U.S. Department
of Transportation

**United States
Coast Guard**

MARINE CASUALTY REPORT

SS POET: DISAPPEARANCE IN THE ATLANTIC OCEAN AFTER DEPARTURE FROM CAPE HENLOPEN, DELAWARE ON 24 OCTOBER 1980 WITH LOSS OF LIFE

U.S. COAST GUARD

MARINE BOARD OF INVESTIGATION REPORT

AND

COMMANDANT'S ACTION

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16. Abstract

At 0120 on 24 October 1980 (all times are EDST +4 time zone based on a 24-hour clock unless otherwise indicated; times given as EST are +5 zone time), the general cargo vessel POET departed Girard Point, Philadelphia, Pennsylvia, loaded with a bulk grain cargo of #2 yellow corn. At 0900, POET sent a U. S. Merchant Vessel Locator Filing System (USMER) message to the Maritime Administration in Washington, D. C., indicating departure from Cape Henlopen, Delaware, on a rhumb line course to Gibraltar and Port Said, and then to Alexandria, Egypt, at a speed of 15 knots. The POET's estimated date of arrival at Port Said, Egypt, was 9 November 1980. The last known communication with the POET was midnight on 24 October when [redacted] third mate on board POET, contacted his wife via ship to shore radio. On 3 November, the Coast Guard Rescue Coordination Center (RCC) in New York was contacted by the vessel's owners stating that the POET had not communicated with them since her departure from Cape Henlopen. During the next 5 days, the Coast Guard conducted extensive communication checks with negative results. An air and surface search was commenced on 8 November and the ensuing search, which covered over 296,000 square miles during a ten-day period, proved unsuccessful and was suspended on 17 November. No trace of the vessel, crewmen, or debris was ever found.

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.

17. Key Words	18. Distribution Statement
Cargo vessel;disappearing;seaworthiness;inspection;grain;loading; search & rescue;weather warnings;waves; storm;emergency communications;auto alarms; EPIRB'S	This document is available to the public through the National Technical Information Service, Springfield, Virginia 22151

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16. *Abstract (cont)*

The Commandant has concurred with the Marine Board that the proximate cause of the casualty cannot be determined. Although significant credibility can be assigned to any of the possibilities noted by the Board, the Commandant considers it more probable that some loss of hull integrity occurred. If a loss of hull integrity occurred, the ingress of water could have gone undetected by the crew long enough to lead to the sudden loss of the ship by plunging, capsizing or foundering.

U.S. Department of Transportation
United States Coast Guard

Commandant
United States Coast Guard

Washington, DC 20593
Staff Symbol: G-MMI-1
Phone: (202) 426-1455

12 APR

Commandant's Action

on

The Marine Board of Investigation convened to investigate the circumstances surrounding the disappearance of the SS POET after departure from Cape Henlopen, Delaware on 24 October 1980 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 and concurred in subject to the following comments.

COMMENTS ON CONCLUSIONS

1. Conclusion 3(a): The Board was advised on 11 February 1982 that the CAPSIZE program had been rerun using a corrected sea height input and that output did not indicate a capsizing in quartering or following seas. Thus, the possibility that the vessel was lost due to capsizing is greatly reduced by elimination of the error in the original computer runs. Although synchronous rolling to the point of capsize remains a possibility for any individual ship, it has not been identifiable as a trend or safety problem for any vessel group. The POET hull form is a MARAD (C-4) hull which has served successfully on all oceans of the world for many years.

2. Conclusion 3(b): Although significant credibility can be assigned to any of the possibilities noted by the Board, the Commandant considers it more probable that some loss of hull integrity occurred. The age of the ship, the fact that it deferred repairs to both underwater hull and topsides, and the severity of the storm are factors to be considered. As the Board noted, if loss of hull integrity occurred, the ingress of water could have gone undetected by the crew long enough to lead to the sudden loss of the ship by one of several loss mechanisms:

a. Plunging - a sudden type of foundering by bow or stern due to the intensity of the storm;

b. Capsizing - loss of stability from the free surface of uncontained water within the hull (possibily combined with sea motion or grain shift due to partially flooded hold, etc.);

c. Foundering - in view of the severity of the storm, this is less likely than the two above.

3. Conclusion 4: Subsequent to the POET case, the Coast Guard and the Maritime Administration (MARAD) have agreed to combine the Automated Mutual Assistance Vessel Rescue System (AMVER) and the U.S. Merchant Vessel Locator Filing System (USMER). Initially MARAD will use its statutory authority to require U. S. Merchant ships on foreign voyages to participate in AMVER in lieu of USMER. The Coast Guard will provide needed information on U.S. Merchant ships to MARAD. In addition, the Coast Guard is conducting a program to test the feasibility of adding a distress alerting feature to the AMVER System. Results of this test are expected in approximately November 1982.

It should be noted that an Emergency Position Indicating Radio Beacon (EPIRB) is primarily a locating device. On occasion, alerting is possible, but the device cannot be depended upon for this. This situation will probably change if a satellite alerting system for EPIRB's becomes operational. Although the "float-free" deployment concept is still considered valid, it is noted that the Search and Rescue (SAR) Coordinator in the SAR case study done on the POET case recommended that vessels carry a minimum of two EPIRB's on deck, and at least one salt water activated EPIRB in every liferaft and lifeboat survival kit. The rationale for this was that it can be assumed that one EPIRB could easily be lost during an emergency or it could fail. If there is more than one EPIRB placed in various areas along the deck, at least one of them should float free to the surface if a vessel is sinking, and the signal could then be picked up by passing aircraft. Merchant vessel owners and operators will be encouraged to equip their vessels with EPIRB's in excess of requirements.

4. Conclusion 7: Conclusion 7 is not concurred with. As pointed out by the Board in the last paragraph of Finding of Fact 10, the Coast Guard inspector who conducted the drydock and biennial inspections had about one year "on the job experience." Although the inspector may have had limited experience compared to, for example, an inspector with 15-20 years of vessel inspection experience, there is no evidence to indicate that the inspections performed were not satisfactory. A Coast Guard inspection is defined in the Marine Safety Manual (CG-495) as "the process of examining a vessel . . . for determining the vessel's reasonable probable compliance with published minimum safety standards." Had the inspections been done by a "more experienced" inspector and had the previous inspection history been available, there is no evidence to indicate that the results of the inspections would have been different. The overall conclusion that the quality of the inspection program needs to be improved is not supported by the findings of fact in this case.

5. Conclusion 8: Conclusion 8 is not concurred with. There is insufficient evidence to state that a gap existed between the efforts of the ship's crew and the safety overview of federal agencies and the classification society.

ACTION CONCERNING THE RECOMMENDATIONS

1. Recommendation 1(a) and 1(b): These recommendations are concurred with and are discussed in the comments on Conclusion 4 above.

2. Recommendation 1(c): This recommendation is not concurred with in light of the Board's conclusion "...that it is likely that the lack of any radio distress message was due to the loss of the ship being so sudden that there was no time to send a distress message on 500 KHz using the main or emergency radio transmitters or the lifeboat radio." The Search and Rescue Satellite system (SARSAT), the International Maritime Satellite system (INMARSAT) and the Future Maritime Global Distress and Safety System (FMGDSS) are efforts dedicated to improving the reliability of ship to shore safety radio communications and revising present maritime SAR doctrine as a result. All these systems recognize the need for improved communications. Further evaluation is unwarranted.

3. Recommendation 1(d): During the SARSAT and the International Radio Consultative Committee (CCIR) coordinated trials programs, EPIRB's will be tested under a variety of sea states. The CCIR testing uses a network of stationary satellites and ground stations providing nearly instantaneous alerting between 70 degrees north and 70 degrees south latitude. Six nations are participating in the program and the first phases of testing are scheduled to be completed by September 1982. The successful design will be recommended for adoption by the Intergovernmental Maritime Consultative Organization (IMCO) as the international standard for use with the INMARSAT system.

The SARSAT program is considering a different type of satellite which is in low altitude polar orbit. The coverage is virtually global, but is not time continuous. Anticipated mean delays of alerting in the northern hemisphere approximate 30 minutes. Both of these satellite EPIRB's are expected to be elements of the IMCO FGMDSS.

4. Recommendation 1(e): Recommendation 1(e) is not concurred with. The need for developing an EPIRB which would emit a signal detectable by other ships was evaluated before the requirements for EPIRB's were introduced in 1975. In general, it was found that the large antenna and high power requirements needed for the maritime frequencies were inconsistent with an EPIRB package of acceptable size and price. Higher, line of sight frequencies used on board ships would not have sufficient range to be effective. Consequently, the line of sight, aeronautical frequencies were chosen as the best alternative. The potential additional coverage offered by other ships is minimal when compared to the coverage offered by aircraft or satellite. This is the impetus for the SARSAT and CCIR coordinated trial programs efforts. To pursue the development of yet another EPIRB would detract from efforts that have a much greater potential.

5. Recommendation 1(f): Evaluating the power and frequency requirements of both the present 121.5 MHz and future 406 MHz EPIRB's is an essential aspect of the SARSAT project.

6. Recommendation 1(g): This recommendation is not concurred with. The Board noted in conclusion 4 that "The EPIRB either did not float free and start

transmitting or did float free and start transmitting but was not received." Therefore, an EPIRB failure cannot be conclusively determined for this case. An electronic or mechanical failure is always a possibility with any device. The effort required to determine failure rates and institute any follow-up action would detract from efforts currently in progress. Specifically, the SARSAT and the FMGDSS efforts are addressing the EPIRB "transmitting but not being received" scenario. Solving this problem has the greatest potential for increasing the safety of life at sea.

Currently, the Federal Communications Commission (FCC), in addition to the Coast Guard, inspects EPIRB's as a part of the annual communications inspection. The Coast Guard has 37 FCC deficiency reports on the MARTECH EPIRB, the type used on the POET, since 1975. Of these, 13 identified some type of operational problem, and 11 of these involved a defective antenna spring. The manufacturer rectified the antenna spring problem in 1978 for all new production and repairs. The FCC inspection of the POET's EPIRB, which took place two months before the casualty, found that the unit had a fresh battery and no problems. Failure of the antenna spring or any other mechanical failure of the EPIRB is therefore discounted. Possible reasons for the EPIRB signal not being received include:

a. The EPIRB being stowed in the pilothouse or another location versus its floatfree container. This is believed to be a fairly common practice in spite of the regulations. It was a contributory factor in the failure to transmit of the EPIRB on the CHESTER A. POLING when that vessel sank.

b. The EPIRB was damaged or trapped when the vesel was lost.

c. Aircraft were avoiding the area of severe weather in which the POET was presumed lost, therefore not coming within the 100 mile nominal range of the unit.

7. Recommendation 1(h): Coast Guard policy currently in existence, e.g., the Telecommunications Manual (Commandant Instruction M2000.3), directs any Coast Guard unit receiving information pertaining to possible distress situations, such as an auto alarm signal, to pass the information to the appropriate Rescue Coordination Center as soon as possible.

8. Recommendation 2: This recommendation is not concurred with. That the POET was lost without EPIRB distress alerting or other radio communication indicates a probable catastrophic failure. The complete lack of evidence makes it inadvisable to attempt a specific course of action, such as the establishment of a National Maritime Safety Radio Communications Plan. Developing such a plan would entail a considerable expenditure of resources and yet there is no assurance that it would have any effect upon future casualties of this nature. Such a plan is not considered cost effective.

9. Recommendation 3: This recommendation is concurred with in part. As noted in the comments on conclusion 3(a) above, the CAPSIZE program was rerun

with corrected sea height input and indicated no capsize in quartering or following seas. Validation of the CAPSIZE program is necessary, and will be undertaken as manpower and funding permit.

10. Recommendation 4: A copy of this report has been forwarded to the Defense Mapping Agency for their information.

11. Recommendation 5: This recommendation is concurred with. Guidance as to the inspection of internal tanks will be developed and promulgated in the Marine Safety Manual. An item on internal compartments will be added to the DRYDOCK EXAMINATION BOOK. The Marine Safety Information System (MSIS) is being developed to improve overall marine safety. In addition to Certificates of Inspection and other documented vessel data, the MSIS, when fully operational, will also contain a complete vessel history which will include casualty reports, reports on individual inspections, and repair reports. These reports will be available to each Marine Inspection/Marine Safety Office for every certificated vessel.

12. Recommendation 6: The Commandant has a continuing goal of increasing the skill and experience level of the work force engaged in the performance of ship inspections. Recent initiatives in this area include an expanded program of direct commissioning of senior merchant marine officers to serve only in commercial vessel safety; updating the charter of the Marine Safety Training Council to provide a coordinated and uniform functional training program for marine safety personnel; and extending tour lengths for personnel assigned to commercial vessel safety.

13. Recommendation 7: This recommendation is not concurred with. The terms regarding delegation of the loadline inspection function to the American Bureau of Shipping (ABS) are clearly set forth in Title 46, United States Code (USC), Section 85b. Delegations to the International Cargo Gear Bureau for cargo gear plans and the National Cargo Bureau, Inc. (NCB) for bulk grain cargoes are in Title 46, Code of Federal Regulation (CFR), Parts 91.37-23 and 93.20-10(b) respectively. With regard to the 1974 Safety of Life at Sea Convention (SOLAS), implementation of that Convention by Executive Order 12234 dated 3 September 1980 allows:

a. The use of the services of ABS for vessel classification functions, and

b. The use of NCB "to perform functions under Chapter VI (Carriage of Grain) of the Convention."

Further clarification regarding such delegations is not deemed necessary.

14. Recommendation 8: International developments are monitored through the Life-Saving Appliance Subcommittee of IMCO. This forum has also been the site of discussions leading to a revision of Chapter III of the 1974 SOLAS Convention which will introduce a number of improvements to vessel lifesaving systems when adopted. Close liaison is also maintained with the U.S. Navy and its lifesaving development programs. The Coast Guard will also continue to monitor casualty data through the marine casualty reporting system in an effort to identify areas of concern and possible improvement of all aspects of marine safety, including improvement of lifesaving equipment and related safety procedures.

15. Recommendation 9: This recommendation is not concurred with in that sufficient oversight now exists. Subpart 30-1-15 of the Marine Safety Manual, Vessel Inspection Policy, defines inspection as "the process of examining a vessel . . . for determining the vessel's reasonable compliance with published minimum safety standards." The Merchant Vessel Inspection program is therefore, the auditing process that the Government, through the Coast Guard, utilizes to insure that owners/operators are maintaining their vessels in a safe manner. Finding of fact 10 lists the various times that the owner/operator of the POET was "audited" (i.e., the number of inspections performed on the vessel) for the U.S. Government.

16. Recommendation 10: A copy of this report has been forwarded to IMCO.

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TABLES

FIGURES

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD
WASHINGTON, D.C. 20593
PHONE:

16732/SS POET

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

Subj: SS POET, O.N. 294731; Disappearance after departure from Cape Henlopen, Delaware, on 24 October 1980 while enroute Port Said, Egypt, with presumed loss of life

FINDINGS OF FACT

1. SUMMARY

At 0120 on 24 October 1980 (all times are EDST +4 time zone based on a 24-hour clock unless otherwise indicated; times given as EST are +5 zone time), the general cargo vessel POET departed Girard Point, Philadelphia, Pennsylvania, loaded with a bulk grain cargo of #2 yellow corn. At 0900, POET sent a U. S. Merchant Vessel Locator Filing System (USMER) message to the Maritime Administration in Washington, D.C., indicating departure from Cape Henlopen, Delaware, on a rhumb line course to Gibraltar and Port Said, and then to Alexandria, Egypt, at a speed of 15 knots. The POET's estimated date of arrival at Port Said, Egypt, was 9 November 1980. The last known communication with the POET was at midnight on 24 October when [redacted] third mate on board POET, contacted his wife via ship to shore radio. On 3 November, the Coast Guard Rescue Coordination Center (RCC) in New York was contacted by the vessel's owners stating that the POET had not communicated with them since her departure from Cape Henlopen. During the next 5 days, the Coast Guard conducted extensive communication checks with negative results. An air and surface search was commenced on 8 November and the ensuing search, which covered over 296,000 square miles during a ten-day period, proved unsuccessful and was suspended on 17 November. No trace of the vessel, crewmen, or debris was found, and to date the vessel has not been heard from.

