shipping or Coast Guard inspection records. Parenthetically, there is ample documentation on file of continuous replacement plating installed in the more than forty year old retained ends of the ship. Thus, the FK 1, 2, 3, 4 and 5 1968 gagings were excluded from the foregoing comparison and analyses.

This situation was uncovered while diving operations progressed and underlined the need for obtaining steel samples to substantiate the actual scantlings of the ship, particularly in way of number 3 cargo tank.

33. Figure (3) contains the actual thickness of recovered steel as measured by the Arnold Greene Testing Labs, Inc. and witnessed by American Bureau of Shipping and Coast Guard representatives on 26 April 1977 at Coast Guard Support Center, Boston, Massachusetts. These final readings were analyzed from two aspects; (a) transverse gagings along the fracture edge were averaged separately, and (b) then combined with the remainder of the plate to obtain a total average plate thickness. The average plate thicknesses are as follows:

		(25% reduction) ABS min.	(20% reduction) NVC 7-68 min.
A-6 port	.413"	.367"	.392"
C-6 port	.392	.367	.392
D-6 port	.502	.367	.392
E-7 port	.430	.367	.392
A-6 stbd	.407	.367	.392
FK3	.586	.450	.480

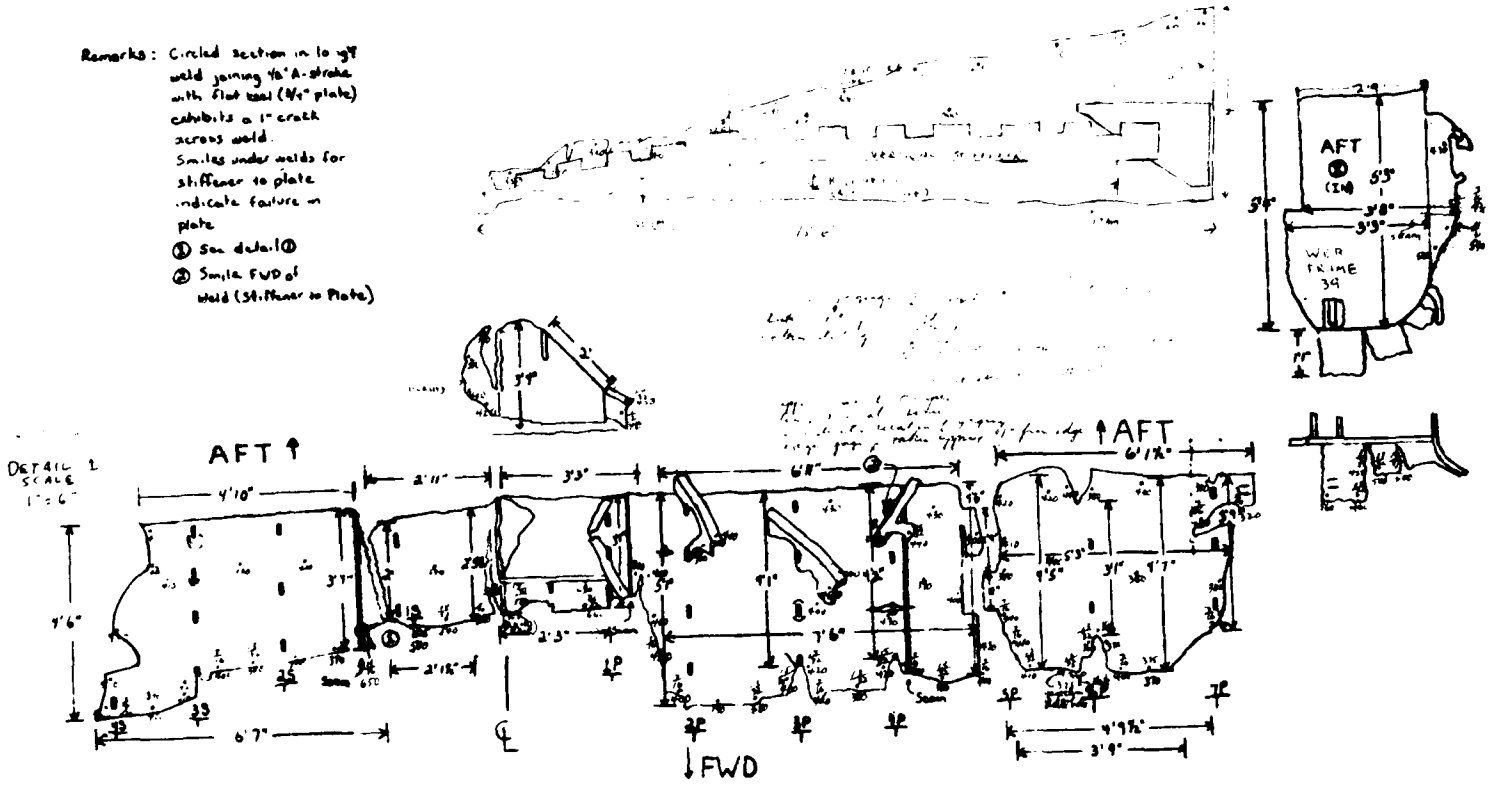
The lowest individual gagings were found along the fracture edge with .360 to .390 not uncommon. Averaging gagings across the plates closest to the break yielded the following results:

A - 6 port .404
C - 6 port .374
D - 6 port .502
A - 6 stbd .392

34. Post Casualty Studies and Investigation

Samples of the recovered steel were forwarded to Battelle Columbus Laboratories for physical and chemical analysis. Studies were simultaneously begun by the Coast Guard (Merchant Marine Technical Division), American Bureau of Shipping, Massachusetts Institute of Technology and University of Kansas consultants to determine to the extent possible, the stress loading experienced by the ship at the time of the casualty. Efforts were made to identify the number of U.S. tankships of similar characteristics and employment which are in coastwise service. U.S. Coast Guard and American Bureau of Shipping experts in loadline regulation administration testified to explain the interrelated elements which form the basis

Figure 3



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for this safety standard. Board members also visited Coast Guard Air Station Elizabeth City, North Carolina to familiarize themselves with Coast Guard rescue helicopter equipment.

35. An internal and external inspection of the tankship CAPTAIN SAM O.N. 233433, sistership to the lost vessel, was conducted by Board members during routine drydock inspection in May 1977 at Caddell Shipyard, New York, to better understand the construction, condition and arrangement of the latter prior to its loss. This ship had also been lengthened at approximately the same time as the CHESTER A. POLING, and upon boarding CAPTAIN SAM on drydock, Board members, owners and American Bureau of Shipping surveyors found a total of four holes caused by deterioration in bottom plating of cargo tanks 1, 2, 3 and 4. They had been soft patched from the interior at some time previously. Some exterior welding in the bottom plating appeared to be deeply pitted and fissured; in particular, a butt weld for virtually full width at number 4 cargo tank's forward end. The visual inspection of cargo tanks internally was hampered by the conditions which prevailed. A substantial amount of tight scale and corrosion coated all of the steel and could not be readily removed manually to expose the structural members. Therefore,defects such as pits and cracks, and wasted steel (to some extent) were totally undetectible. The absence of adequate lighting and scaffolding further restricted attempts to assess the ship's material condition. The upper portions of bulkheads and side shell plating and attached stiffeners could only be viewed from a distance, either by standing on a deep web bottom frame or the tank's access ladder, with the aid of a handheld flashlight. (These working conditions were reportedly identical to those experienced by Coast Guard inspectors at the 1976 drydock and internal examination of cargo tanks).

The shell plating was gaged during this drydock period on subsequent dates, with renewals in the midbody area completed thereafter as listed below:

K-2 - Frame 60 to 53 - 32 ft. x 4 ft. 1 in. x 5/8
K-3 - Frame 53 to 48 - 9 ft. 6 in. x 5 ft. x 5/8 in.
A4S - Frame 54 to 47 - 11 ft. 2 in. x 5 ft. 10 in. x 5/8 in.
A5S - Frame 48 to 44 - 32 ft. 9 in. x 6 ft. 3 in. x 5/8 in.
B4S - Frame 51 to 47 - 12 ft. 3 in. x 5 ft. 2 in. x 5/8 in.
B5S - Frame 47 to 44 - 20 ft. x 7 in. 9 in. x 5/8 in.
C2s - Frame 24 to 16 - 16 ft. 2 in. x 3 ft. 11 in. x 5/8 in.

36. (a) Battelle Columbus Laboratories was awarded a contract to conduct a metallurgical examination of selected pieces of steel from the tanker and reassembled in a partial mock-up at Coast Guard Support Center, Boston, Massachusetts. Battelle's task was to report the results of the laboratory analyses, without interpretation, conclusions or recommendations. Their summary stated that on the basis of visual inspection alone, many small cracks were noted on top and bottom surfaces of plating, near the fracture. Chevron marks on the main fracture indicated three distinct fracture origins, two of which were in longitudinal seam welds, and one of which was in a transverse butt weld. A considerable portion of the main fracture was battered to the extent that the nature of that portion could not be determined.

Figure 4

CAPT Tankship CHESTER A. POLING, O.N. 233334

TIME DATE 13 April 1977

DESCRIPTION Bottom shell plating salvaged from sunken afterbody. View is aft and as labeled

TAKEN BY PA 1 Van Valkenburgh (CCGD1 dpa)

WITNESSED BY LCDR P. A. Dux

CAMERA Nikon F 2 Indoors, Support Center, Boston

Black & white FILM TRI EX PAN DEVELOPED BY Van valkenburgh

(b) The transverse butt weld and longitudinal seam welds appeared to have been made with a single, machine made, two wire submerged arc weld on the top, followed by several passes of manual overhead shielded metal arc welds on the botton. Radiographic examination and metallographic sectioning revealed small defects in the seams and rather large defects, probably entrapped slag in the butt weld.

(c) The chemical compositions of the 0.50 inch thick plates and longitudinal stiffener were found within the specified range for ABS Class A steel, and the composition of the 0.75 inch thick plate was within the specified range for ABS Class B steel. The tensile properties and yield strengths were generally within specifications and the nil-ductility transition temperature of the flat keel strake was 45°F. Charpy V-notch impact properties were determined for the plates, a longitudinal stiffener, and the welds.

(d) Fractures-A map of the portion of the fracture studied is shown in figure (5). The circled letters designate the pieces that were sent to Battelle. The pieces of the bottom plate were bent with the concave side of the bend generally being upward, especially along the fracture. The centerline bulkhead also was bent, and a vertical stiffener on the bulkhead had been bent backward approximately 90 degrees. Four of the longitudinal stiffeners remained attached to the plate at positions several feet from the fracture, but they had been torn from the plate near the fracture. The stiffeners also were severely bent as though they had been pushed toward the stern. Fractures in the attached stiffeners occurred in one of three places: in the fillet weld, in the stiffener, or in the plate. The locations of some of the individual fractures are indicated by Roman numerals in figure 5. Most of the fracture in the flat keel plate was badly battered, giving the appearance that it had been pounded by the mating fracture surface prior to the ultimate failure. This implies that the two halves of the hull maintained their alignment for some time after some plating and stiffeners failed. The flat keel plate fracture surface was probably a brittle mode failure. Most of the fractures in both A-strakes and the port C-strake were tearing shear fractures. The surfaces were smooth and at approximately 45 degrees to the top and bottom surfaces. Battelle's metallographic examination revealed that the deformation associated with the tearing shear fractures was all downward, indicating that the forward half of the ship was moving downward with respect to the aft half as the bottom hull plate tore apart. A tearing shear fracture, as opposed to a tensile or propagating shear fracture, generally is the final event in a fracture process and is not associated with fracture initiation.

(e) Secondary Cracks-Many secondary cracks were observed in the top surface of the longitudinal seam welds and the plate within a couple of feet of the fracture. Secondary cracks were also observed in the bottom surface of the flat keel within an inch of the fracture. Some of the cracks were opened fairly wide, suggesting that the plate had previously been bent upward and the cracks probably formed when the plate was bent back downward.