2. VESSEL DATA

Name:	POET (ex-PORT, PORTMAR, GENERAL OMAR BUNDY)(AP--152)
Official Number:	294731 (USA)
Service:	General Cargo
Document:	Temporary Registry #7
Gross Tons:	11421

Net Tons:	7636
Length:	522.88 Ft.
Breadth:	71.5 Ft.
Depth:	43.5 Ft.
Built:	December 1944, Kaiser Comp., Inc., Richmond, CA, Shipyard No. 3
Material:	Steel
Construction/Type Hull:	Welded, part riveted/C4-S-A1
Converted:	April 1965, Bethlehem Steel Corp., Shipbuilding Div., Sparrows Pt. MD
Propulsion:	Steam Turbine
Horsepower:	9900
Homeport:	New York, NY
Owners:	Hawaiian Eugenia Corporation 17 Battery Place New York, NY 10004
Operators:	International Ship Management & Agency Services, Inc. 17 Battery Place New York, NY 10004
Master:	Leroy A. WARREN [redacted]
License:	[redacted] Issue 4-9 Master, Steam & Motor Vessels Any gross tons, Upon oceans - Radar Observer. Last renewal 17 June 1980. Baltimore, MD
Date/Place Certificate of Inspection:	Issued 6 March 1980/Port Arthur, TX Authorized Route - Ocean
Expires:	6 March 1982
Date/Place Last Drydocked:	March 1980/Port Arthur, TX
Cargo Ship Safety Equipment Certificate:	Issued 6 March 1980, USCG

Cargo Ship Safety Construction Certificate:	Issued 30 June 1980, ABS
Cargo Ship Safety Radiotelegraphy Certificate:	Issued 19 August 1980, FCC
Cargo Ship Safety Radiotelephony Certificate:	Issued 19 August 1980, FCC
Exemption Certificate issued under the authority conferred by Regulation 5 of Chapter IV of the regulation annexed to the SOLAS '74 Convention:	Issued 9 May 1980, FCC
Load Line Certificate:	Issued 18 June 1977, ABS
Last Annual Endorsement:	19 August 1980, ABS
Cargo Gear Certificate:	Issued 15 February 1979, ABS
Classification:	American Bureau of Shipping (ABS) +A1(E) Hull +AMS Machinery
Radio Station License:	Issued 16 August 1979, FCC

3. CREWMEMBER INFORMATION

Name: Leroy A. WARREN, [redacted]
Position: Master
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Norman H. CURRIER; [redacted]
Position: Chief Mate
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: William A. KING; [redacted]
Position: Second Mate
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Robert W. GOVE; [redacted]
Position: Third Mate
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Joseph VYHNAK; [redacted]
Position: Radio Officer
SSN: [redacted] DOB: [redacted]
Address: Unknown (Czech National)
NOK: Unknown

Name: Edward D. ADAMS; [redacted]
Position: Bosun
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Mother - [redacted]

Name: Rickey A. SALLEE; [redacted]
Position: Able Seaman
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Mosel Myers; [redacted]
Position: Able Seaman
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Roland H. COURTER; [redacted]
Position: Able Seaman
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Mother and Father - Mr. & Mrs. [redacted]

Name: Hans P. ZUKIER; [redacted]
Position: Able Seaman
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Mother - [redacted]

Name: Carl L. GOFF; [redacted]
Position: Able Seaman
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Shawn T. GOODEN; [redacted]
Position: Able Seaman
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Stephen J. CONNORS; [redacted]
Position: Ordinary Seaman
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Alfred SCHMIDT; [redacted]
Position: Ordinary Seaman
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Mother - [redacted]

Name: Edward E. BRADLEY; [redacted]
Position: Ordinary Seaman
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Mother - [redacted]

Name: Lloyd G. THAYER; [redacted]
Position: Chief Engineer
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Michael S. CANFIELD; [redacted]
Position: First Assistant Engineer
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Father - [redacted]

Name: Christopher CARRINO; [redacted]
Position: Second Assistant Engineer
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Mark S. HENTHORNE; [redacted]
Position: Third Assistant Engineer
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Mother - [redacted]

Name: Anthony J. BOURBONNAIS; [redacted]
Position: Third Assistant Engineer
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Frank E. HOLLAND; [redacted]
Position: Deck/Engine Utility
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Sister - [redacted]

Name: Walter M. MITCHELL; [redacted]
Position: Oiler
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Brother - [redacted]

Name: Claude D. BERRY; [redacted]
Position: Oiler
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Otis R. HUNTER; [redacted]
Position: Oiler
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Calvin E. BETHARD; [redacted]
Position: Fireman/Water Tender
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Brother - [redacted]

Name: Abraham G. MURILLO; [redacted]
Position: Fireman/Water Tender
SSN: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: George E. WARD; [redacted]
Position: Fireman/Water Tender
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Mother - [redacted]

Name: Thaddeus M. SIMMONS; [redacted]
Position: Wiper
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Eddie SYLVESTER; [redacted]
Position: Chief Steward
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Carl JACKSON; [redacted]
Position: Chief Cook
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Noel W. McLAUGHLIN; [redacted]
Position: Chief Baker
SSN: [redacted]
Address: [redacted]
NOK: Wife - [redacted]

Name: Tracy R. WALKER; [redacted]
Position: Messman
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Mother - [redacted]

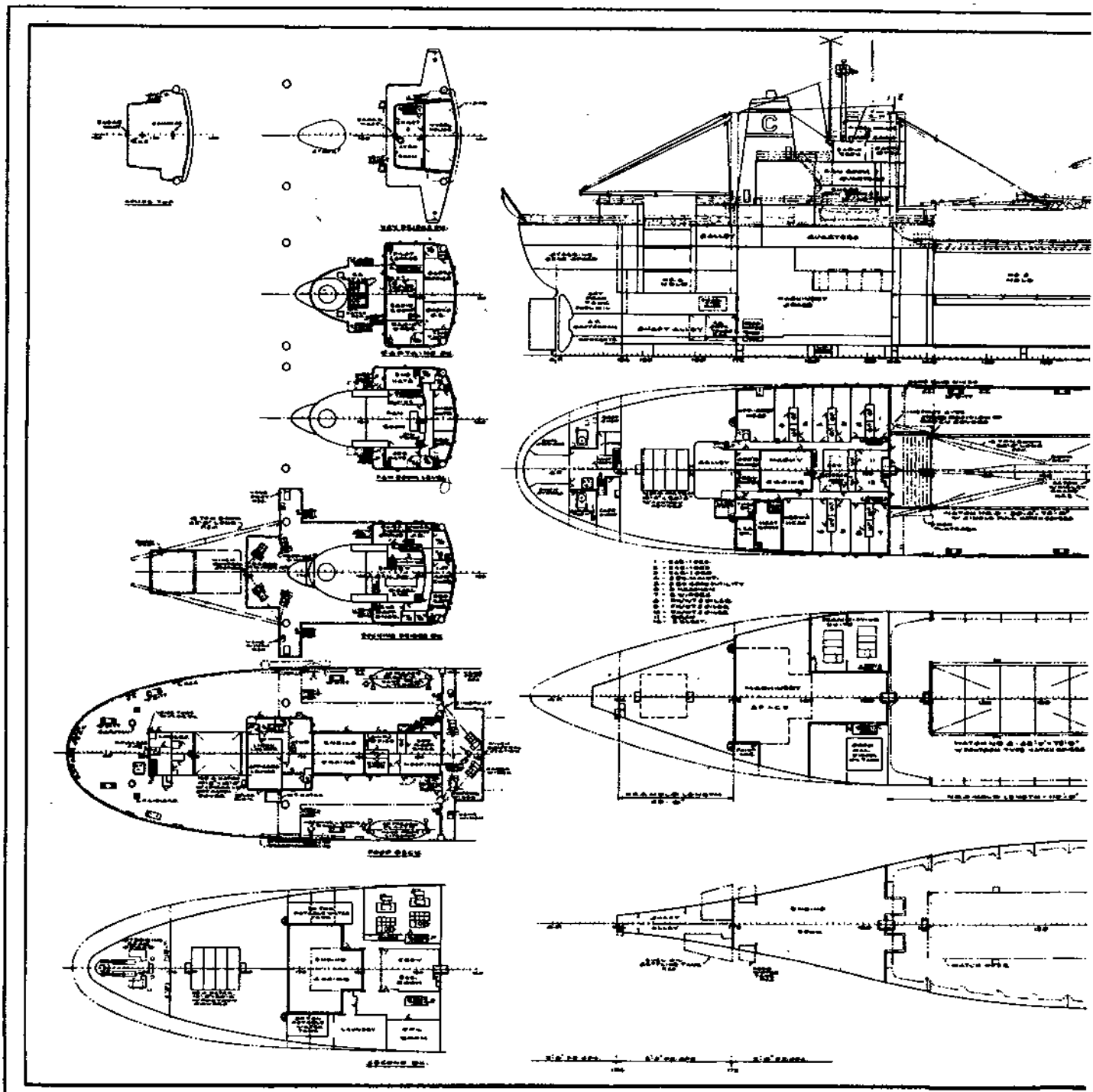
Name: Jerry BATCHLER; [redacted]
Position: Messman
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Mother - [redacted]

Name: Earl K. WHATLEY; [redacted]
Position: Steward Utility
SSN: [redacted] DOB: [redacted]
Address: [redacted]
NOK: Father - [redacted]

4. GENERAL DESCRIPTION

The SS POET, O.N. 294731, was built in 1944 with a standard C-4 troopship hull configuration by Kaiser Shipbuilding Corp. at Richmond, California. On 6 January 1945, the vessel was commissioned the GENERAL OMAR BUNDY (AP-152). In June 1946, the vessel was transferred to the War Department and carried troops for the Army until returned to the Maritime Commission in December 1949. GENERAL OMAR BUNDY entered the National Defense Reserve Fleet and was berthed in the James River until delivered to the Bethlehem Steel Corp. in April 1964. In 1965, the vessel was converted for service as a cargo vessel for Calmar Steamship Corp. Renamed the SS PORTMAR, the vessel was used to transport steel products and other bulk commodities. SS PORTMAR was renamed SS PORT and finally SS POET by subsequent owners. Figure 1 shows the general arrangement of the vessel after conversion by Bethlehem Steel Co., Shipbuilding Division, Sparrows Point, Maryland.

POET was steam turbine powered with two boilers and a single screw and rudder. Berthing, machinery, and navigation spaces were located in the single deckhouse aft. POET had six transverse watertight bulkheads. Four cargo holds were provided; three (#1, 2, & 3) forward of the deckhouse and one (#4) aft of the deckhouse. The #1 deck hatch cover was a two-piece steel pontoon type which was opened and closed by using the forward booms. The #2 and #3 deck hatch covers were steel folding "McGregor" type covers. The #4 deck hatch cover was a single piece hinged steel cover. All hatch covers were fitted with gaskets and were secured by means of dog bolts. POET had two rotary cranes forward which were used to load and discharge bulk cargo. Booms at the #4 cargo hold had been removed in February 1979 and, consequently, the aftermost hatchcover could not be opened or closed with ship's gear. Over the past few years, the vessel was operated as a tramp ship carrying general cargo; knockdown houses, steel, bagged flour, and bulk grains. When the aftermost cargo hold was used, shore-based cranes were utilized.



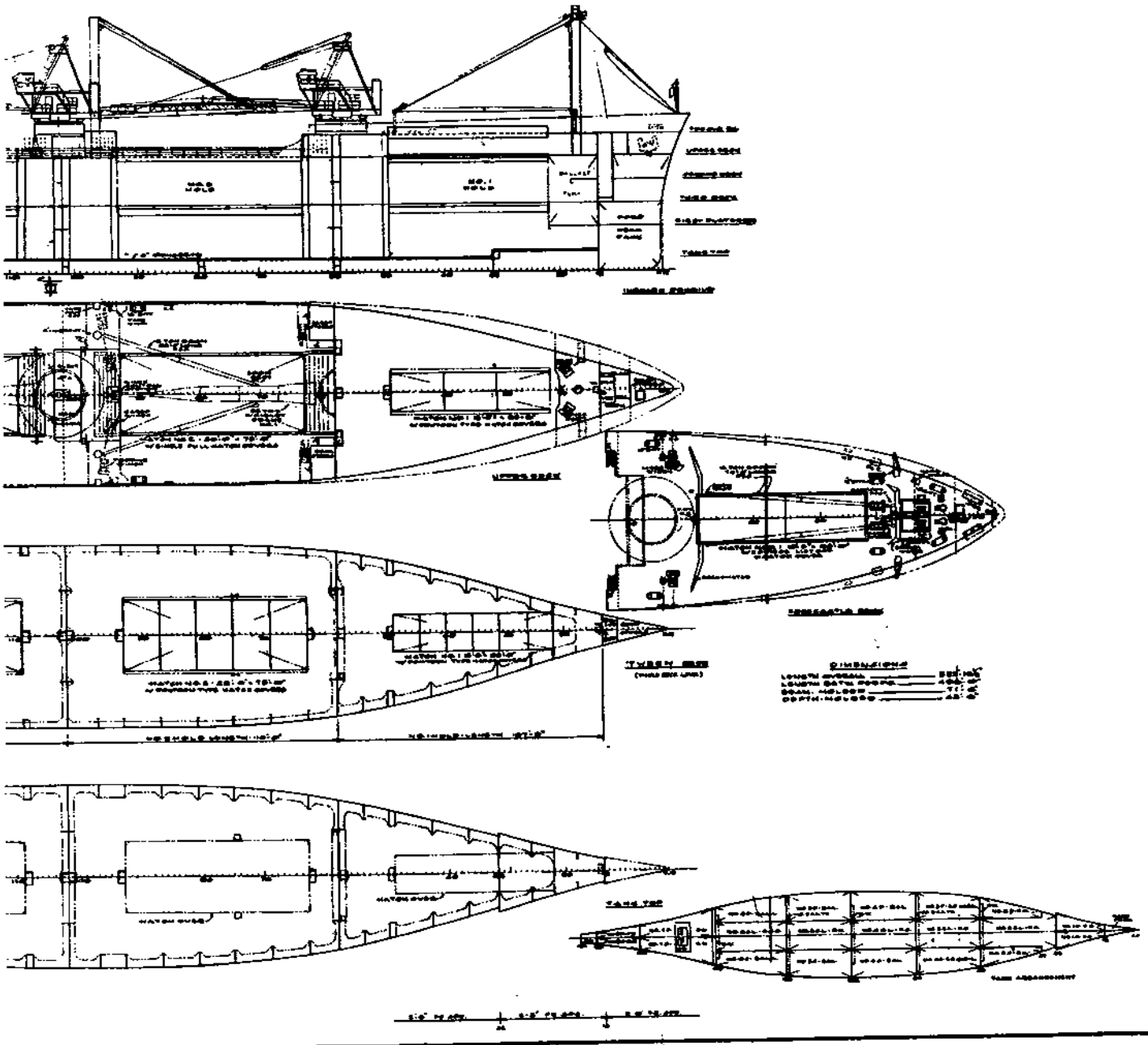


Figure 1 POET--General Arrangement

2022

Mr. [redacted], president of Hawaiian Eugenia Corp., owner of POET, was also president of International Ship Management and Agency Service, operators of the POET. Both home offices were located in the same building and room and had the same office personnel handling the vessel's affairs. Hawaiian Eugenia Corp., in addition to permanently employed port engineers, on occasion, employed temporary representatives to oversee repair work or otherwise represent the owners.

5. COMMUNICATION AND NAVIGTION EQUIPMENT

Equipment

Communication and navigation equipment on board POET consisted of the following:

Main Transmitter:	RCA Model ET 8051A
Emergency Transmitter:	RCA Model ET 8043
Main Receiver:	RCA Model CRM R6A
VHF/FM Bridge to Bridge Receiver:	GE Model ER 52 A
Emergency Receiver:	RCA Model AR 8510
VHF/FM Bridge to Bridge Transceiver:	INTECH Mariner Model 70
Lifeboat Transceiver:	ITT Mackay Model 401A
Auto Alarm:	RCA Model AR 8603
Auto Alarm Keyer:	RCA Model 8651
Single Side Band (SSB) Radio Transceiver:	CAI Model CA 35 MS KW
Emergency Position Indicating Radiobeacon (EPIRB) Class A:	Martech Model EB-2BW CG Approved #161.011/1/0
General purpose high frequency (HF) transmitter (required after 25 May 1981):	RCA Model CRM TIA-1000 M
Radio Direction Finder (RDF):	RCA Model AR 8714B
Loran C:	Northstar 6000
Radar:	Decca, Model D202 Raytheon, Model 1401

Power for the main communications equipment and high frequency transmitter was supplied from the ship's main electrical system through a motor-generator set located in the machinery space below the radio room. Emergency transmitter, receiver, and lighting (radio room) were powered by lead acid batteries located in the battery locker adjacent to the radio room on the captain's deck. These batteries were manually charged off the motor-generator set.

POET was fitted with independent long wire main and emergency antennas. Main and emergency radio equipment could each be operated using either antenna through a selector switch located in the overhead in the radio room. Both wire antennas were fitted with a safety link. If for any reason the link should part, the antenna would become slack and remain functional but not so slack that it would come in contact with any of the ship's structure or gear.

An Emergency Position-Indicating Radio Beacon, or EPIRB is a device which can be manually or automatically activated to transmit radio frequency signals which alert search and rescue (SAR) forces and provide a signal at the position of the distress which can be homed on. The EPIRB on POET operated on 121.5 and 243 MHZ FM which are aircraft distress frequencies. These signals are line of sight and presently only military aircraft and commercial aircraft on oceanic flights have the capability of homing on an EPIRB alerting signal.

The EPIRB on board POET was typically stowed in a float free position on the after face of the starboard bridge wing when the vessel was underway. The EPIRB container on the POET was designed to allow the EPIRB to float free without overhead obstruction. When the container becomes submerged in water, the lid floats off, allowing the EPIRB to be released and float to the surface. Evidence indicates that it was normal procedure for the EPIRB to be taken inside the pilothouse when the vessel was in port. The EPIRB on board POET was small and light and, according to testimony, susceptible to pilferage. Once inside the pilothouse, it was placed in an area where the mate would almost "trip over it." This situation acted as a reminder to the mate to put it back out on the bridge wing during the testing of the bridge equipment prior to the vessel getting underway. There is no evidence indicating that this was or was not accomplished prior to the vessel's departure from Philadelphia.

Inspection of Communication Equipment

On 19 August 1980, POET underwent an annual inspection by Mr. [redacted], of Decatur, Georgia, of the Federal Communications Commission (FCC). The inspection included checks of the currents to the antennas and the input power into the final stage of the main transmitter. During the inspection, the main and emergency transmitter would not load properly into the emergency antenna. According to [redacted] the cause of the improper loading was due to a partial ground resulting from salt deposits on the emergency antenna insulators dissolving in rainwater from a passing thunderstorm. In the FCC Inspector's experience, this was a common condition typically taking several months to develop. The antenna was lowered, the insulators wiped clean and raised back. The main and emergency transmitters were then loaded into the emergency antenna and tested satisfactorily. During the inspection, the FCC inspector noted that POET had a satisfactory complement of spare parts aboard for the main and emergency transmitters and receivers.

The auto alarm and keyer were tested and found satisfactory. The keyer was tested by actually transmitting on 500 kHz. The emergency lifeboat radio, which is normally stowed in the radio room, was tested on the "dummy load" and found satisfactory. Emergency lighting in the radio room was also tested and found satisfactory.

Emergency batteries were checked by several means including specific gravity and by operating emergency radio equipment on the batteries alone to ensure that sufficient power was available. The batteries were considered satisfactory by Mr. [redacted].

The EPIRB was examined and tested. The EPIRB test procedure used by the FCC inspector included immersing it in a bucket of water for 60 seconds to check for any leakage. According to the inspector, if the EPIRB was not watertight, it normally would have been discovered within 15 seconds. The EPIRB operated satisfactorily during the test. Frequency output was checked on 121.5 MHZ using the attending radio officer's small commercial radio which was capable of receiving on 121.5 MHZ. The inspector noted that fresh batteries had been installed.

Upon completion of the FCC inspection, the radio equipment was found to be in full compliance with the applicable FCC and SOLAS regulations. POET was issued a Cargo Ship Safety Radiotelegraphy Certificate, an EPIRB Compliance Certificate and a Vessel Bridge to Bridge Radiotelephony Certificate.

On 9 May 1980, POET was issued a SOLAS Exemption Certificate by the FCC. This certificate, valid until 25 May 1981, exempted the vessel from complying with the 1974 SOLAS convention which requires ship stations to maintain a listening watch on 2182 kHz (distress frequency) and to have auto alarm equipment for detection of an automatically transmitted distress signal on 2182 kHz when the radio operator is not on watch.

Repairs

The vessel's owners had a contract with RCA Global Communications to maintain the POET's radio equipment in proper order and to maintain the various ship radio licenses up to date. RCA personnel visited POET periodically to examine the equipment and to make repairs when necessary. They also conducted pre-FCC inspection checks and assisted the ship's radio officer during the annual FCC inspection.

On 18 October 1980, while POET was in Philadelphia, Pennsylvania, Mr. [redacted] an RCA marine service field technician from Medford, New Jersey, boarded the vessel to discuss with Mr. [redacted], ship's radio officer, any problems he might be experiencing with the radio equipment so that appropriate repairs could be made.

According to Mr. [redacted], Mr. [redacted] stated that on POET's last voyage from Port Said, Egypt, to Philadelphia, Pennsylvania, he experienced difficulty communicating on the HF transmitter and believed that one of the meters needed calibration. [redacted] inspected the transmitter and found that it was loading out to the antenna at approximately 400 milliamps (ma) vice 600. According to [redacted], 400 ma should have been sufficient loading to obtain communications. [redacted] compared the milliamp meter on the HF transmitter to

his own and found that the meter on the transmitter was off by only 5 ma. He felt no calibration was necessary and he made none. [redacted] went through the loading at various bands from 6 through 22 megahertz (MHz) and discovered that a 2,500 ohm, 100-watt resistor was broken and needed replacement. [redacted] noticed that it had been temporarily repaired by placing a jumper across the defective portion of the resistor. He replaced the resistor and proceeded to tune the transmitter. During the tuning, one of the rectifier tubes arced to ground, blowing some of the console fuses. The rectifier is the power supply for the main and HF transmitters. According to [redacted] this occurs due to dust and dirt buildup and exposure to the salt air environment over the years. [redacted] lifted the tube out of the socket, made up a base of insulated material and put it under the tube socket, and reinstalled the tube. After completion, [redacted] loaded the HF transmitter to the main antenna on 6, 8, 12, 16, and 22 MHz. The full 600 ma was attained. [redacted] then conducted radio checks with local stations along the coast and obtained satisfactory results.

Mr. [redacted] also requested that the gain control sensitivity (RF) and audio gain (AF) controls and band switch on the main receiver be changed. The audio control was noisy and, when the volume was changed, it made a scratchy sound. According to Mr. [redacted] the noisy sound is a characteristic of this particular model receiver. When the gain is turned from low to high, it does so in a sudden blast. [redacted] noted that some of the bank switches were dirty and required shop time in order to be cleaned and aligned. Therefore, the receiver was removed from the ship and taken to the RCA repair shop in Jersey City, New Jersey, for servicing.

Mr. [redacted] later brought a used receiver of the same type back to the POET as a replacement unit; however, the radio officer found it unacceptable and rejected it. According to [redacted], Mr. [redacted] was not satisfied with the calibration; in addition, the automatic gain control did not work as well as the original receiver. The replacement receiver was removed from the ship and returned to Jersey City. Repairs were made to the original receiver and it was re-installed on the POET on 23 October.

During his visit, Mr. [redacted] noticed that the radio officer had his own digital radio receiver. At one time, he saw it being used and heard it tuned to a station in Athens, Greece. The emergency receiver was also on and working. [redacted] also recalled that the ship's auto alarm keyer inadvertently was turned on, keying the transmitter. This keyer is designed to transmit a series of 12 consecutive 4-second dashes with 1-second intervals on 500 kHz (international distress frequency). If the radio officer on the receiving vessel is not on watch, this signal would activate the auto alarm. The auto alarms on the POET were located in the pilothouse and radio officer's quarters. It takes 8 or more dashes to activate an auto alarm. If an actual distress signal (auto alarm) was sent, it would be followed by a distress message (Mayday) giving the name or call sign of the vessel, position of the ship, and the nature of the distress.

6. POSITION REPORTING PRACTICES

Vessel Practice

Mr. [redacted], the radio operator (who had just recently completed his 6-month apprenticeship program), reported on board on 18 September 1980 at Port Said, Egypt. POET's trip from Egypt to Philadelphia with Captain [redacted] as master was [redacted] first "solo" voyage. A review of the POET's communications sent on that voyage disclosed that after departing the Mediteranean Sea, fuel, position, and USMER messages were sent on schedule.

POET's operating manual states that the vessel should communicate with the owners every second day. The message should include, among other things, the vessel's noon position, speed made good over last 48 hours, and any appropriate comments with regard to the condition of cargo or unusual weather conditions encountered or forecast which have significantly affected the vessel's performance or will affect their estimated time of arrival (ETA). According to Mr. [redacted], president of Hawaiian Eugenia Corporation, the masters do not always adhere to this schedule. [redacted] further stated that the masters and radio officers often cited atmospheric conditions as a reason for not meeting this schedule. According to Captain [redacted], a previous master on POET, fuel and position messages were sent to the owners every Monday and Thursday when at sea and USMER reports were sent upon departure and every 48 hours thereafter until arrival in port.

Reporting Systems

The U. S. Merchant Vessel Locator Filing System (USMER) exists to keep interested agencies of the Federal Government informed concerning arrivals, departures, and at-sea locations throughout the world of U. S. flag merchant vessels and particular foreign flag, U. S. owned vessels. Position reports are required to be submitted by all U. S. flag merchant vessels of 1,000 gross registered tons and over engaged in foreign commerce and not operating under the control of the Military Sealift Command, and non-U. S. flag vessels covered by a "war risk" insurance binder issued by the U. S. Government. Statutory authority for USMER reports is found in the Merchant Marine Act of 1936, PA 835 Section 212(A). Once received, USMER messages are relayed to the central filing point by U. S. Navy and Coast Guard communication stations at no cost to the vessel operator. Vessels transiting the Atlantic Ocean and Mediteranean Sea address USMER messages to Address Indicating Group (AIG) 388, which includes the following:

(1) Naval Ocean Surveillance Information Center (NOSIC), Suitland, Maryland. NOSIC receives reports and stores the position information in a computer, retrieves information, and prepares reports for the Maritime Administration.

(2) Automated Mutual Assistance Vessel Rescue (AMVER) Center in New York. The information contained in the message satisfies Coast Guard AMVER requirements. AMVER is a voluntary system operated by the Coast Guard which maintains information on positions of commercial vessels for utilization in search and rescue operations. Data on predicted vessel positions and vessel

SAR capabilities are made available to recognized Rescue Coordination Centers of any nation, for use during emergencies at sea. Predicted vessel locations are disclosed only for reasons related to maritime safety.

(3) Fleet Numerical Weather Center, Monterey, California. The Weather Center utilizes weather information that is contained in the remarks portion of the message.

(4) Maritime Administration (MARAD), Washington, D.C. MARAD administers the USMER program.

USMER messages must be sent upon departure and arrival at each port and at sea, beginning at noon of the second day following departure and every 48 hours thereafter. Revised at-sea reports are to be submitted whenever the estimated time of arrival (ETA) changes more than 24 hours or if the ship's destination changes.

According to [redacted], National Security Planning Officer for MARAD, MARAD has not been tasked with the requirement of performing an audit trail of ships reporting to USMER. Approximately every three months, MARAD runs a one-month check to see which ships are reporting into the system. If it is discovered that a ship has not been reporting on schedule, MARAD makes inquiries to the owners to ascertain the reason.

7. CARGO AND LIQUID LOAD

Grain Loading Regulations

Grain is among the most basic of commodities and must have been a cargo very early in marine trade (grain vessels are mentioned in the commentaries of Julius Caesar). Grain can be shipped in bags but, today, grain is shipped in bulk. Bulk or loose grain has long been recognized as a problem cargo requiring special precautions to avoid shifting. The loss or near loss of several vessels transporting grain in bulk subsequent to the 1960 Safety of Life at Sea Convention led to a major research program which uncovered a fallacy in the International Grain Regulations in force at the time. These regulations had been developed on the premise that sinkage or settling of grain occurred after loading and could be compensated for by installation of a feeder constructed in the hatch trunk. These regulations presumed that the holds could be trimmed full--a condition desired but later found not to be obtained in actual practice. The subsequent research found substantial void spaces remaining under horizontal surfaces clear of the hatchways. The feeders did not perform as intended; instead they fed grain to the low side once a ship had acquired a list, aggravating the problem.

The International Grain Regulations have since been revised on the basis of these research results. These new regulations require that stability calculations be made prior to each voyage. These calculations are necessary to make sure the vessel has sufficient residual dynamic stability to prevent capsizing in the event of an adverse shift of the grain cargo. To increase the level of safety, an assumption that a void space exists is included in the calculations.

The regulations applicable to the loading of grain on POET are found in:

Title 46 Code of Federal Regulations, Part 93.20, "Bulk Grain Cargoes".

Coast Guard policy on the implementation of the regulations is published in:

Navigation and Vessel Inspection Circular 3-75, 20 August 1975, "Bulk Grain Cargoes, Parts 31, 74, and 93," containing IMCO Resolution A.264 (VIII), "Amendment to Chapter VI of the International Convention for the Safety of Life at Sea, 1960." This amendment to SOLAS 1960 contained the International Grain Regulations in effect at the time of the POET's disappearance. Since that time, SOLAS 1974 has come into effect and the same requirements now appear in Chapter VI of SOLAS 1974.

Navigation and Vessel Inspection Circular No. 2-78, 16 October 1978, "Bulk Grain Cargo Regulations, 46 CFR 31.10-33, 46 CFR 74.10-12, and 46 CFR 93.20," which establishes procedures for the submission and approval of calculations and for the issue of the Certificate of Loading.

Grain Loading Procedures

For U. S. vessels, the process used to ensure that shifting of grain will not be a problem involves a number of steps. Prior to carrying grain, calculations are made by naval architects to establish loading restrictions which will minimize grain shifting problems and to ensure that grain loading arrangements meet the requirements of the International Grain Regulations. These calculations are incorporated into the stability booklet, which is approved by the National Cargo Bureau and the U. S. Coast Guard. In the case of POET, the trim and stability booklet was prepared by naval architects Wesley D. Wheeler and Associates, Ltd., and approved by the National Cargo Bureau on behalf of the U. S. Coast Guard on 20 January 1979.

The stability booklet, including information on acceptable grain loading arrangements, is placed on the vessel for use by the vessel's crew in planning grain loading arrangements. Each time grain is loaded, a ship's officer, usually the chief mate, makes a loading plan and performs calculations to establish that the vessel will be in satisfactory stability condition. These calculations are recorded on a National Cargo Bureau form, "Grain Stability Calculation." Prior to the loading, these calculations are checked by a surveyor from the National Cargo Bureau to ensure that they have been done correctly and that the proposed loading plan provides adequate vessel stability.

In addition to reviewing stability calculations for the proposed stowage of the vessel's cargo, the National Cargo Bureau surveyor inspects the holds prior to loading to ensure that they are clean and that there is no damage or excessive wear in way of the holds, and monitors the loading of the vessel. Normally, when a vessel is loading grain, a National Cargo Bureau surveyor is on board periodically each day to inspect and discuss with the chief officer the progress of the loading and any associated problems. The surveyor is on telephone recall when not actually aboard. In addition to the daily visits, a surveyor is in attendance when the ship finishes cargo loading. The surveyor is not necessarily present during the trimming out of each cargo hold but monitors the trimming operation during his periodic visits to the vessel.

Cargo and Liquid Load on POET

The charter agreement for the 24 October voyage was signed on 14 October 1980 between Hawaiian Eugenia Corp. and the Egyptian Company for Maritime Transport with the Egyptian Commercial and Economic Office of Washington, D.C., as agents for the Ministry of Supply, Cairo, Arab Republic of Egypt, Charterers. The agreement called for one voyage with a full and complete cargo of 13,750 metric tons of #2 yellow corn. The port of discharge was specified as either Alexandria or Port Said, Egypt. According to testimony, cargo shipped under this charter party was financed under The Food for Peace Act of 1966, Pub. L. No. 89-808, 80 STAT 1526 (amending Pub. L. No. 83-480) which provides for the U. S. Government to loan certain funds to various countries. The Cargo Preference Act of 1954, Pub. L. No. 83-664, 68 STAT 832 (amending Public Act 835) requires that U. S. flag vessels be used to transport half of all cargo shipped under the Food for Peace Act. The POET had been chartered to meet this requirement.