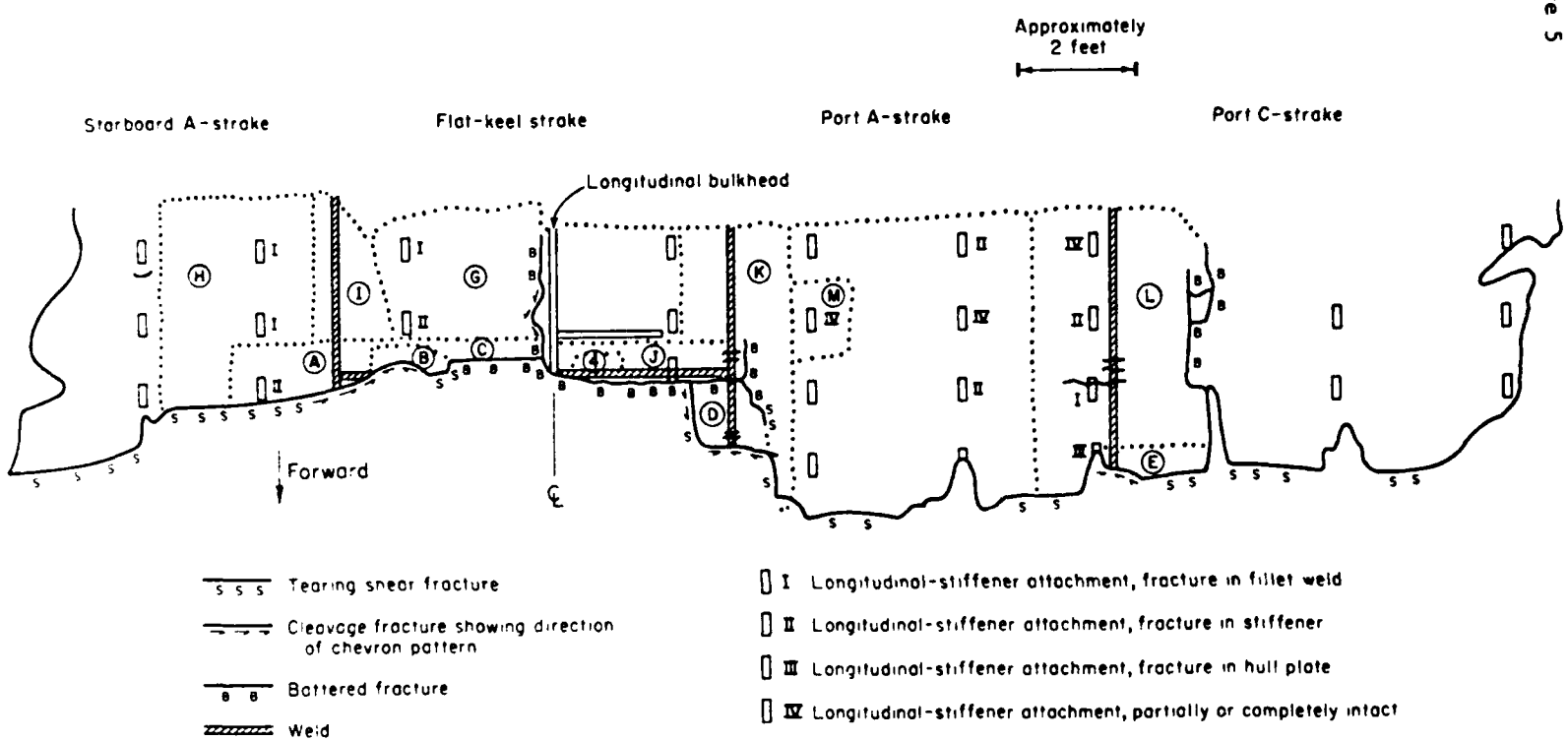


FIGURE 5. MAP OF FRACTURE IN THE BOTTOM HULL PLATE OF THE CHESTER A. POLING

The top (inside) surface of the plate is shown.

(f) Welds-Corrosion on the surfaces of welds made them so rough that it was not possible to obtain meaningful data by ultrasonic inspection. Radiography was fairly successful, but interpretation of the radiographs was sometimes difficult because it was not always possible to distinguish between internal porosity and external corrosion pits. Intermittent small porosity was observed on the longitudinal seam weld between the starboard A-strake and flat keel strake, with porosity being worse near the aft end of the sample. A number of transverse cracks were observed aft of the butt weld in the seam weld and in the plate. In the longitudinal seam weld between the flat keel and the port A-strake, some porosity was observed, as well as several cracks. The seam weld between the port A-and C-strakes displayed many transverse cracks in the vicinity of the stiffener attachment marked 1 in figure (5). There was also a 2 inch long line, possibly indicating lack of fusion. The transverse butt weld in the flat keel strake had evidence of porosity and/or entrapped slag along the entire available length of the butt weld. There was also evidence of lack of fusion between passes, and the overall quality of the butt weld appeared to be very poor. Many small secondary cracks were seen in the adjacent plate edge near the fracture, according to Battelle's report.

37. (a) Although the University of Kansas consultant's report and that of the U.S. Coast Guard Merchant Marine Technical Division differ in details, they are generally supportive of each other in arriving at conclusions and explaining the reasons for failure of the hull girder. They differ in that the Coast Guard engineering analysis indicated the likelihood of a compressive failure occurring in the deck structure of the POLING with the ship in a sagging condition. Although no physical evidence or testimony exists to support this failure mode, it was theorized in this study that the deck was the area of the POLING most susceptible to initial failure. It was further thought likely that tensile failure in the hull bottom was due to low-cycle fatigue at a stress concentration rather than simply being overstressed. In this view, the evidence of buckling at the bottom was caused by buckling failure in the hogging condition after considerable tensile failure in the bottom. Finally, the particular ballasting was considered a significant contributing factor to failure of the hull, which could have been avoided by other loading configurations.

(b) In analyzing the factors which led to the hull failure of the CHESTER A POLING, the University of Kansas consultant to the Marine Board of Investigation differed somewhat in finding that the high stress levels led to initial failure in the vessel's bottom. The complete failure was a combination of overload, buckling, brittle and shear modes of failure with other factors, i.e., design, materials, welding, and loading contributing to these various modes of failure. Of these, neither the quality of welding (some of which could be considered as satisfactory and some as unsatisfactory), nor materials, nor design (although the serrated longitudinal stiffener profile was not the most desirable) was as important a factor as loading. That is, in this advisor's opinion, the extreme sea conditions, along with the particular condition of ballast, resulted in stresses estimated to be in the range of 25 - 30 ksi in the sagging condition and about - 10 ksi in the hogging condition.

The still water bending stress in the bottom plate was estimated to be about 10 ksi and the dynamic bending stress in the range of 15 - 20 ksi.

(c) These stresses were calculated by the University consultant based on long term loadings prepared by ABS. Using ABS short term loadings, the maximum tensile and compressive stresses would even be higher. Although the actual tensile yield strengths of the steels used in the ship were 39 ksi or greater (minimum ABS specification value is 32 ksi), a nominal stress of 25 - 30 ksi is extremely high, in the consultant's opinion. Furthermore, the critical buckling stress decreases to about - 9 ksi (from - 31 ksi) when just one stiffener is removed. Once a single stiffener is lost, and initial buckling occurred, subsequent inelastic deformation and cracking of the bottom plate, with brittle fractures initiating at these cracks, subsequent tensile instability (shear failure) and final failure of the hull girder would be expected because of the extreme overload condition.

38. In order to develop the total bending stress experienced by the CHESTER A. POLING, the Coast Guard Merchant Marine Technical staff initially developed the sectional modulus of the ship's midship section at the time of the loss. This was of primary concern because of the strong evidence of considerable hull wastage, which could significantly affect the section modulus for the vessel's midship section and thereby, resistance to large bending moments.

The following assumptions were made to calculate the wasted section modulus:

1) Wherever gaged thicknesses were taken in the salvaged plate, the average value of the gaging for each type of plate was used as the section thickness.

2) In all other sections, the scantling thicknesses were taken to be 75% of the original.

3) Buckling and post-buckling behavior of panels in compression were taken into account using an effective width method in the calculation of the section moduli below.

	ORIGINAL		WASTED	
	S deck;	S bottom	S deck:	S bottom
HOG	6296	5849	4778	4854
SAG	5812	6158	3821	5322

The initial step in determining the stresses experienced by the hull structure of the POLING was to calculate the bending moment experienced by the ship due to loading conditions and sea state. This bending moment is represented by Mt, where:

$$M_t = M_{sw} + M_{wave\ induced}$$

A. Msw - is the still water bending moment of a vessel due to its loading condition. The SCHP computer program was used to calculate the magnitude of the bending moment at 41 locations (stations) along the POLING's length, with tanks number 2,3,4, and 5 fully ballasted and tanks 1 and 6 empty. This loading condition resulted in a sagging condition amidships with a maximum bending moment of 22,521 ft-tons at 128.23 ft. aft of the forward perpendicular. This loading condition exceeds the allowable still water bending moment in accordance with the 1976 ABS Rules (by 2%).