The POET arrived at Pier 2, Girard Point, Philadelphia, Pennsylvania, from Port Said, Egypt, at 0700 on 17 October 1980. Pier 2 at Girard Point was to be a layberth for the POET while she awaited a loading berth at the grain terminal. During the morning, the vessel was prepared for an initial inspection by the National Cargo Bureau surveyor and U. S. Department of Agriculture inspectors to establish that the vessel was ready for loading grain. Preparations included opening of the hatchcovers to provide access and light in the holds. Captain [redacted], National Cargo Bureau surveyor, was aboard the POET from approximately 0945 until 1800. In addition to inspecting the holds with the USDA inspectors, [redacted] reviewed the grain loading calculations prepared by the chief mate. These initial calculations used a stowage factor of 50.7 or 50.8 cubic feet per ton. Based on grain loading experience in Philadelphia, [redacted] advised the chief mate that he felt this figure was too high and that the grain stability calculation should be reworked using a stowage factor of 49 cubic feet per ton. Captain [redacted], another of the National Cargo Bureau surveyors assigned to the Philadelphia office, visited [redacted] on the vessel and also reviewed the calculations and concurred in the judgment that a stowage factor of 50.7 was too high. Although the holds had been cleaned by the ship's crew on the voyage from Port Said, the USDA inspectors determined that the vessel was not in a satisfactory condition to load cargo due to water, rust scale, and cargo residue still remaining in the holds. Cleaning crews worked Saturday and Sunday to prepare the vessel for a second inspection on Monday, 20 October.

Captain [redacted] visited the POET on Saturday, 18 October, to see how the chief officer was doing on revising the grain stability calculations and also to check the progress of the crews cleaning the holds. [redacted] and the chief mate worked on the grain stability calculation together, developing contingency plans for the possibility that the grain's stowage factor might be as low as 47.7 cubic feet per ton.

On Monday morning, 20 October 1980, the USDA inspectors were aboard the POET to conduct the repeat inspection along with Captain [redacted] At 1045, this inspection was completed. The lower holds, 'tween decks in 1,

2, and 3 holds and the upper hold in No. 1 were passed for loading of grain. A notice of readiness was tendered to the Tidewater Grain Company and John E. O'Connor and Sons, Inc., agents for the cargo, advising them that the ship was ready to load grain. Captain [redacted] of the National Cargo Bureau was also aboard and, in company with [redacted] reviewed the revised grain stability calculations prepared by the chief mate. These calculations indicated the planned loading provided satisfactory stability and the calculations were signed by the Master, Captain [redacted], and approved and signed by [redacted] for the National Cargo Bureau. These calculations were based on a stowage factor of 49 cubic feet per ton. GERCKEN also prepared and signed a Certificate of Readiness indicating that the vessel was ready to load grain.

Both Captain [redacted] and Captain [redacted] recalled seeing and using a copy of the POET's Trim & Stability Booklet in the chief officer's cabin and testified that to the best of their knowledge, the book on the ship was identical to Board Exhibit 6.

At about 0320 on Tuesday, 21 October, the POET shifted from Pier 2 at Girard Point Terminal to Pier 3, the Tidewater Grain Company loading berth. The POET was tied up at Pier 3 by about 0415. At 0800, three longshore gangs reported for work and at 0900, commenced loading of the corn into the POET. Grain was discharged from the elevator's loading spouts into holds 1, 2, and 3 with a stevedore gang working at each hold. Initially the grain was discharged into the bottom of the holds with the loading spouts and, when it reached a certain level, trimming machines were lowered into the holds to trim or level the cargo out into the wing sections of the holds. These trimming machines consist of a hopper which drops grain onto a motor-driven belt. This motor-driven belt throws the grain into the corners of the compartment. The compartment is then trimmed up close to the overhead so that there are no empty pockets or voids.

The POET was also equipped with another feature to aid in completely filling the lower holds. The 'tween deck in way of No. 2 and No. 3 holds on the POET were perforated; that is, there were a number of two and one-half inch diameter holes cut in the 'tween deck on about 30-inch centers which would allow grain loaded into the 'tween deck space to pass through the deck into the lower hold until the lower hold becomes completely filled. These holes or perforations are shown on page 13 of the Trim & Stability Booklet.

At about 1300 on 21 October, as grain loading was progressing, USDA inspectors informed vessel personnel that weevil contamination had been discovered in the grain being loaded in No. 3 hold. The loading of No. 3 hold was stopped so that the cargo already in the hold could be fumigated. The loading of Nos. 1 and 2 holds progressed in the meantime. About 1930, a ship's fumigation service came on board and commenced fumigation of No. 3 hold. Fumigation was complete at 2030 and access to No. 3 hold was secured.

About 2200, Interstate Oil Barge ARGOIL 130 arrived alongside the POET to deliver fuel oil. The delivery of 4157 barrels of fuel oil was completed at 0540 on Wednesday, 22 October, and the ARGOIL 130 departed. Vessel records indicate that the POET had on board 2,655 barrels of fuel oil when

she arrived in Philadelphia; she received 4,157 barrels from the Barge ARGOIL 130, and reported on departure some 6,217 barrels of fuel oil aboard for the voyage to Egypt. These figures indicate some 595 barrels were consumed for the 7-day period in port. This corresponds to approximately 13 long tons per day inport use of fuel oil.

Captain [redacted] was aboard the POET from 0900 to 0930 on 22 October 1980. During that period, stevedores were loading Nos. 1 and 2 holds. No. 3 was not being loaded due to the halt for fumigation. [redacted] reviewed the progress of loading with the chief mate and again went over the contingency plans to be employed if the cargo stowed lighter or heavier than anticipated in the grain stability calculations.

At 1030 on Wednesday the 22nd, a marine chemist certified No. 3 hold to be safe for men, and USDA inspectors gave approval to resume loading No. 3 hold. The loading of No. 3 resumed at 1300. Loading continued in all three holds until 2300 when the longshore gangs were released for the day.

Loading of all three holds resumed at 0800 on Thursday, 23 October, when three gangs reported for work. Captain [redacted], the National Cargo Bureau surveyor, returned to the POET at about 1500. At this point, No. 1 lower hold was full with the pontoon covers in place--No. 2 hold was full--and loading of No. 3 hold was in progress and nearing completion. At 1535, No. 3 was full and trimmed out. Approximately 121 long tons remained to be loaded to fulfill the cargo specified in the charter agreement. At that point, [redacted] revised the Grain Stability Calculation, Board Exhibit 8, to reflect the actual loading conditions, using a final stowage factor of 49.3 cubic feet per ton. [redacted] determined that the vessel would be within the allowable heeling moment in both departure and arrival conditions without strapping the free surface of the grain to be stowed in No. 1 lower 'tween deck. (Strapping is a technique for securing the free surface of grain in a hold to prevent shifting. A temporary floor of burlap and plywood supported by wooden framing is laid down on top of the grain and secured by cables attached to the ship's structure.)

At 1545, the gang at No. 1 hatch started loading the remaining cargo in No. 1 'tween deck and this was completed at 1620, the grain spouts removed from the vessel and the last longshore gang left the vessel at 1630. A total of 13,538.116 long tons (541,524 and 36/56 bushels at 56.0 pounds per bushel) of No. 2 yellow corn was loaded. This cargo was distributed as shown in Table 1.

TABLE 1 POET - Cargo Loading on 23 October 1980 at Philadelphia, Pennsylvania

No. 1 Upper Deck			Empty
No. 1 'Tween Deck (Third Deck)	121	Long Tons	Slack
No. 1 Hold	1,491	Long Tons	Full
No. 2 'Tween Deck (Third Deck)	2,926	Long Tons	Full
No. 2 Hold	2,997	Long Tons	Full
No. 3 'Tween Deck	3,027.116	Long Tons	Full
No. 3 Hold	2,976	Long Tons	Full
No. 4 Upper Deck			Empty
No. 4 Second Deck			Empty
No. 4 Hold			Empty
Total Cargo	13,538.116	Long Tons	

The pontoon hatchcovers were in place between No. 1 lower hold and No. 1 'tween deck and grain was loaded to a depth of approximately 1.7 feet in No. 1 'tween deck. The cargo in No. 1 'tween deck was not secured; that is, the grain surface was not "strapped".

When loading was completed, Captain [redacted] and the vessel's chief mate observed the vessel drafts fore and aft and took freeboard readings amidships. Draft readings recorded at the completion of loading at 1630 were 34'8" forward, 32'0" aft for a calculated mean fresh water draft of 33'4". Freeboard readings of 10'2" port and 9'10" starboard were recorded. [redacted] indicated in his testimony that he believed that one or both of these freeboard measurements is incorrect and that the vessel's actual freeboard was more than the 10'0" mean freeboard indicated by these recorded readings. He further said he believed the vessel was one and a half inches light of her summer fresh water marks amidships. At the completion of loading, the POET was trimmed 2'8" down by the bow. The master and chief officer advised [redacted] that this trim would be reduced by transferring fuel oil from tanks forward to ones aft. Prior to leaving the vessel at approximately 1700, [redacted] filled out a Certificate of Loading indicating that to the satisfaction of the attending National Cargo Bureau surveyor, the loading was in accordance with the recommendations of National Cargo Bureau, Inc., and the applicable U. S. Coast Guard Regulations. [redacted] had the master sign the Certificate of Loading indicating receipt, and then departed. Information extracted from the vessel's inport log indicates that at 1745 on 23 October 1980, the holds were secured and the vessel was awaiting high tide to sail.

Earlier on 23 October, between the hours of 1530 and 1730, some 2,500 gallons of diesel fuel were delivered to the POET by tank truck as the vessel lay alongside Pier 3 at the Girard Point Terminal. Records indicate that on its arrival, the POET had aboard some 2,300 gallons of diesel fuel used to provide fuel for the emergency generator and also for the diesel engines in the cargo handling cranes. At departure, the vessel had 4,800 gallons of diesel fuel on board. In addition to the cargo, fuel oil, and

diesel oil loads described above, information extracted from the vessel's log by the agent prior to departure indicates 141 long tons of potable water and feed water were aboard.

Considerable testimony was received on the question of the tightness of the grain loading on the POET and the possibility that voids existed within the holds which might allow cargo shifting in excess of that anticipated by the International Grain Regulations. Captain [redacted] president of the National Cargo Bureau, Inc., testified that on the basis of his review of the available information on the cargo loading of the POET, and a comparison of the internal volume of the ship available for grain loading as shown in the vessel's Trim & Stability Booklet, the amount of grain that was actually loaded onto the ship resulted in a final stowage factor of 49.3 cubic feet per ton. A comparison of this final stowage factor to the density of the corn loaded on the POET indicates, in [redacted] view, a very "tight" stowage of the vessel, more indicative of what would be expected of a bulk carrier with no inhibiting structure within the holds rather than a conventional 'tween deck cargo ship, and that the probability that sufficient voids existed within the holds to allow grain shift in excess of that contemplated by the grain regulations is very low. He indicated that the relatively low stowage factor indicating tight stowage was indicative of the effectiveness of the perforations of the 'tween decks in holds 2 and 3 and the effectiveness of the mechanical trimming used in loading the vessel.

Testimony was also received concerning the potential hazard to the vessel which might result from the grain cargo getting wet. Captain [redacted] testified that there is a belief that grain cargos swell upon getting wet and the force due to expansion of the grain when wet can hazard the vessel. More recent experience has shown that this is not a significant hazard with modern steel ships and cargos such as corn according to [redacted].

Testimony was also received concerning occurrence of any incidents to ships loaded in accordance with the revised International Grain Regulations and the validity of these regulations in preventing stability problems. Captain [redacted] testified that he knew of only one such incident involving the stability of a ship loaded in accordance with the revised grain loading regulations. This was a multi-deck American vessel far more complicated than the POET. The vessel encountered conditions that were far worse than the conditions envisioned by the revised grain loading regulations. [redacted] indicated that the vessel rolled an estimated 16,000 times such that she almost submerged her hatches. The vessel survived these conditions, getting safely into port with damage to approximately five percent of her cargo. [redacted] further testified that to his knowledge this was the most severe test of the grain loading regulations and served as proof of the efficiency of these regulations.

Testimony was also received on the ability to transfer fuel oil on the POET and use of the bilge system and related operating procedures. Mr. [redacted] regular chief engineer on the POET was on vacation at the time of the ship's disappearance. [redacted] testified that the usual custom was to use the aft peak tank as a fuel oil settling tank and to maintain this tank in a nearly-full condition by transferring fuel from the forward double bottom storage tanks to this aft peak tank. [redacted] also testified that there had

been some problems in the past involving fuel oil leaks into the steam heating coils in the fuel oil tanks which had contributed to difficulties in transferring high viscosity fuel oil obtained in Egypt on previous voyages. [redacted] also testified to problems in the past with the bilge system and the problem of grain entering the bilge piping systems through the hold bilge suctions when the holds were being cleaned between voyages. The bilge system consisted of two mains--one port and one starboard--which could be used to take suction on individual bilge compartments within the holds. [redacted] testified that the port system was used for routine bilge pumping and that he maintained the starboard system as a standby. Thus, any cargo residue that might enter the bilge system would be confined to the port system, and the starboard system would remain free of any blockages and would be available for use in an emergency.

8. INTENDED VOYAGE

At 0100, 24 October 1980, the docking pilot boarded the POET and two tugs were in attendance. At approximately 0120, POET sailed from Pier 3, Girard Point, Philadelphia, Pennsylvania, loaded with the cargo enroute Egypt. The exact port of discharge, Port Said or Alexandria, was to be wired to the vessel by the owners when it became finalized.

At the time of sailing, drafts of 34'06" forward and 32'06" aft were observed and recorded by crewmen on board the assisting tugs prior to undocking. The same figures were recorded in the POET's log and, according to the docking pilot, these readings were confirmed by the mate on watch in the pilothouse. Liquid load at sailing time was recorded as 6,217 bbls of fuel, 4,800 gallons of diesel, and 141 long tons of water. No information on precise distribution of the liquid load within the vessel is available.

The docking pilot turned the ship over to the Delaware River pilot at about 0145. As POET proceeded down the Delaware River, the river pilot observed that POET responded sluggishly to rudder movements. He attributed this to the fact that POET was maneuvering in shallow water and was down by the bow. After entering deeper water, the sluggishness ceased. The pilot left POET at 0820 on 24 October just off Cape Henlopen, Delaware.

At approximately 0900 on 24 October 1980, two messages were transmitted by the POET. The first message was transmitted simultaneously to the U. S. Coast Guard's Automated Mutual Assistance Vessel Rescue system (AMVER) and to the U. S. Maritime Administration, Merchant Vessel Locater Filing System (USMER). The USMER message indicated that POET was sailing a rhumb line course at a speed of 15 knots from Cape Henlopen to Gibraltar then to Port Said, Egypt. The second message, which was sent to the owners, read "Departure Cape Henlopen, 24, 0830 bunkers received 4157 sailing 6218 ETA Port Said 090600." At midnight on 24 October, the vessel's third mate contacted his wife via ship to shore radiotelephone. The substance of the phone conversation did not include any discussion of the vessel, its location, or the weather conditions other than to indicate the vessel was enroute to Egypt. This was the last known communications with the vessel.

According to Captain [redacted], previous master on POET, at-sea fuel and position reports were transmitted to the owners every Monday and Thursday at 1200 (ship's time). USMER reports were sent upon departure from port and every 48 hours thereafter until arrival in port. Given this schedule, the following communications could have been expected from POET:

Date		Type Message
26 Oct		USMER
27 Oct	(Monday)	Fuel & Position
28 Oct		USMER
30 Oct	(Thursday)	USMER and Fuel & Position
1 Nov		USMER
3 NOV	(Monday)	USMER and Fuel & Position
5 Nov		USMER
6 Nov	(Thursday)	Fuel & Position
7 Nov		USMER
9 Nov		USMER

A review of USMER records conducted by MARAD showed that the following U. S. flag vessels were in the general vicinity of the POET's intended track (rhumb line) between 24-28 October 1980 and reported through the USMER system:

Vessel Name	Position	Date/Time Group	Remarks*
AMERICAN ARCHER	45 31N/044 13W	251210	Heavy Weather, Anticipate reduced speed next 12 hours
SAM HOUSTON	36 03N/055 15W	261100 (EST)	None
THOMPSON LYKES	37 41N/044 30W	261100 (EST)	Adverse weather
SEALAND PACER	37 29N/040 48W	261235 (EST)	None
CV STAGHOUND	43 25N/057 44W	261400 (EST)	None
COLUMBIA	35 09N/067 40W	261500 (EST)	Diverted course because of adverse weather
ARGONAUT	38 25N/058 05W	271400 (EST)	Heavy seas
MARJORIE LYKES	43 29N/052 13W	281000 (EST)	Varied course and speed due to adverse weather

SEALAND PACER	38 25N/058 44W	281300 (EST)	None
MERRIMAC	36 52N/058 52W	281400 (EST)	None

* Weather remarks on the USMER messages were made in accordance with MARAD instructions.

9. WEATHER

National Weather Service Forecast

The National Weather Service Offshore Forecast for the area between 32°N, 40°N and west of 65°W at 2339, 23 October, included a gale warning for the area west of 70°W and south of 37°N.

The 0539, 24 October, updated forecast expanded the gale warning to all of the forecast area west of 70°W. This warning was continued until the 1734 forecast on October 24 when the gale warning was extended to cover the whole forecast area.

The 0539, 25 October, forecast established a storm warning for the northeast portion of the forecast area and continued the gale warning for the remainder of the area north of 34°N.

The 1739, 25 October, forecast extended the gale warning to the whole forecast area. This warning remained in effect through the 0539, October 26 forecast.

At 0700, October 24, the National Weather Service issued a storm warning for a storm to move across the estimated path of the POET. This forecast was repeated every 6 hours through 2100, 25 October. The storm center was east of Jacksonville, Florida, at 0700, 24 October. It moved up the coast and was over eastern New York at 2100 on the 25th. Forecast conditions ahead of the storm were for severe conditions of winds 35 to 50 knots, seas 12 to 22 feet.

North Wall Advisories

The U. S. Navy Eastern Oceanography Center, Norfolk, Virginia, issues advisories concerning the Gulf Stream North Wall to U. S. Navy and government contracted vessels such as Military Sealift Command (MSC). These advisories include information identifying the position of the North Wall and the expected increase of wind and sea parameters during the forecast period.

The North Wall phenomenon is one of rapidly increasing wind and seas in the area of the northern boundary of the Gulf Stream where the sea surface temperatures can change dramatically. In such a region of large surface temperature contrast, a potential for damaging and volatile weather frequently exists. When cold air flows over this narrow zone of warm water, the air is rapidly warmed and rises. The rising air displaces the heavier, colder air aloft which descends generating strong, gusty winds at the surface.

During the period 24 to 31 October 1980, the U. S. Navy Eastern Oceanography Center issued the following North Wall advisories:

--2000, 23 October, "You are advised that a cold northeasterly flow within 50 NM of the North Wall of the Gulf Stream can cause temporary conditions of winds 15 knots and seas 5 feet higher than those forecast..."

--2000, 24 October, "...weather/wind/sea conditions in vicinity North Wall may be significantly higher than in surrounding areas, particularly during cold outbreaks from the continent."

--0800, 25 October, same as the previous statement.

--2000, 25 October, "You are advised that a cold northeasterly flow within 100 NM of the North Wall of the Gulf Stream can cause temporary conditions of winds 10 knots and seas 5 feet higher than those forecast..."

--0700 (EST), 26 October, "...weather/wind/sea conditions in vicinity North Wall may be significantly higher than in surrounding areas, particularly during cold outbreaks from the continent."

NTSB Weather Analysis

A weather analysis was conducted by the Weather Group of the National Transportation Safety Board. According to the analysis:

During the period 0800, October 24, 1980, to 0700 (EST), October 27, a low pressure area moved from a position approximately 250 miles east of Jacksonville, Florida, to a position east of the Hudson Bay passing over the Virginia Capes at 0800 on the 25th.

As the low moved northward, it deepened rapidly and moved closer to a high pressure area moving east from a position over central New England developing a very strong pressure gradient and the attendant strong south to southeast winds and rain shower activity.

The POET's intended track would have placed the vessel to the east of the highest winds aloft. According to the NTSB analysis, reduced speed would have put the ship beneath winds of 90 to 100 knots during the period from 0800, 25 October, to 1900, 26 October.

The analysis further stated that, based upon the estimated track of the POET, the ship probably came under the influence of the North Wall of the Gulf Stream between 2000 on the 24th, and 0800 on the 25th. This influence could have resulted in winds 15 knots greater and seas 5 feet higher than would be expected for the same weather conditions away from the North Wall.

The worst wind and sea conditions in the vicinity of the estimated track of the POET occurred during the period from the very early morning on October 25 through the evening of the 26th.

Weather Observations

The following weather observations were made by mariners transiting the storm affected area:

Mr. [redacted] captain of the ketch WANDERING AENGUS, O.N. 607211, reported a "rogue wave" estimated to be 40 to 50 feet high which capsized his vessel at approximately 1000 (EST) on 26 October at 38°44' north, 69°37' west. At the time of this incident, the WANDERING ANGUS was between 50 and 60 miles from the North Wall of the Gulf Stream as positioned by the Navy Eastern Oceanography Center at 0800 on the same day.

The yacht POLAR BEAR, O.N. 537782, enroute to Bermuda from Shelter Island, New York, via Montauk Point, encountered increasing winds and seas on Saturday the 25th. The wind increased to 60, possibly 70 knots after shifting to the south. The captain of the yacht took down all sails by late in the day on Saturday. The yacht sank in high seas late in the afternoon on Sunday the 26th. There was no information to accurately position the yacht or to establish the height of the waves. The crew was picked up by the Polish freighter ZEMIA GDANSKA at 0400 on 31 October 1981 at 37°46'N, 62°45'W.

On 24 October 1980, the cargo vessel SS COLUMBIA, O.N. 247519, was underway from Norfolk, Virginia, enroute Alexandria, Egypt. Table 2 contains log book entries concerning the weather during the first few days of the SS COLUMBIA's voyage. At 1000 on 27 October, a damage survey was conducted on board COLUMBIA. The log book entry reads as follows:

> "Surveyed vessel for storm damage and found the following: expanded metal catwalk torn lose 40' long by 4' wide--cement over wing tank manhole covers broken off of 15 covers--Ch Engr reports piping on main deck strained by seas. RAM NEK tape around hatchcovers torn loose. Two ring buoys broken up."

NOAA Weather Analysis

During hearings before the U. S. House of Representatives Committee on Merchant Marine and Fisheries on 9 April 1981, personnel from the National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS) provided testimony concerning weather conditions associated with the projected voyage of the POET. According to their testimony, POET could have experienced the following weather conditions.[1]/

-24 October 1980, 2000 (EDST +4)--The storm center with associated frontal system continues to move northward. A slackened pressure gradient north of the storm center has somewhat reduced the area of gale force wind and high seas. The POET is within the outer edge of the storm's counter-clockwise circulation and will experience gradually increasing winds and seas.

[1]/Assumptions of course and speed are not specified in the NOAA report. A telephone conversation between Mr. [redacted] of NOAA and LT [redacted], a member of the Board, indicated that a rhumb line course from Cape Henlopen, Delaware, to Gibralter at a speed of 15 knots was utilized. However, between 2000 EDST on 25 October to 1900 EST on 26 October, when POET would have been encountering storm force winds, NOAA utilized a reduced speed of 8 knots. After 1900 EST on 26 October, a speed of 15 knots was again utilized.

Table 2 SS COLUMBIA (U.S.), O.N. 247 519--Logbook Entries Regarding Weather on 24-26 October 1980 and Estimated Distance and Bearing to POET's Position

DATE/TIME	TRUE COURSE	DIRECTION OF WIND/SPEED (COMING FROM)	DIRECTION OF SEAS (COMING FROM)	WATCH ENTRY COMMENT IN LOG BOOK	ESTIMATED DISTANCE/TRUE BEARING TO POET'S DR POSITION (SAME DATE & TIME)
24 OCT/2000	112°	E/Force 6 (22-27 KTS)	---	Vry rough seas shipping over bow & port main deck	206 mi/053°
25 OCT/0800	090°	SE/Force 9-10 (41-55 KTS)	SE'ly	Vessel pitching mod'ly into very high SE'ly seas. Shipping seas on bow and stbd deck ocaly over nav bridge deck. Vis fair to poor due to blowing spray.	270 mi/060°
25 OCT/1200	090°	SxE/Force 9-10 (41-55 KTS)	SxE'ly	Overcast-vis fair-periodic rain squalls-vessel pitching & rolling mod in very high SxE'ly swell. Shipping seas stbd side main deck & over bow, occasionally on bridge deck.	300 mi/067°
25 OCT/1800	102°	SSW'ly/Force 7 (28-33 KTS)	---	---	332 mi/070°
25 OCT/2000	102°	WSW'ly/Force 8 (34-40 KTS)	WSW'ly	O'cast. Vessel in easy pitching motion in very rough WSW'ly sea. Taking seas over stbd bow and main deck.	340 mi/070°
26 OCT/0000	130°	SW'ly/Force 9 (41-47 KTS)	SW'ly	P cloudy-vis fair-vessel rolling & pitching in rough SW'ly sea & swell. Shipping water over stbd side main deck fore & aft.	380 mi/070°
26 OCT/0200	120°	SW/Force 9-10 (41-55 KTS)	---	---	385 mi/070°
26 OCT/0400 (EST)	120°	SWxW/Force 9 (41-47 KTS)	SW	Ship pitching & rolling moderate to heavy in high 20 ft sea & swell from SW. Seas & spray over stbd side fore & aft continuously during watch (0000-0400)	390 mi/070°
26 OCT/0800 (EST)	110°	W'ly/Force 5 (17-21 KTS)	---	Cldy-vessel yawling & pitching in a rough sea & long high confused swell. Taking seas over stbd bow and main deck & hatches.	420 mi/065°
26 OCT/2000 (EST)	102°	WNW/Force 4 (11-16 KTS)	---	Cldy-vessel pitching & yawing in a rough following sea.	480 mi/062°

-25 October 1980, 0800 (EDST +4)--The POET is now entering a period of severe weather that will continue until the morning of the 26th. Winds and seas have increased substantially in the last 12 hours as the storm has intensified along its northward track. A second cold front now along the Southeastern Coast will overtake and intensify the frontal system just ahead to the east.

-25 October 1980, 2000 (EDST +4)--The area of storm force winds has overtaken the POET and the ship is now encountering the most severe conditions of the storm. Southerly winds of over 50 knots and high seas are hitting the ship abeam on its easterly course. These conditions will continue for 10 to 12 hours.

-26 October 1980, 0700 (EST +5)--The frontal system associated with the storm has overtaken the POET within the last 3 hours with wind gusts up to 60 knots, rain squalls and high seas. The wind has shifted from SE to SW and will continue veering to the West. Sustained winds are now in the 30 to 40 knot range.

-26 October 1980, 1900 (EST +5)--The major storm activity has moved away from the POET's position. The estimated course and speed keep the ship in relatively mild weather and sea conditions about 200 miles behind the cold front.

-27 October 1980, 0700 (EST +5)--Gale force winds and rough seas are well to the east and northeast of the POET's position. Mild weather and sea conditions will follow the ship for the next two days.

-27 October 1980, 1900 (EST +5)--Mild open ocean conditions surround the POET's position.

10. INSPECTIONS OF HULL, MACHINERY, AND EQUIPMENT

Cargo ships are periodically inspected by the U. S. Coast Guard (USCG), American Bureau of Shipping (ABS), Federal Communications Commission (FCC), and the National Cargo Bureau (NCB). The relationship between these inspecting agencies is established by law, regulation, policy statement, and agency directives.

The following inspections and examinations of POET were the most recent covering major safety aspects of the vessel prior to the vessel's sailing from Philadelphia on 24 October 1980.

Dates	Agency	Conducted for	Type
12/76	ABS	U.S. Government	Quadrenniel Cargo Gear Survey
6/77	ABS	U.S. Government	SOLAS; Loadline Survey
6/77	ABS	U.S. Government	SOLAS; Safety Construction Survey
6/77	ABS	Owner	Special Survey No. 6 of Hull

2/78	USCG	U.S. Government	Biennial Cargo Vessel Inspection Repair fire damage No. 2 Hold
12/78	ABS	Owner	Repairs to hatchcover, cargo hold No. 1
		Owner	Hull repairs in way of collision damage
2/79	ABS	U.S. Government	Annual Inspection of cargo gear & removal tubular booms No. 4 hatch
7/79	USCG	U.S. Government	Install 2nd Radar
8/79	ABS	Owner U.S. Government	Annual Survey of Hull & Machinery Annual Loadline Inspection
3/80	ABS	Owner Owner Owner Owner Owner	Boiler Survey Drydock Survey Tailshaft Survey Intermediate Survey (incomplete) Miscellaneous audio-gauge readings
3/80	USCG	U.S. Government	Biennial Inspection Drydock Inspection including Tailshaft Examination
8/80	ABS	Owner U.S. Government Owner	Annual Survey of Hull Annual Loadline Intermediate Survey of Older Vessel
8/80	FCC	U.S. Government	Radiotelegraphy
10/80	USCG	U.S. Government	Special Examination for Navigation Safety Equipment

The most recent internal examination of the vessel's double bottom ballast tanks took place while the vessel was in Tampa, Florida, during April 1977 and at New Orleans, Louisianna, during June 1977. All ballast tanks were opened, cleaned, and examined by ABS surveyors during these periods. The hull was ultrasonically gauged under ABS supervision in December 1976 and the results analyzed by ABS, New York. The condition of the double bottom area of the vessel was found satisfactory by ABS as stated in the ABS, New York office review. No similar gauging or analysis was conducted by the Coast Guard during this time period.

POET sustained minor hull damage in January 1978 while berthed in Matadi, Zaire. This hull damage was located on the vessel's port side aft between frames 178 and 184. In addition, a number of small indents were noted on the vessel's starboard side between frames 142 and 158 during the ABS damage survey conducted in December 1978. The ABS surveyor indicated in his report that permanent repairs were not necessary at that time and that, aside from sealing of the port side indent with cement, permanent repairs were deferred until the next regular drydocking. Damage to hatch cover No. 1 was also noted

by the ABS surveyor as follows: Cargo Hold No. 1 forecastle deck, watertight steel hatch cover after section knuckled approximately 9" up from ends at center port side with skirt and gasket retaining channel buckled inboard. Four plate intercoastal fore and afters were knuckled in between transverse hatch beams. Temporary repairs to the hatch were accomplished to the satisfaction of the surveyor and permanent repairs were deferred until the next regular drydocking. On 10 February 1978, while underway in the Gulf of Mexico, POET had a fire in cargo hold No. 2 which caused a 4-foot-long fracture in the main deck plating running fore and aft approximately 8 feet to the port side of the ship's centerline from frame 102 forward. On 11, 12, and 13 February, the Coast Guard conducted a special survey of the POET in Galveston, Texas, and required a permanent repair to the fracture.

The condition of No. 1 hatch cover was examined during the annual loadline inspection conducted at Portland, Oregon, on 15 August 1979 and again during a loadline inspection conducted at Mobile, Alabama, on 19 August 1980. At Portland, the temporary repair was found to be adequate by the ABS surveyor. At Mobile, the surveyor was not aware of the temporary repair. The temporary side shell repair was examined while the vessel was undergoing an intermediate survey by ABS during March 1980 at Beaumont, Texas. No further aggravation, fractures, or released connections in the damaged area were found. The attending surveyor recommended permanent repairs be deferred until the next scheduled drydocking (March 1982).

There is testimony that minor repairs to the No. 1 hatchcover skirt were ongoing primarily because of wastage of the bottom edge of the skirt. The most recent repairs of this type were accomplished at Philadelphia just before the vessel loaded cargo in October 1980. The Port Engineer's recollection is that a welded doubler plate was applied to the hatchcover corner and, in another case, sections of the skirt bottom edge were cropped out and a welded insert installed.