B. M Wave induced - is the dynamic bending moment action. The SCORES Computer Program was used to calculate the root-mean square (RMS) magnitude of the bending moment for the POLING at 21 stations. Two sea states were examined through the use of this program:

1. Seaway A - is the unidirectional wave spectrum associated with waves having a mean wave length of 10 times the significant wave height. This spectrum was used to calculate the dynamic bending moments affecting the POLING for a significant wave height of 25 feet at relative wave headings of 140°,150°, 160°,170°, and 180°.

2. Seaway B - is the unidirectional wave spectrum associated with waves having a mean wave length of 7 times the significant wave height. This spectrum was used to calculate the dynamic bending moments affecting the POLING for the same wave height and relative wave headings listed in the previous paragraph.

Bending Moments and Stresses

Representative bending moments of 65,600 ft-tons sag and 20,500 ft-tons hog were calculated based upon a still water bending moment of 22,500 ft-tons sag and the wave induced bending moment from the 1-in-1000 highest wave associated with the spectra. This 1-in-1000 wave is the largest wave associated with the wave spectrum that occurs in 1000 wave periods. It is reasonable to assume that the POLING encountered such a 1-in-1000 wave since it occurs approximately once every two hours in Seaway A and B. The dynamic contribution in the following tables is the 1-in-1000 bending moment amplitude (= BM_{rms} times 3.72).

25'Foot Significant Wave Height

	SEAWAY A					SEAWAY B				
Wave Heading	140°	150°	160°	170°	180°	140°	150°	160°	170°	180°
Max. Sag Moment	60837	63813	65301	66045	66417	62697	64557	65301	65673	65673
Max. Hog Moment	15795	18771	20259	21003	21375	18195	19515	20259	20631	20631

SWBM: 22,521 ft-toms (sag)

39. A study report from Massachusetts Institute of Technology looked at the sea state and the response of the POLING to those seas. The report highlighted the influence of ships speed upon ship response; in particular, an increase from 0 to 6 knots showed an increase in hull stress of about 40%. In addition, MIT found the ship was more influenced by developing seas than by fully developed seas. Or stated in another way, those seas developed by a storm moving into the vicinity of the ship induced higher stresses than those seas developed by distant storms. Their studies showed at speeds of about 6 knots approximately 140 slams per hour would occur. MIT had access to scientifically derived sea state data collected in the area of ocean involved, which tend to validate the heights and lengths of seas reported by Captain Burgess and Harry Selleck before the ship broke in half. Other of the consultants (ABS, Coast Guard) tended to discount the possibility of 25 to 40 foot seas, with a length between crests of 175 to 300 feet, as reported in testimony taken by the Board of Investigation.

40. Loadlines and Stability

In addition to other standards and regulations, the loadline regulations establish safety criteria for certain vessels engaged in commerce. Information was developed during the investigation of this casualty by review of records and testimony from Coast Guard and American Bureau of Shipping loadline administrators, who described and explained the loadline standards under which the CHESTER A. POLING operated on its last voyage. Because it failed to survive that voyage, this investigation sought to explore the degree of protection afforded the CHESTER A. POLING by those regulations.

Under authority delegated to it by the U. S. Coast Guard, the American Bureau of Shipping administers 46 Code of Federal Regulations Part 44 and 45, reviewing the construction, design, and arrangements of vessels, inspecting them, and issuing to them loadline certificates without further reference to the federal authorities in routine cases. The CHESTER A. POLING had always had a special service coastwise loadline and was categorized as a self propelled barge under 46 CFR 44.05-20(c). The self propelled barge category was included in the law to consider a large group of Great Lakes type vessels in operation at the time the Loadline Act was passed. The concept and procedures generally aim toward assuring that an operating vessel will have sufficient freeboard to prevent breaching of the vessel's weather deck openings by the seas, and have sufficient "reserve buoyancy" to cope with anticipated sea conditions. According to testimony given an evaluation of hull strength is an integral portion of the loadline assigning authority's review process. The continuing responsibility for evaluating and reviewing the CHESTER A. POLING's hull structural strength and ability to withstand loads resided within the American Bureau of Shipping, acting as the delegated loadline assigning authority for the U. S. Coast Guard, even though the vessel was no longer "in class". This assessment is understood to include both a physical inspection and calculations of hull strength, including the midships section modulus, by the loadline assigning authority. Information elicited during the investigation disclosed that at present there is no routine review of loadlines by the Coast Guard before issuance by American Bureau of Shipping.

The standards of hull strength such as section modulus of the hull girder are embodied in the American Bureau of Shipping Rules for Building and Classing Steel Vessels. Thus, a vessel found to meet these construction standards is considered under 46 CFR 45.107 to have adequate strength for assignment of the corresponding loadline. Although a required section modulus is outlined in 46 CFR 43.15-17 for coastwise routes the scantlings--steel thicknesses and shapes--in turn are based upon a ship of a "standard" configuration, which, at the time of enactment of the loadline regulations in the 1930's, was a vessel with a length to depth ratio of 15.

The sectional modulus and scantlings of the CHESTER A. POLING was found upon review in 1956 to be adequate for oceans service, except that its length to depth ratio was 16. Since the POLING had an L/D in excess of 15 a Special Service Load Line designation was assigned by ABS and in accordance with practice at the time was approved by Commandant U.S. Coast Guard letter dated 29 February 1956. Recent calculations by Coast Guard engineering staff show that the as-built sectional modulus exceeded that required by the loadline regulations by about 60% and at fracture, exceeded the section modulus required by ABS by about 40%. At the time of development of the loadline regulations, a standard tankship of usual type designed to meet classification society rules on Great Lakes or limited coastwise service would incorporate very roughly about 50% of the sectional modulus of a full ocean service vessel.

This could vary considerably, depending on other details. Neither of these scantlings schemes however, included in it explicitly a presumed loading, or stress level, which the hull girder should be capable of accepting once the ship was underway. Loading manuals and trim and stability booklets were developed as an approach to establishing operational limits of loading (of hull stress) to which a vessel should be exposed. The loading manual, based upon a complex series of engineering calculations, brings together the vessel's buoyancy curve, longitudinal distribution of weights on the ship and various cargo (or ballast) loading arrangements. The final bending moment curve, a numerical value, is divided by section modulus and a final "stress numeral" is derived. After consideration of such items as hull material and design details, stress numeral limits are established. Stress numeral limits as prescribed should not be exceeded by the master in operation of his vessel.

Further testimony given by loadline administration officials indicated the special service coastwise loadline assumes the following conditions: that sea states near shore may be not as severe as offshore; or if sufficiently severe to approach a vessel's limiting stress loading, a ship's master has ready access to a relatively nearby harbor of refuge and can thus extricate himself from a storm before the ship is damaged.

Due to the ship's date of construction, the master of the CHESTER A. POLING was not required by federal regulations to be provided with sufficient information (in a form approved by the Commandant of the Coast Guard), to enable him to load and ballast the vessel in a manner to avoid unacceptable stress in its structure, and compute the stability of the ship under varying conditions of service.

CONCLUSIONS

1. The cause of the casualty was total structural failure of the hull girder in way of number 3 cargo tank. This in turn was due to (a) adverse ballast configuration, (b) the combination of ship's speed versus sea conditions encountered, and (c) a reduced sectional modulus of the hull midship structure due to deterioration, (not necessarily in any order of significance). It was not possible to determine with precision the exact location of the fracture origin which initiated massive structural failure. There were probably small, multiple point failures scattered throughout the cargo tank's plating and stiffeners which may have fractured more or less simultaneously. The hull girder being thus weakened greatly increased the loading of the remaining intact portions, and with increased loading and loss of supporting stiffeners, instability failure or compressive buckling occurred. The two halves of the hull remained substantially in alignment for an unknown period of time, while cracks opened progressively around the ship's girth. The mating surfaces of each crack sustained battering blows as the mid-body hogged, sagged and twisted. Ultimate failure may have occurred when the ship encountered the large wave described by Harry Selleck. As surprising as it may seem, the hull vibration described by Harry Selleck as it entered the last big wave was similar to hull vibrations described by other members and former members of the crew on previous occasions. This suggests that a major portion of the hull girder was effective until just before final rupture.

2. The Board adopts as its own, the conclusions of the Coast Guard Merchant Marine Technical Division study as follows:

(a) With the actual ballast quantity and distribution and with wasted hull scantlings, the POLING could possibly have survived a similarly oriented seaway with significant wave heights up to 18 feet.

(b) Had the ballast carried been loaded in tanks 1, 2, 5 and 6 or 1, 3, 4 and 6 instead of tanks 2,3, 4 and 5 as actually loaded, the ship could have survived the seaway encountered regardless of wasted hull scantlings, and in fact possibly could have survived a seaway with significant wave heights of 31 to 33 feet.

(c) With the ballast as actually loaded and with original as built scantlings the POLING could have possibly survived the seaway encountered and could have survived a seaway with significant wave heights up to 27 feet.

3. The alternatives available to Captain Burgess with respect to navigating his ship through severe seas were to (1) delay departure from port to avoid adverse conditions, (2) if exposed to heavy seas while underway, either seek a harbor of safe refuge, or (3) alter course and speed so as to minimize the impact of storm driven waves upon the hull. The decision to ballast all, some, or none of the cargo tanks in some time sequence could only be made in conjunction with his appreciation of expected weather and sea conditions.

It is the Board's conclusion that Captain Burgess was not adequately provided with the necessary weather and sea predictions to enable him to make an informed decision prior to departure from Boston, Massachusetts, as to whether it was advisable to delay sailing until the approaching storm had passed, or the need for full or partial ballasting prior to entering exposed coastal waters.

4. Even though Captain Burgess apparently did not receive or hear the forecast sea heights prior to departing Boston, it is concluded that the wind-generated sea height predicted and broadcast by the National Weather Service was significantly underestimated and therefore misleading for recipients of the forecasts. The apparent incongruity between meteorologists' theoretical understanding of wind-generated swells and reality, in this instance, was emphasized in the "hindcast" provided to the Board. The meteorologist formulating the report which predicted 3 to 5 foot seas based his computations on data gathered by observation of the actual storm in which the tanker sank; this analyses was therefore in arrears by at least a factor of four.

5. The master's ability to assess environmental conditions, once underway, was very much hampered by the lack of gaging and metering instruments. The tanker was not equipped with elementary equipment such as anemometers, pitch and roll indicators, or RPM vs. speed tables. Since no accurate input was available, Captain Burgess had to rely upon "seamans eye" to form an opinion concerning the rising intensity of the storm he encountered. This in turn may have hampered him in making timely decisions concerning ballasting and evasive action.

6. However, even if more accurate data gathering means had been available it is doubtful that the ship's captain could have utilized the resultant information meaningfully to avoid disaster, since he was also without numerical data regarding the structural strength of the CHESTER A. POLING. In conformance with the practice of most mariners, for example, he was of the opinion that a vessel's stresses are reduced when operated with seas coming from nearly directly ahead, and avoided steaming in the troughs with a beam sea. Rolling, then, which actually reduces the longitudinal loading stresses on a hull and is preferred to pitching in terms of ship's (not necessarily human) considerations was a situation which Mr. Burgess avoided. Analysis by MIT indicated as many as 140 slams per hour were likely; however, if noticed the master did not consider these important and other crew members did not consider ship motion and response too unusual. Even if he had had all available information concerning the structural adequacy and integrity of the vessel such as would be included in a loading manual or trim and stability booklet, he would have been unable to make an informed assessment of the ship's ability to respond to existing sea conditions. The master could only estimate very crudely the magnitude of the forces impinging upon the ship, and arrive at a decision based solely on his own experiences to take evasive action.

7. The nature of this ship's business virtually guaranteed that it operated almost continuously in close proximity to shore. In this case, the wind and seas were continuously setting the vessel toward a near lee shore, and the master compensated accordingly by steering a course to seaward of his normal route. When conditions, at about 0930, were becoming sufficiently severe for him to consider various evasive maneuvers, the lack of a nearby safe haven and a lee shore were both factors which induced him to attempt continuing the voyage. The course change to a northwesterly heading upon rounding Cape Ann, Massachusetts was expected to provide the tanker with a quartering sea, which the captain had experimentally determined would result in easing the motion experienced. It was also expected that the turn to 341°T could be made at about 1030 to 1100 if the ship were sufficiently distant offshore at that time. Conversely, return to Boston entailed proceeding for about 2 hours on a reciprocal course, thereby exposing the vessel to at least equally severe sea conditions for a greater period of time. While calculations furnished the Board show strong impact of speed on hull stress and increase dramatically the number of "slams" the vessel encounters, testimony given the Board suggested the master did not note unusual or dangerous hull movement and vibration and had no information available to describe the influence of speed on his ship. It is the Board's conclusion that Captain Burgess exercised reasonable judgment under the circumstances, in selecting a plausible course, speed and destination when confronted with the need to extricate the ship from the storm.

8. Considering the multiple problems of defining the hull loadings, certain basic assumptions for load line assignment should be reexamined. Calculations by Coast Guard staff engineers show that the as built section modulus exceeded the section modulus required by load line by about 60% and at fracture the actual section modulus exceeded the required by some 40%. This suggests that vessels may operate with special service coastwise load lines while subjected to hull loadings far beyond those expected by load line and beyond those outlined by classification rules. Further, it appears that a limited service coastwise load line assignment is based to some extent upon the notion that (a) sea and weather conditions near in shore may not be as severe as further offshore; and/or (b) that general weather conditions in coastal areas are better known or understood than farther to sea; and/or (c) that in any case, a ship finding itself in extremis has an opportunity to seek refuge or avoid the problem by not departing port until the problem has passed. It is concluded that this casualty casts doubt about the validity of these assumptions.