The ship underwent USCG biennial and drydock inspection by Marine Inspection Office, Port Arthur, Texas, while the vessel was at Orange, Texas, and Beaumont, Texas, between the dates of 20 February and 6 March 1980. At that time, the vessel was found fit for route and service and the Certificate of Inspection reissued for a two-year period. All lifesaving equipment was overhauled and inspected with the exception of the inflatable life rafts. There is a Coast Guard record that the life rafts on board were factory serviced in November 1979. The life rafts on the vessel at the time of the March 1980 biennial inspection would have routinely been due for annual servicing during November 1980. An invoice dated 27 March 1980 indicates that on 14 March 1980, two SEA-JAY ELLIOT LIFERAFTS, ocean service, 20-man CJH/S, S/N 2037 and S/N 2041, were shipped to the vessel. Two Welin reinforced plastic hand-propelled lifeboats, builders serial numbers A140 and A141, with a capacity of forty persons each, were located on the vessel port and starboard centered on frame 153 of the poop deck with Welin Crescent type boat davits. In the secured stowed position, the boats were supported at each end of the keel by the davits and gripped at each end with quick-release wire pendants. The boat falls were attached to the boats with Rottmer type releasing gear. The boats were marked on the exterior with the name POET and other markings required by 46 CFR 97.37-37. At the conclusion of the Biennial

inspection, a requirement that the vessel conduct a boat drill to the satisfaction of attending Coast Guard Marine Inspectors remained outstanding. This requirement was met at Galveston, Texas, on 17 March 1980.

The vessel was fitted with eighteen ring life buoys, nine of which had water lights attached. Eight of the buoys with lights attached were stowed in racks at various locations on the after superstructure. Two of the buoys were caged on the bridge wings and secured in place with toggle pins. The actual location on the vessel of the remaining life rings has not been determined. The life rings were marked with the name POET and/or PORT and other markings required by 46 CFR 97.37-43.

Coast Guard inspection records from 1976 to 1980, inclusive, did not include any notations of recommended future areas of inspection emphasis or of special interest. The Marine Inspector conducting most of the drydocking and biennial inspection in 1980 had been assigned to those duties at Port Arthur, Texas, for about one year. He had no previous experience inspecting commercial vessels.

11. SEARCH EFFORT

At 0959 (EST) on 3 November 1980, the Rescue Coordination Center (RCC) in New York received a telephone call from a representative of Hawaiian Eugenia Corporation, owners of the POET, stating that they had not heard from the vessel since its departure from Cape Henlopen, Delaware, on 24 October 1980 and that efforts to contact the vessel for some five days through RCA Chatham had failed. The vessel was expected to pass through the Strait of Gibralter on 3 November and was due to arrive at Port Said, Egypt, on 9 November 1980. Due to the immense area of ocean involved (3,250 track miles without drift factors), the lack of information related to the vessel, and because POET was not overdue either at Port Said or passing through the Strait of Gibralter, RCC classified this vessel in the uncertainty phase as an unreported vessel. A communications search was therefore initiated.

The communications search included, among other things, contacting Lloyds Intelligence Service for any information that could be developed, querying law enforcement computers as well as other intelligence sources for possible sightings, checking with the U. S. Navy for a record check of the USMER system, and initiating an Urgent Marine Information Broadcast and Hydrolant to all ships to be on the lookout for the POET and to report any sightings. No sightings of POET were reported as a result of these efforts. RCC also checked their unverified distress signal folder which consists of reports of auto alarms or other electronic alarms that are received with no position, name of distressed unit, or call sign. According to the Search and Rescue Case Study of the POET conducted by the Commander, Coast Guard Atlantic Area, unverified distress signals are for the most part untrackable unless they remain on long enough to get a Radio Direction Finder (RDF) bearing on them. Nothing positive was established as a result of this check. The SAR study stated that the Urgent Marine Information Broadcasts and Defense Hydrolants were probably the most effective SAR tool available to the Coast Guard. While search planners were attempting to cover large portions of ocean with limited numbers of aircraft, the broadcast information was covering the entire Atlantic Ocean and Mediterranean Sea, and all ships listening within.

At 1520 (EST) on 7 November 1980, RCC New York received word from NOSIC that POET had reported continuously into the USMER system every 48 hours on previous voyages. At 1840 (EST) on 7 November, RCC New York obtained weather information along POET's intended track. RCC was advised by the Naval Eastern Oceanography Center in Norfolk, Virginia, that weather was gale force along the track from 0800 on 25 October to 0800 on 26 October 1980. According to the SAR study, these pieces of information lead to two primary assumptions:

"--that the POET had encountered some unknown difficulties prior to 1200 on 26 October." (The vessel did not send a USMER message on 26 October 1980 as scheduled.)

"--that whatever occurred, did so in the storm." (A casualty would be more likely during storm conditions.)

Based upon the above information as well as additional information gathered, RCC prepared a search area during the evening of 7 November. On 8 November, SAR forces were first deployed. During the 8th and the days which followed, the following aircraft searches were undertaken:

Date	Square Miles Searched	Aircraft Sorties Flown
8 NOV	34,850	6
9 NOV	85,000	9
10 NOV	16,000	2
11 NOV	32,000	6
12 NOV	10,000	5
13 NOV	14,500	5
14 NOV	41,250	6
15 NOV	18,500	6
16 NOV	35,700	5
17 NOV	9,600	4
Total 10 Days	297,300	54

No trace of the vessel or crew were found and at 1420 (EST) on 17 November 1980, the active search for the POET was suspended.

Pursuant to a request by the U. S. Coast Guard, the U. S. State Department sent a message to U. S. Embassies and Consulates in Portugal, Spain, France, Ireland, and the United Kingdom on 23 April 1981 requesting public and private agencies assist in locating debris which may be from POET.

To date, no debris identified as possibly coming from POET has been found. The alert remains in effect as of the date of this report.

12. UNVERIFIED DISTRESS SIGNALS

At 0000 (EDST) on 26 October 1980, Mr. [redacted], marine radio operator on duty at commercial marine radio station WMH, Baltimore, Maryland, heard an auto alarm signal or portions thereof consisting of 4 to 6 four-second dashes at one-second intervals on 500 kHz. [redacted] works at station WMH part-time on weekends and holds an FCC Radiotelegraph license and a Coast Guard-issued Radio Officer license. The auto alarm signal was clear but weak. The signal did not fade in or out but was steady and then abruptly ended. No follow-up distress message was heard. According to [redacted] he discounted the possibility of the signal being a "tune in" because the signal was "pretty perfect". He also believed that other stations were listening in on the signal because the radio frequency suddenly became quiet. [redacted] could not determine the distance to or direction of the signal's origin. No further auto alarm signals were heard on 26 October. According to [redacted] he contacted the Coast Guard Communication Station in Portsmouth, Virginia (NMN), and inquired if they had also heard the auto alarm signal. [redacted] stated he was informed that they had not heard the signal. No further action was taken by [redacted] at that time. [redacted] later became aware the POET was missing and at 2303 EDT on 14 November 1980 called RCC New York and informed them of the auto alarm signal he heard on the 26th. At that time, the search for POET had been underway for seven days.

At 1633 EST (+5) on 27 October 1980, the auto alarm on the SS COLUMBIA sounded. COLUMBIA was approximately 260 miles south of POET's intended trackline at the time. Mr. [redacted] Radio Officer on COLUMBIA, was aft eating when he was notified of the alarm. He immediately went forward to the radioroom, turned off the alarm, and listened on 500 kHz.

According to Mr. [redacted], he listened to what the other ships and shore stations were doing. If the frequency (500 kHz) is quiet and other stations are not transmitting, he would suspect an emergency exists and would listen accordingly. He further stated that when any emergency message or communications is sent, nearly all stations stop sending in order to listen to the message. In this instance, normal communications continued. [redacted] therefore believed that no other stations heard the auto alarm signal.

Mr. [redacted] also stated it is common to have entries of "false" auto alarm signals in a ship's radio log. These "false" signals occur particularly during bad weather because of static and lightning and also from the combined signals from many stations working or calling at the same time. [redacted] maintained a listening watch on 500 kHz until 1648. This time also covered the period of time in each hour when all vessels are required

to maintain a listening watch on 500 kHz (1645-1648). No other significant signals or communications were heard. No follow-up distress messages, i.e., name of vessel, position and nature of the distress, or auto alarm signals--were heard. No further action was taken by [redacted].

13. TECHNICAL STUDIES

As the Board took testimony concerning the disappearance of the SS POET from witnesses and obtained and reviewed relevant documents during November and December 1980, it became evident that certain technical investigations into the stability, strength, and seakeeping characteristics of the vessel were needed. The approach taken by the Board was to:

1. Identify possible accident event sequences and relevant causal factors which might account for the disappearance of the vessel.

2. Carry out investigations needed to permit evaluation of the severity (in terms of impact on vessel and crew) and probability (the liklihood of occurrence) of each of these accident event sequences.

Technical assistance in evaluating vessel hull strength, stability, and seakeeping characteristics was provided by the Merchant Marine Technical Staff at Coast Guard Headquarters. Relevant information from the results of these technical studies is summarized in the following paragraphs.

Using information on cargo, fuel oil and other liquid loads, draft and freeboard measurements, and vessel stability characteristics, a vessel "departure condition" representing the condition of the vessel at the time of departure from Philadelphia was reconstructed. An "even keel" condition was also developed, corresponding to the loading condition that could have been achieved at 0000 EDT on 26 October 1980 allowing for the consumption of 100 long tons of fuel and transfer of fuel from No. 1 and 2 double bottom tanks to No. 3 and 4 double bottom fuel oil tanks to achieve nearly even-keel loading. These two conditions were used along with an estimate of sea conditions based on analysis of weather in the area of the POET's estimated track line during the period of 24-26 October 1980 to determine estimated strength, stability, and seakeeping characteristics of the vessel in the sea conditions it was probably subjected to. Based on the National Transportation Safety Board's analysis of enroute weather conditions, a significant wave height of 22.5 feet was selected on a preliminary basis as representative of conditions likely to have been encountered by the POET.[2/]

[2/]In reporting average wave heights observed at sea, it has been discovered that mariners have a tendency to neglect the smaller waves. It has been found that the reported value is about the average of the highest one-third of all the waves present, and this value, called significant wave height, is commonly used in relating at-sea observations to more-scientific studies of waves.

Hull Strength

In order to assess the probability that POET suffered a major hull structural failure, estimates were made by the Board of the stresses likely to have been induced in the hull after departure from Philadelphia on 24 October 1980. Results of ultrasonic thickness measurements of the hull ("hull gaugings") made in December 1976 and March 1980 were used to estimate changes from the original midships section hull scantlings for use in evaluating longitudinal hull girder strength of the vessel. Review of 1980 measurements indicated inconsistencies raising questions concerning the validity of these measurements. (Individual readings indicated thickness loss as great as 43 percent and thickness gains as great as 16 percent. Readings on the port side were consistently thicker than readings on the starboard side.) Because of these inconsistencies in the 1980 gaugings, the 1976 gaugings were used in the strength analysis.

Ultrasonic thickness measurements made in December 1976 indicate very mild and consistent corrosion losses in shell and deck plating ranging from 0.9 to 3.1 percent from the original thicknesses when the vessel was built in 1944. Measurements indicate corrosion losses in tanktop plating averaging 8.2 percent, 7.5 percent for transverse floors within double bottom tanks, and an average of 2 percent for internals within the double bottom tanks.

Using an estimate of the midships section scantlings based on the 1976 hull gaugings, stillwater bending moments and shearing forces, wave-induced moments and shearing forces, and resulting hull stresses were calculated for a number of intact and damaged loading conditions and compared to design values specified in 1981 American Bureau of Shipping Rules for Building and Classing Vessels and the estimated ultimate strength of the POET's hull. Estimated maximum stillwater and wave-induced bending moments and shearing forces and resulting hull stresses determined as a result of these calculations are shown in Table 3.

Table 3 POET - Estimated Maximum Stillwater and Wave-Induced Bending Moments and Shearing Forces and Resulting Hull Stresses

Condition	Bending Moment (ft-tons)	Bending Stress (psi)	Shearing Force (tons[1])	Shear Stress (psi)
STILL WATER				
"Even-keel" loading condition[2]	29,590	7,100[3]	667	
ABS Design Value	124,760	22,830	1,302	
WAVE-INDUCED LOADS - Extreme Conditions				
Even-keel loading, with Hold No. 1 flooded, Speed 8 kts into head sea of 22.5 ft. significant wave height	229,780 (hogging)	19,700[3] (compression)	1,856	6,500
Accepted Design Values 1981 ABS Rules	302,000	14,400	2,227	
Estimated Ultimate Strength	500,000[4]			16,500[5]

NOTES: 1. "Tons" are long tons of 2,240 pounds.

2. Stillwater "departure" loading condition (approximately two feet down by bow) bending moment, shear forces, and resulting stresses are less than for "even-keel" condition.

3. Primary stresses are the stresses resulting from overall bending of the hull girder in hog or sag. Secondary stresses are the stresses resulting from grillage bending between bulkheads due to the hydrostatic pressure of water pushing against the hull. Tertiary stresses are the stresses resulting from plate bending between frames due to hydrostatic pressure. With the transverse framing system used on the POET, the primary and tertiary stresses are aligned and are additive; the secondary stresses do not align with the primary and tertiary stresses and are negligibly small. Stillwater and wave-induced bending stresses shown

(Table 3, NOTES, continued)

in this Table include both primary and tertiary components, while ABS design values are for primary bending stress alone; tertiary bending stresses are taken into account indirectly by means of frame spacing requirements. The 19,700 psi combined wave-induced bending stress shown is composed of 10,800 psi primary stress due to the longitudinal bending moment, and 8,900 psi tertiary stress due to the lateral loading from external water pressure.

4. The ultimate strength or "collapse moment" of the SS POET is estimated to be approximately 500,000 ft-tons using FLEXSM computer program to provide strength analysis of hull girder taking into account buckling of plating.

5. Methods of computing the critical buckling stress of a plate subjected to combined axial and shearing loads vary but, using U. S. Navy Design Data Sheet 1100-3, the critical stress for the SS POET's bottom plating is estimated to be 16,500 psi.

The calculated bending moments and stresses for all of the conditions investigated, including the damaged conditions, were all less than commonly accepted maximum design values.

Calculated stillwater hull deflection in the "departure" loading condition was 0.33 inches of sag (midships lower than ends).

The strength of No. 1 hatch cover was analyzed in an effort to assess the probability that the hatch cover was stove in by the sea leading to sudden flooding of No. 1 Hold. Results of this analysis (which utilize a finite element computer program) indicate that the hatch cover stiffeners would yield and begin to show signs of permanent deformation or "set" under a static head of approximately 12 feet of water. Deflection under such a loading would be approximately one inch at the center of the hatch cover.

Stability

Estimates of the vessel's intact and damage stability characteristics under various conditions were made in order to assess the probability that the POET sank due to flooding, capsizing, or foundering

Intact Stability. Using information on cargo loading and fuel oil and other liquid loads, "departure" condition metacentric height and statical stability curves were prepared by the Board and compared to the pre-voyage estimates prepared by vessel personnel and approved by National Cargo Bureau Surveyor, and to the applicable regulatory requirements. Investigation of POET's intact stability characteristics had four objectives:

1. Check values of grain volumetric heeling moment from vessel's Trim & Stability Booklet used by the vessel's crew in preparing grain loading plans and Grain Stability Calculation.

2. Check the accuracy of the Grain Stability Calculation.

3. Verify that the stability characteristics of the vessel as it was actually loaded (the "departure" condition) complied with the stability requirements of SOLAS 1974 and 46 CFR Part 93.

4. Determine the estimated angle of heel and available residual dynamic stability in the event of shifting of grain cargo with the vessel loaded as it was on departure from Philadelphia.

Results of technical analyses carried out by the Coast Guard indicate that values of grain volumetric heeling moment tabulated in Trim & Stability Book, Board Exhibit 6, were accurate except that they did not take into account the presence of some dehumidifier ventilation ducts running through the No. 3 hold just below the main deck. Calculations indicate that although failure to account for the presence of these ducts resulted in maximum permissible grain volumetric heeling moments somewhat larger than values corrected for the effect of these ducts, the POET's departure loading condition still met stability requirements of the International Grain Regulations.