9. It is concluded that the sonic gagings made in conjunction with the March 1976 American Bureau of Shipping hull survey were misleading, in that a majority of the side and bottom shell plating was not accurately depicted. This is based on a comparison of the 1976 report with the gaged samples of salvaged hull plating from the CHESTER A. POLING, as well as deterioration found on the sister ship during drydock inspection, and gaging data contained in the 1968 and 1972 gaging reports.

The actual scantlings of the vital midships section plating appears to have averaged in most areas substantially less than that reflected by the 1976 gaging report. The 1968 and 1972 gagings filed by the American Bureau of Shipping are thought to be more accurate baseline data, because the 1968 readings were a second attempt to correct a previous report and thus, probably made with some care. It is also possible that, alternatively, the 1972 plate measurements were inaccurate, and based on the limited evidence available, it is not possible to absolutely state which of the two is the more correct. However, most of the 1972 readings are lower than the 1976 and thus more in line with the even lower gagings of salvaged plating made in 1977. The Board concludes that gagings of this quality, in conjunction with a visual inspection made under limited conditions during the 1976 drydocking period, resulted in a vessel receiving the approval of the classification society and loadline administrators, and certification by the Coast Guard, on the basis of imprecise and inadequate information.

10. Based on testimony elicited from Harry Selleck and Charles Burgess, it is clear that neither individual was well informed of the overall design and intended use of the Electronic Position Indicating Radio Beacon (EPIRB) that they attempted to activate. The equipment is required to be installed on board ship in a "float-free" rack, and it activates automatically when afloat or if held upright to transmit a radio signal for homing purposes on VHF frequencies of 121.5 or 243.MHZ. These are generally available only on aircraft receivers, or surface units equipped with radio receivers tunable to these frequencies. Generally, Coast Guard vessels and shore stations of the type which responded to the CHESTER A. POLING could not have intercepted this signal, even if the EPIRB had been activated. It is doubtful whether either of the two men had in fact recognized the arming switch or indicator lamp provided, either due to an inconspicuous location or identification, or personal ignorance of the operating instructions. The Coast Guard helicopter which assisted in the rescue of survivors was not airborne until after the EPIRB had been discarded and the two men on the forebody rescued, but the aircraft pilot reported receiving no signals when he tuned to its frequency. It is concluded, therefore, that the EPIRB probably did not activate. Nonetheless, lack of knowledge concerning proper use of this survival equipment, or the possibility of improper use, did not contribute to the casualty or loss of life.

11. None of the required primary lifesaving equipment--lifeboat or inflatable liferaft--was of any assistance in effecting the survivors' rescue due to the following circumstances:

(a) There was no boat or raft installed in the vicinity of the pilothouse, forward (nor was there required to be, under current regulations). Selleck and Burgess could not make their way aft across the submerged mid body of the ship after it broke in two, and they were effectively isolated from the remainder of the crew, and the life boat and liferaft installed on the after house.

(b) Due to its location on the weather side of the ship, and the stern's low freeboard, boarding seas forced Chief Mate Lord and his assistants to abandon attempts to rig out the ship's only lifeboat. In their opinion, it was not expected that the boat could have

been hoisted out of its cradle, due to the stern's adverse heel and list. Finally, they conjectured that the boat would have been stove in by striking against the ship's side in short order, even if it could have been launched.

(c) For some unknown reason, the inflatable liferaft failed to open as intended by its design. The techniques used by the men who worked with it were seemingly correct, but the sea painter attached to the CO_2 inflation unit in the raft at some point apparently resisted the men's efforts to withdraw it completely. This was a temporary situation though, because the raft was later seen to have lodged itself among some of the midbody wreckage, inflated. The Board does conclude that the loss of this equipment deprived the crew of a potentially effective tool, and thus may have contributed to the loss of one life.

12. Personal flotation devices were utilized by all the survivors of this casualty when they abandoned ship. Based on testimony received, the Board concludes that this equipment performed as intended, and furthermore, that PFD's were instrumental in saving lives. Charles Lord, a non-swimmer, for example, floated in a face upward attitude until rescued by CG 1438. The other survivors also related that their preservers maintained them head above water with no great difficulty. A ring buoy from the ship was also used with some success in supporting two men. Due to hypothermia, exhaustion, trauma, bulky clothing, and ingestion of salt water, the seamen were in most cases unable to fully function after the first few minutes afloat. Had rescue forces not been immediately available, this casualty would, in all probability, have resulted in a much greater loss of life.

13. Joao daRosa was lost at sea in the Atlantic Ocean off Gloucester, Massachusetts when he unsuccessfully attempted to enter the helicopter rescue basket which was being maneuvered into position on or alongside the afterbody. He was not wearing a PFD when last seen, and based on eyewitness testimony, it is concluded that he failed to don his life preserver after changing into dry clothing sometime prior to the helicopter's arrival. It is considered probable that failure to utilize his preserver and to understand the use of a helicopter rescue basket contributed to his death.

14. The absence of communications equipment in the after accommodation area of the CHESTER A. POLING (although not required by regulation) hampered the crew's own organization of abandon ship efforts as well as their rescue by the helicopter. For example, after Harry Selleck's battery-powered loudhailer became unuseable due to salt water immersion, the master was totally without means to direct or control his crew's efforts toward survival. Chief Mate Lord was unable to obtain advice or solicit help from his superior, and after Coast Guard craft appeared on scene, was unable to communicate with them to coordinate rescue attempts. Ambient noise levels accompanying the storm were so high that the electric loudhailer on Cutter CAPE GEORGE was ineffective. The helicopter pilot was not able to instruct the POLING's crew about the proper methods of tending the rescue basket guide line, or that they should maneuver the basket onto a clear location on deck before climbing into it.

He expressed the opinion that, under conditions such as existed during this disaster, one very important factor involved in successfully hoisting people aloft is communicating to them the pilot's intentions as well as specific instructions. The Board of Investigation therefore concludes that rescue of personnel from the after deck of this ship would have been greatly facilitated had a radiotelephone of even limited capabilities been available; and further, that Joao daRosa could possibly have survived, had the Chief Mate been given clear on-the-spot instructions concerning the use of the helicopter rescue basket, with which he was apparently unfamiliar.

15. The Board concludes that surface Coast Guard units which responded were taxed to the utmost in providing rescue services. Men were exercised to the very limits of their abilities; the seakeeping and operational characteristics of small Coast Guard craft were tested under most dire circumstances. A scramble (cargo) net rigged over the side appeared to be of greater utility to those rescued by the Cutter CAPE GEORGE, than did the metal jacobs ladder and block and tackle employed aboard the CAPE CROSS. In either case, however, the men in distress were unable to climb out of the water unaided since their hands were immobilized by cold and exposure. They were pulled aboard only because they were able to entwine their arms and legs in the net mesh or ladder rungs. This illustrated the need for rescue personnel whenever feasible, to attempt to enter the water themselves and secure a harness or line to the immobilized victims. It is recognized, however, that under the existing circumstances this course of action was of itself very risky and could have easily resulted in only adding to the number of persons afloat requiring rescue and assistance. Suitable recognition for the heroic efforts of military and civilian persons who responded was initiated by Commander, First Coast Guard District.

16. Coast Guard first aid procedures and hypothermia treatment rendered to those requiring it appeared to be adequate, with none suffering long term ill effects from their ordeal. Space and equipment limitations aboard small Coast Guard units, as well as less than optimum working conditions, appeared to influence the medical treatment given. For example, it was found that carrying helpless, heavily clothed and waterlogged victims from topside down steep, pitching ladders for immersion of the torso in a warm shower was time consuming as well as difficult. It is problematical whether the tanker's unconscious engineer would have survived or, perhaps, had serious medical repercussions had more time elapsed before his rescue from the ocean. This aspect of the operation is not thought to have affected the overall outcome of the case with respect to human survival.

17. There is evidence of a possible violation of 46 USC 574, 46 CFR 14.05-20 (i.e. failure to report the employment, discharge, or termination of services of crewmembers on Coast Guard form CG 735-T) by Charles Burgess.

18. There is evidence of a violation of the Federal Water Pollution Control Act, 33 USC 1321(b), which has been further investigated by the Captain of the Port, Boston, Massachusetts.

19. The recommendations and comments entered in block 29 of report forms CG 924E and block 34 of CG 2692 have been addressed in other conclusions in this report.

20. With the exception of the above there is no evidence of actionable misconduct, negligence, inattention to duty, or willful violation of law or regulation on the part of licensed or certificated persons, nor evidence that any personnel of the Coast Guard, or of any other government agency or any other person contributed to the casualty.

RECOMMENDATIONS

1. Further investigation under RS 4450 proceedings regarding Charles Burgess' alleged failure to report the employment and discharge of his crewmembers is recommended and was referred to the Officer in Charge, Marine Inspection, New York, New York, in whose zone the Master resides, on 19 May 1977.

2. Survival systems training should be provided merchant mariners within an institutionalized framework. Such could be incorporated into the curricula of merchant marine academies, upgrading schools for unlicensed members of the merchant marine and further reflected in the examinations administered by the Coast Guard. It is recommended that all examinations for merchant marine personnel include questions on rescue and survival. The uninspected towing vessel operator's examination is the only examination that at the present includes questions on this subject. It is also recommended that training in rescue and survival equipment and techniques be required at the fire and boat drill held at the time of biennial, midperiod, and annual Coast Guard inspections by vessel's personnel. This should include the design and use of EPIRB's, helicopter rescue baskets, inflatable life rafts, etcetera.

3. The dependency of mariners upon timely and accurate weather and sea state forecasts should be re-emphasized, both to users and providers of the National Weather Services' broadcasts. It is recommended that the National Weather Service be requested to consider the divergency between predicted and actual sea conditions as described in this report with a view toward producing a closer correlation between wind velocities and sea heights in their coastal forecasts.

4. The Marine Board of Investigation recommends further study in the following topics and areas, looking toward possible regulatory changes and requirements:

a) That primary lifesaving equipment be fitted forward as well as aft on tankships in coastwise routes which have working spaces in the forebody usually occupied when the vessel is underway; that consideration be given to broadening the applicability of 46 CFR 33.05-2(f).

b) That consideration be given to amending the current regulations concerning primary lifesaving equipment requirements, with a view toward requiring exposure suits now being manufactured under approval number 160.071 as a portion of the lifesaving equipment on board Coast Guard inspected vessels.

c) That limited range/power battery operated radiotelephone communications equipment be provided in areas of tankships usually occupied when underway, other than the site of the main radiotelephone outfit, for survival purposes, where not now required by existing regulations. Although this would not have prevented the breakup of the ship, timely communications between the rescue helicopter and survivors on the tanker after body concerning proper use of the rescue basket could likely have saved Joao daRosa's life. A small portable transmitter receiver would also have been of assistance when the master on the forebody was trying to pass instructions to his crew, and when the Coast Guard patrol craft was attempting to float a raft to the tanker.

d) That vessels be fitted with a suite of elementary instruments, such as anemometers, barometers, pitch and roll indicators to enable officers to better comprehend the natural environmental conditions to which their ships are exposed. As noted in conclusion 3, the master's perception of the impending storm, and consequently his opportunities to take early and adequate countermeasures for the safety of his ship, was considerably influenced by misleading weather forecasts. A barometer, thermometer, and anemometer could have afforded Captain Burgess quantifiable verification of the forecast and an opportunity to respond earlier (perhaps to return to port) when he realized the true situation; he would not have had to rely on "seamans eye" with the storm already upon him.

5 (a) The Marine Board recommends that a method be devised to mark or label Coast Guard helicopter rescue baskets with essential user information. In particular, distressed persons unfamiliar with hoisting requirements and procedures need to have impressed upon them the desirability of landing the basket on unobstructed surfaces and that guide lines are to be tended to accomplish this. This simple assistance should be independent of any instruction which could be imparted by radiotelephone communications.

(b) Though space and weight constraints limit the type and amount of rescue and medical equipment which can be stowed aboard small Coast Guard search and rescue craft, the experience of this casualty supports a recommendation that cutters with freeboard such as the 95' patrol boat be equipped with scramble nets to assist retrieving distressed persons from the water. Such equipment compared favorably with the less useful block and tackle, and flexible metal jacobs ladder also used in this case by the cutter not outfitted with a scramble net.

(c) One of the men rescued by the responding Coast Guard cutters was brought aboard unconscious and displayed a marked degradation of vital signs, believed due to shock and hypothermia. It is recommended that body core (torso) warming equipment be developed for Coast Guard use to enhance the first aid treatment administered to persons in need of it.

6. More specific guidance to Coast Guard Marine inspectors and vessel operators than is presently available in existing Coast Guard documents and publications should be promulgated concerning the conditions required to satisfactorily inspect the interior of cargo tank areas on older ships in clean product trade. In particular, uncoated tanks should be carefully inspected at about the fifth Coast Guard biennial inspection for recertification, and lighting, cleanliness and accessibility to remote reaches in tanks should be a required precondition to assure quality results of visual inspection efforts. It should also be emphasized that thickness gagings must be compared with data previously tabulated to reduce the chances of accepting information which seems plausible but can be actually erroneous, misleading or inaccurate. Such verification will also result in developing trend information useful for evaluating the condition of the hull in the future.

7. In this casualty, the currently prescribed maximum hull steel corrosion limits in the midships area, up to 20% to 25%, appears to have a causal connection with an unacceptable risk level having been reached. Although the original ship's design exceeded the required minimum scantlings, and improper ballasting was a principal factor in this casualty, the hull plating had deteriorated in certain areas to borderline tolerances, as noted in the findings of fact, paragraph 33. A re-evaluation of this standard should be made, particularly as concerns vessels of similar characteristics, age, and employment as the CHESTER A. POLING. Under separate cover the Marine Board of Investigation is forwarding to Commandant, U.S. Coast Guard, a compilation of names of such ships.