Independent calculations verified that the calculations made by the ship's personnel in Grain Stability Calculation, Board Exhibit 8, and checked by NCB surveyor were accurately done.

Grain loading of the SS POET was found to comply with all the requirements of Chapter VI, SOLAS 1974, and U. S. regulations insofar as intact stability requirements are concerned. Table 4 shows a comparison of POET departure condition to applicable stability criteria.

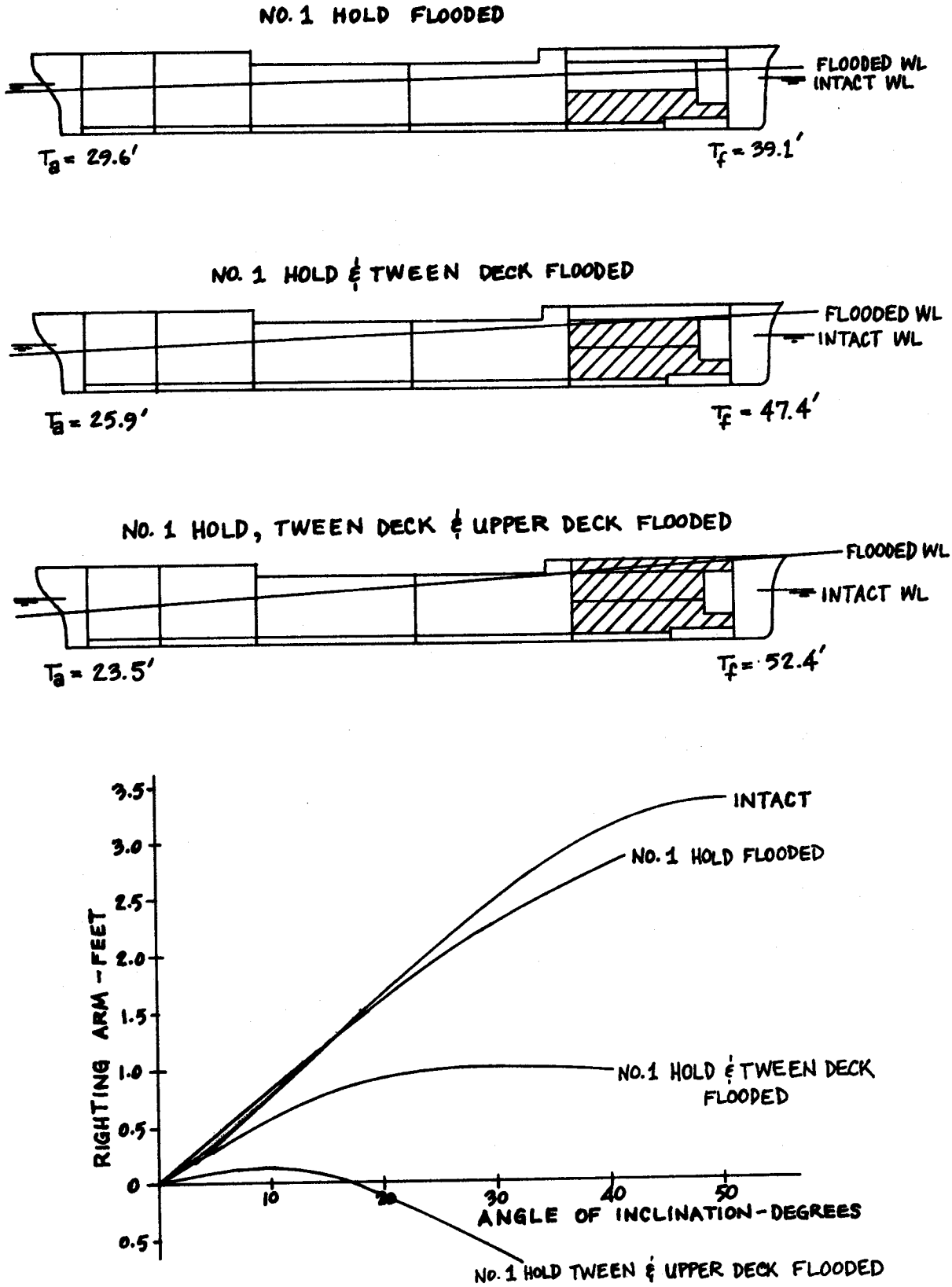
Table 4 POET - Summary of Intact Stability Characteristics

Condition	Metacentric Height (ft) GM	Angle of Heel Due to Grain Shift (degrees)	Area Between Heeling Arm Curve & Righting Arm Curve (ft-deg)
INTACT STABILITY			
POET "departure" loading condition	4.13	10.6	36.6
Required by Reg. 4, SOLAS 74	0.98 minimum	12.0 maximum	14.1 minimum
Required by USCG "weather criteria," 46 CFR 98.07-5	1.25	—	—

Calculations indicate that with the vessel in the "departure" condition, a 15 degree shift of grain in all filled compartments, and a 25 degree shift of grain in No. 1 'tween deck hold (which was only partially filled) would result in the vessel having a static angle of heel of 10.6 degrees. The available residual dynamic stability would be 36.6 foot-degrees up to a heel angle of 40 degrees. (These assumed shift angles are in accordance with the required assumptions in Sections II and IV of Part B, Chapter VI, SOLAS 1974.)

Damage Stability Conditions. From a damage stability viewpoint, the possible accident event sequences of greatest interest are those involving flooding of No. 1 hold or the machinery space. Since No. 2 and 3 holds were filled with cargo, flooding of these spaces would not result in significant change to the vessel's drafts or stability characteristics. Likewise, flooding of No. 4 hold, because of its relatively small size, was not considered by the Board to be one of the cases requiring further technical study. In order to evaluate the effect of flooding either No. 1 Hold or the Machinery Space, estimates were prepared of the vessel's draft, trim, and stability characteristics in these two conditions.

Before the vessel left Philadelphia, No. 1 lower hold was filled and No. 1 'tween deck hold partially filled with cargo. Damage to the forecastle deck hatchcover to No. 1 hold could permit progressive flooding of No. 1 hold in a seaway. To examine the impact of such an event, calculations were made to determine drafts, metacentric height and statical stability at various stages of flooding. For purposes of these calculations, it was assumed that the bow-down departure trim condition had been corrected by transferring fuel from No. 1 and 2 double bottom tanks to No. 3 and 4 double bottom tanks. Therefore, prior to flooding of No. 1 hold and roughly 50 hours after departure from Philadelphia, the vessel would be at a mean draft of 32.5 feet with very little trim. It was assumed no damage to the hull or flooding of empty double bottom ballast tanks occurred and that flooding of No. 1 hold occurred only through the damaged hatchcover. Permeabilities of 0.60 for No. 1 lower hold (fully loaded with corn), 0.95 for No. 1 'tween deck hold (essentialy empty), and 0.95 for No. 1 upper hold (empty) were assumed. Figure 2 shows relative drafts and righting arms at various stages of flooding. The righting arms would be slightly reduced if the lower hold were flooded, but the freeboard would be significantly reduced (19.4 feet to 12.9 feet), thus increasing the rate of flooding from boarding waves. Flooding of No. 1 'tween deck hold and No. 1 upper hold would reduce the vessel's transverse stability and increase the flooding rate by further reducing freeboard at the bow. With No. 1 hold completely flooded, the deck at the side would be immersed just aft of the forecastle. In this condition, the vessel would have maximum righting arm of 0.13 feet with a range of positive stability of less than 17 degrees. The initial metacentric height of 4.15 feet in the unflooded condition would be reduced to less than 1.2 feet. With the ship encountering seas with a distance between waves of 75 percent to a 125 percent of the ship's length, positive righting energy would disappear as the wave crest approached midship with the vessel in this flooded condition.



NOTE: 1. Righting Arm Curves have been corrected for free surface effect of flooding water.
2. Taken from Board Exhibit 166, Figures 320-1 and 320-2, pages 43-44.

FIGURE 2
Flooding of No. 1 Hold, Drafts and Statical Stability Curves

In order to evaluate the severity of accident sequences involving flooding of the machinery space, calculations were made to determine drafts, metacentric height, and statical stability for that condition. The vessel was assumed to be in the "even-keel" condition prior to damage. It was assumed both the machinery space and the double bottom tanks under the machinery space were flooded and open to the sea but that watertight doors to shaft alley and machinery flat aft of frame 172 beneath No. 4 hold were closed. Figure 3 shows resulting drafts and righting arms. Due to the addition of weight (flooding water) low in the vessel, metacentric height increases to 4.6 feet.

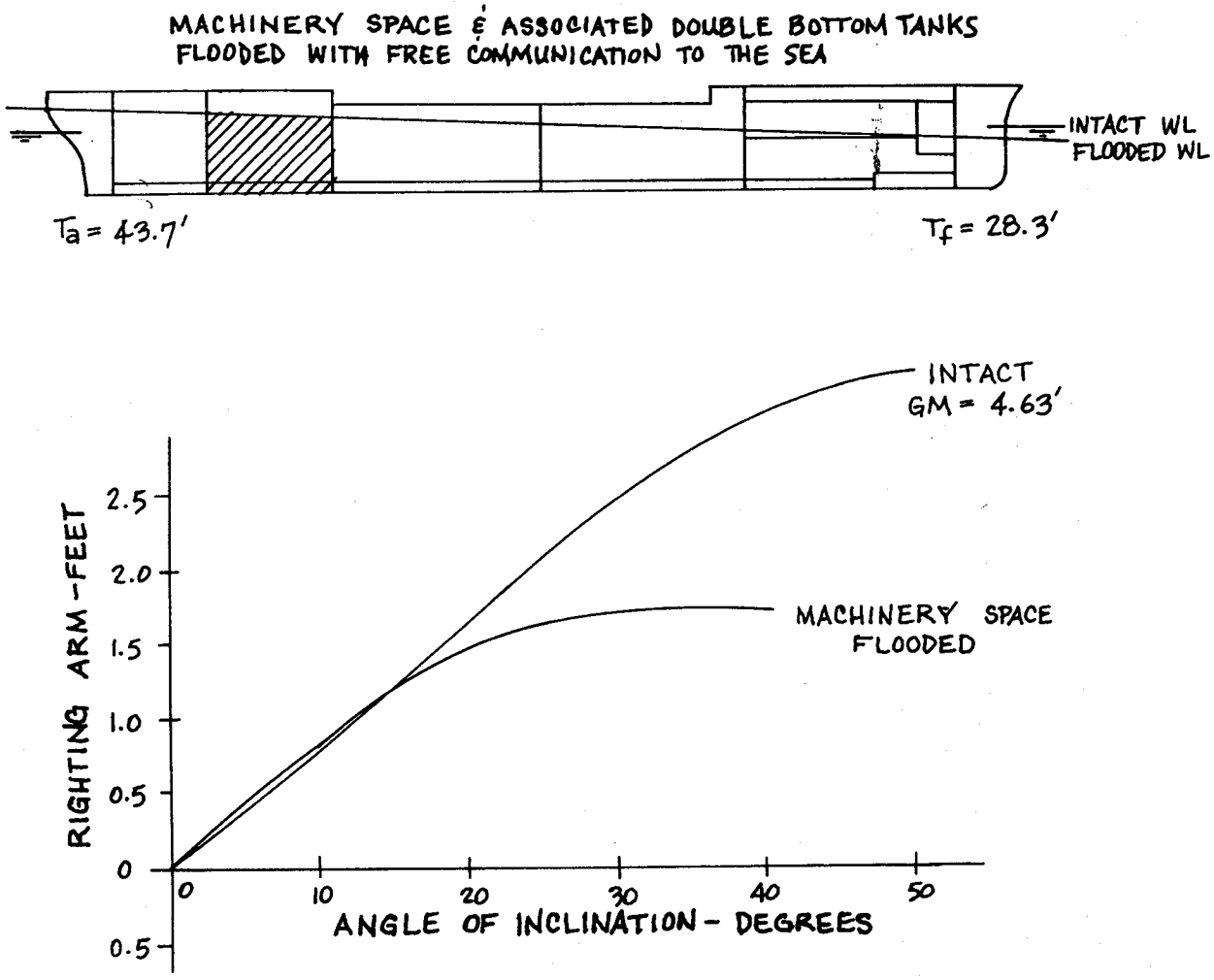
Stability in Longitudinal Seaway. In recent years, much effort has been directed at predicting the onset of large roll angles in irregular sea states.[3]/ Both experimental work using ship models and computer simulation studies have been done under Coast Guard sponsorship. Professor Paulling of the University of California at Berkley conducted a series of experiments with a 30-foot model of a fast cargoliner in San Francisco Bay, recording vessel motions and wave heights so the sea spectrum could be determined. As a result of this experimental work, three modes of instability leading to capsizing in following or quartering seas have been identified:

a. Low-Cycle Resonance. In this instability mode, regular rolling of the vessel is augmented by passage of several steep waves, resulting in increasingly large roll amplitude and eventual capsizing. This mode of capsize is characterized by a very regular rolling motion which, in a group of three or four waves, rose rapidly to a large amplitude which may end with the vessel model capsizing into a wave crest.

b. Pure Loss of Stability. This mode is characterized by sudden capsizing of the model with little preliminary rolling as a wave crest remains relatively stationary amidships, causing a dramatic loss in transverse stability due to change in shape of the underwater hull. For this to occur, high model speeds in following or quartering seas were required so that the model remains relatively stationary on the crest of the wave.

c. Broaching. Here, a series of steep waves from astern caused a loss of steering control and the model turned parallel to the troughs, capsizing on a wave crest.

[3]/This work is described in D. M. Bovet, R. E. Johnson, and E. L. Jones, "Recent Coast Guard Research into Vessel Stability," Marine Technology, October 1974, pp. 329-339 and William A. Hendrickson, "Assessing Intact Stability," Marine Technology, April 1980, pp. 163-173.



NOTE: 1. Righting Arm Curves have been corrected tor free surface effect of flooding water.
2. Taken from Board Exhibit 166, Figure 321-1, page 46.

FIGURE 3
Flooding of Machinery Space, Drafts and Statical Stability Curves

From these model test results and corresponding computer simulation work, the CAPSIZE computer program has evolved. This computer simulation program was used to provide stability and synchronous rolling estimates for the POET in following seas. This CAPSIZE simulation examines the synchronous, non-linear rolling motions of the vessel. Eight simulation runs were made. Results of these are shown in Table 5. The results of these computer simulations seem to suggest a strong possibility that POET may have capsized as a result of instability in following or quartering seas. For this to be the case, it must be true that:

a. The computer simulation model, CAPSIZE, correctly represents full-scale real-life vessel performance.

b. POET was subjected to following or quartering seas of 23-foot significant wave height.

c. POET maintained speeds of approximately 5 to 8 knots.

d. The onset of capsizing came too fast to be detected and avoided by speed or course change by the vessel's crew.

On the question of model validity, the Board has no adequate way of assessing the reliability of the model in predicting full-scale capsizing of the POET. The Board knows of no known full-scale vessel capsizing due to instability in following or quartering seas, except perhaps the case of the EDITH TERKOL described in the paper by Bovet, Johnson, and Jones referred to earlier. Resolution of uncertainty over the validity of the model is beyond the Board's capability.

It appears quite likely that POET could have been subjected to following or quartering seas as the storm center passed and POET moved eastward along the intended trackline and the seas shifted around to the south and southwest. It also appears quite possible that the POET may have been progressing at speeds as slow as 5 to 8 knots due to the weather.

The simulation model suggests times on the order of one-and-a-half to two-and-a-half minutes for capsize situations to develop. The program does not take into account whether the crew could recognize and diagnose the problem in time to take effective action in that period of time.

TABLE 5 POET - Stability in a Longitudinal Seaway; Results of Eight Simulation Runs on Computer Program CAPSIZE

RUN	VESSEL		SEAS	SIMULATION RESULTS
	Loading Condition	Speed (Knots)		
1	Departure	8	Following	Showed a gradually increasing roll motion, peaking at 101 degrees at 121 seconds after start
2	Departure	5	Following	Showed a rapidly decreasing roll motion with maximum roll occurring at start of simulation
3	Departure	8	Quartering	Roll gradually increased to 115 degrees ("capsize") at 103 seconds
4	Departure	5	Quartering	Roll gradually increased to 65 degrees at 104 seconds, then gradually decreased, but anomolously capsized at 151 seconds
5	Even-keel	8	Following	Rolls remain moderate (20 to 30 degrees) but peak suddenly at 79 degrees between 155 and 165 seconds, then subside
6	Even-Keel	5	Following	Rolls decay rapidly and remain small until a sudden peak of 80 degrees is reached between 180 and 195 seconds
7	Even-Keel	8	Quartering	Rolls increase gradually to 115 degrees ("capsize") at 114 seconds
8	Even-Keel	5	Quartering	Rolls remain moderate except for a local peak of 63 degrees occurring around 122 seconds

NOTES: 1. CAPSIZE simulation examines synchronous, non-linear rolling motions of a vessel and results of each run are highly individualistic.