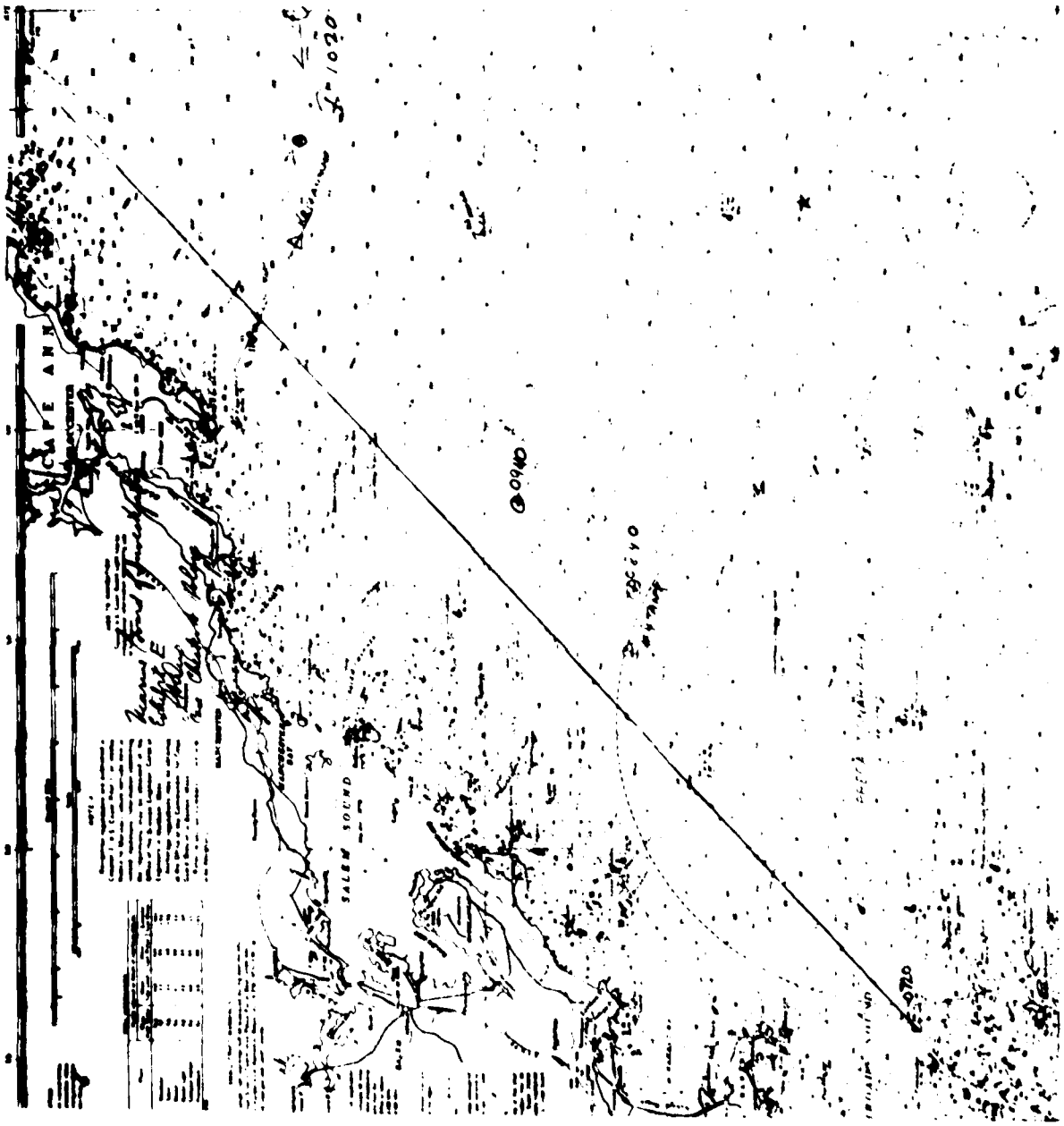
8. The inter-related elements which comprise the concept of the special services coastwise loadline assignment, and certain assumptions included within this framework, should be reexamined in the light of the loss of this tanker. Risk levels have been accepted which may either not be well defined, or not established upon sound empirical data. For example, the stress levels imposed upon the CHESTER A. POLING during its last voyage clearly exceeded those contemplated by the American Bureau of Shipping section modulus and scantling standards, and loadline regulations. The Board of Investigation recommends that a review and analysis of the empirical basis for the coastwise limited services loadline be undertaken. It is also recommended that an information transfer system be established whereby the American Bureau of Shipping will upon issuance of each loadline assignment, disclose to the Coast Guard the extent of its hull strength evaluation and review.

9. Had ballasting been carried out in a different sequence of tanks, it is likely that this casualty might not have occurred. Under current regulations, 46 CFR 31.10-30, 31.10-32, 42.15-1 and 44.05-20, this tanker was not required to have a trim and stability booklet or a loading manual prepared to prevent over-stressing of a ship by improper loading. The principal hull stress of a ship lying in still water is created by the longitudinal distribution of the ship's weight, stores, cargo (or ballast, in this case) and buoyancy resulting in a midship bending moment.

The trim and stability booklet affords a simplified indirect means of arriving at a stress numeral for any condition of loading, which is not to be exceeded. However, the computations required are normally calculated on the basis of a full (original) scantling hull sectional modulus, and further are completed prior to the commencement of a voyage. Therefore, while it is recommended that the requirement for a trim and stability booklet or loading manual be extended to include tank vessels such as the CHESTER A. POLING, it is also recommended that the peculiar characteristics of the short coastwise trade voyage be taken into consideration. To be of maximum utility and accessibility, the method of deriving a stress numeral should be such that the ship's master or mate will not be overburdened by repetitive laborious or time-consuming arithmetical calculations. The manning scale for this tanker permitted the two deck officers on board, Mr. Burgess and Mr. Lord, to alternate watches on a six hour rotation. Each would thus normally work twelve hours in every twenty-four, in port and at sea. Under normal circumstances, but one seaman (plus a "dayworker") was available for assistance in cargo handling, steering, navigating,etcetera. Further, voyages of short duration involved continual operations entering and departing port and navigating in coastal waters, close in shore, with concommitant demands upon the crew. Therefore, it is suggested that any regulatory change should encourage development of devices such as an electronic, pre-programmed on board computer which can readily enable a master to make informed and timely decisions concerning his vessel's loading under varying voyage conditions. This rapid problem-solving mechanism would parallel, for example, the modern trend to computer assisted radar collision avoidance systems. The instrumentation recommended in paragraph 4(d) above could be augmented by sensors which generate ship stress input to the computer on a real time basis, thereby providing the master with guidance in making operational decisions and predictions. Actual (reduced) scantling conditions would then be accounted for in arriving at safe stress numerals.

10. Due to the loss of the equipment with the ship, the Board was not able to determine the nature of the problem which delayed inflation of the life raft. Therefore, no recommendation is made concerning possible remedies for this anomaly.

Appendix A



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Chairman

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Member

P. A. DUX, Lieutenant Commander, USCG
Member and Recorder

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