2. Initial conditions used were: Roll angle of 21 degrees and pitch of 1.35 degrees down by the bow. Roll angle was evaluated at one-second intervals for a period of 200 seconds.

3. Seas were 23 feet high regular waves with a period of 8.9 seconds approaching the vessel from astern ("following") or on the stern quarter ("quartering").

4. The program arbitrarily defines "capsize" as a roll angle in excess of 2.0 radians (114.6 degrees) and the simulation is stopped when this condition occurs.

Seakeeping and Water on Deck

To provide information for use in assessing the probability that the forecastle deck hatchcover to No. 1 hold was damaged, permitting flooding of the hold, the computer program "SCORES" was used to provide an estimate of the frequency of deck wetnesses under the sea conditions POET probably encountered after leaving Philadelphia. The results of this analysis are summarized in Table 6.

At speeds of 5 knots and 8 knots in seas of 22.5 feet significant wave height, water on deck occurs more often in stern quartering seas than with seas on the bow. The top of the hatch coaming for the hatch to No. 1 hold is 5 feet above the forecastle deck. In the "even-keel" condition, this location would become immersed less than once per hour in bow seas. Water would not exceed a height of 4 feet above the top of the hatch coaming more than once per hour in head or bow seas. Results also indicate that with stern quartering seas (a more severe condition from a deck-wetness standpoint), a wave 8 feet above the top of the No. 1 hatch coaming could be expected once in 3 hours, and a wave height of 12 feet above the top of the hatch coaming once in 16 hours.

TABLE 6. POET - Estimated Deck Wetnesses, Occurrences Per Hour

Vessel Loading Condition	Assumed Speed (Knots)	Location on Vessel (Note 1)	Deck Wetnesses Per Hour for Various Angles to Direction of Seas				
			Average All Headings	Head Seas	Bow Seas	Stern Quartering Seas 30°	Stern Quartering Seas 60°
"EVEN KEEL" (Draft of 32'-6", Trim of 2" down by the bow)	5	Point 1	43.7	21.4	39.0	44.9	52.3
		Point 2	3.8	0.02	0.7	10.8	11.6
		Point 3	0.7	0.0004	0.07	3.2	3.4
	8	Point 1	42.3	21.1	40.2	39.6	49.8
		Point 2	3.5	0.02	0.7	9.1	10.6
		Point 3	0.7	0.0005	0.07	2.5	3.0
"DEPARTURE" (Draft of 32'-8½", Trim of 2'7" down by the bow)	5	Point 1	61.1	33.5	55.1	62.7	70.9
		Point 2	5.9	0.03	1.1	16.2	16.7
		Point 3	1.2	0.001	0.1	5.2	5.3
	8	Point 1	59.4	33.1	56.6	56.3	68.1
		Point 2	5.5	0.05	1.2	13.7	15.3
		Point 2	1.1	0.0015	0.13	4.2	4.7

NOTES:
1. Point 1 is located at the fo'c'sle deck level at the forward perpendicular (FP). Point 2 is located at the level of the Hold #1 hatch coaming at the forward edge of the hatch. Point 3 is located 4.0 feet above Point 2.
2. Significant wave height of 22.5 feet assumed for these calculations.
3. Source: Table 410-A, Page 48, Board Exhibit 166.

ANALYSIS

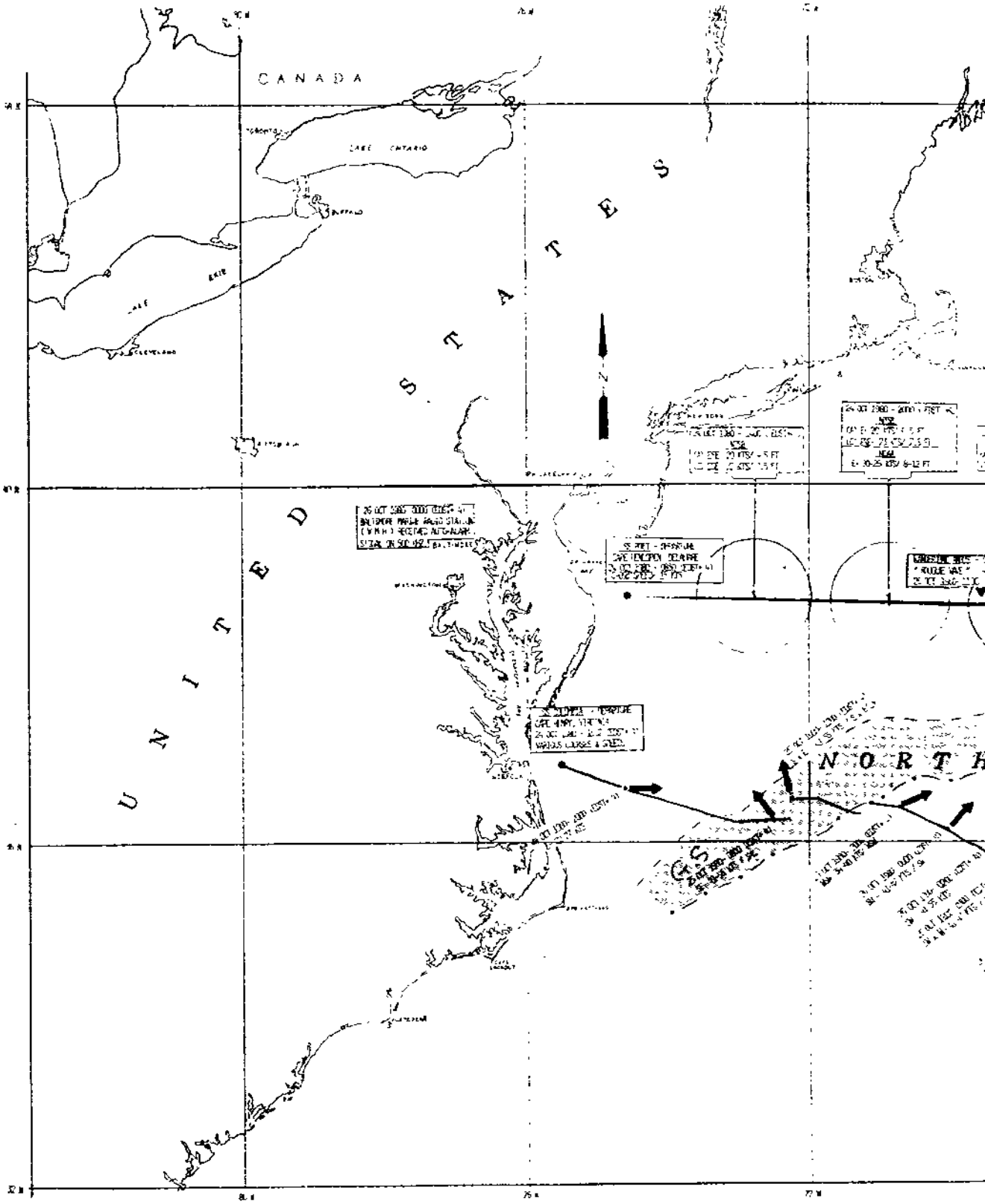
This analysis, based on the factual information developed, is a record of the reasoning process used by the Board in reaching appropriate conclusions and recommendations.

1. PREFACE

There are no survivors or witnesses to provide first-hand information on what happened to the POET after it departed Cape Henlopen enroute to Egypt on 24 October 1980. No debris which might be from the vessel has been sighted or recovered to date. No distress message was received from POET. Thus, information available to the Marine Board consists of documents remaining ashore and the testimony of persons who had served on the POET on previous voyages; of employees of the companies which owned and operated the vessel; of personnel of the Coast Guard, the American Bureau of Shipping, and the Federal Communications Commission, agencies which had conducted various inspections and surveys of the vessel and its equipment; of personnel who made repairs to the vessel and its equipment prior to departure on the 24th; of Coast Guard personnel who participated in the extensive search which followed the disappearance of the vessel; of personnel of the National Cargo Bureau and others who were present during the loading of the cargo in Philadelphia; and of personnel of the Maritime Administration. Also available to the Board were results of the Search and Rescue Study conducted by the Commander, Coast Guard Atlantic Area; analyses of the weather and sea conditions provided by the National Transportation Safety Board and the National Oceanic and Atmospheric Administration; and results of the technical investigation of the stability, strength, and seakeeping characteristics of the POET provided by the U. S. Coast Guard Merchant Marine Technical Division. The Board also visited a sister ship, the SS PENNY, O.N. 295108, at Tampa, Florida, on 19 January 1981. The visit was for orientation purposes, to allow the Board to better understand the many days of hearing room testimony by touring a ship of the same design, size, age, general arrangement, and trade.

2. WEATHER

Using information in POET's USMER departure message indicating the vessel intended to follow a rhumb line track from Cape Henlopen to Gibraltar at a speed of 15 knots, the Board constructed the projected track of Figure 4. Also shown in Figure 4 is information on estimated wind and sea conditions along the track from NTSB and NOAA analyses, estimated location of Gulf Stream North Wall, and weather and weather-related problems experienced by other craft in the area. After departure on the 24th, POET would have initially encountered winds of 20-25 knots and seas of 10 feet from directly ahead. These would have gradually increased and shifted to the southeast during the day on the 25th as the low pressure area moved up the coast. The vessel would have approached within 50-100 nautical miles of the northern edge of the Gulf Stream late on the 24th or early on the 25th, a region where the Navy North Wall advisories indicate wind and seas may be more severe than generally forecast. It appears likely that the vessel's speed would have been reduced from 15 knots to 5-8 knots in order to moderate increasing ship motions, but this speed reduction would not have changed the vessel's estimated time of arrival at its destination enough to require an update message to USMER.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LAKE ERIE
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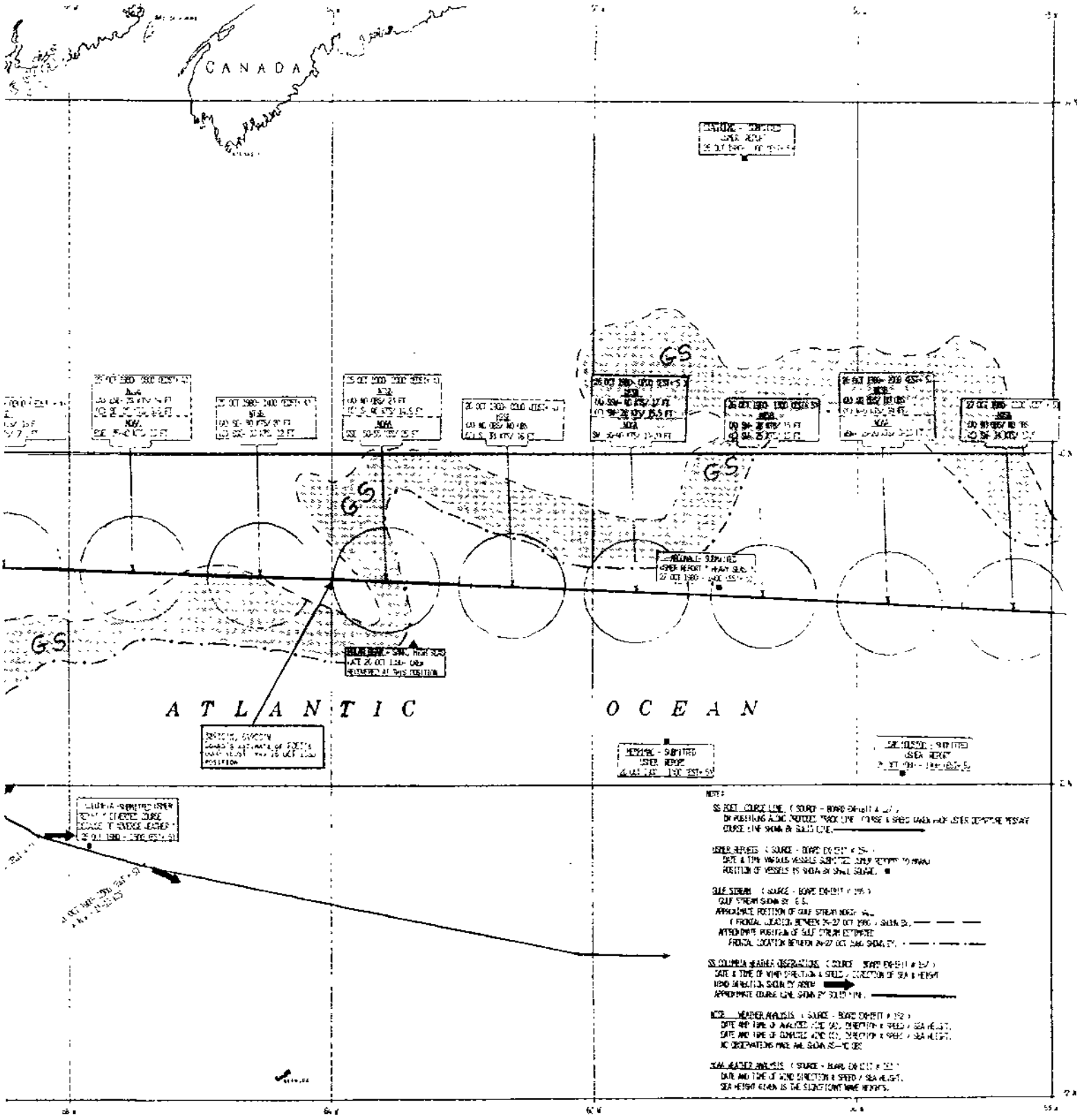

Figure 4 POET--Projected Track
24-26 October 1980

Other vessels in the area at the time reported speed reductions due to heavy weather in regular USMER messages they submitted. The POET would have encountered the most severe weather conditions late on the 25th and early on the 26th as wind and seas shifted from south-southeast (broad on the starboard bow) around to the south and southwest (on the starboard quarter). With the effect of the North Wall, POET may have encountered winds of up to 60 knots and seas up to 30 feet somewhere in the vicinity of 38 degrees 30 minutes north latitude, 64 degrees west longitude (indicated on Figure 4) around midnight on 25 October 1980. It was at this time that an unidentifiable and incomplete auto alarm signal was received by radio station WMH in Baltimore. In addition, the next regular USMER message scheduled to be sent around 1200-1400 on 26 October 1980 was not received.

3. EVALUATION OF SEVERITY AND PROBABILITY OF POSSIBLE ACCIDENT EVENT SEQUENCES

Using information developed from documents, testimony, and technical studies, the Board has evaluated the severity and probability of the possible accident events using the following procedure:

a. Identify possible hazards or "accident event sequences" which could account for the disappearance of the vessel.

b. Establish the severity of each of these hazards. In order to do this, the hazard severity categories shown in Table 7 were developed.

c. Establish probability of occurrence of these hazards. The hazard probability categories shown in Table 8 were developed.

d. Rank the possible accident event sequences into a hazard ranking. At the top is the sequence having the highest probability and the most severe consequence, and at the bottom is the hazard with the lowest probability and the least severe consequence.

The results of this rating and ranking process are shown in Table 9. The rationale used to arrive at these ratings is described in the following paragraphs.

TABLE 7. POET - Hazard Severity Categories

CODE	HAZARD LEVEL	EFFECT ON VESSEL AND CREW
A	Catastrophic	Total sudden loss of the vessel (within 5 minutes in daytime, 10 minutes at night). No distress message, no survivors, no lifeboat or liferaft survives.
B	Critical	Vessel lost in period of over 5 minutes in daytime, 10 minutes at night. There is time enough to send distress message and launch lifeboats and liferafts.
C	Marginal	Vessel disabled, some danger of sinking, can send distress message, no immediate need to abandon ship
D	Negligible	Vessel continues on voyage (perhaps after some delay for repairs), can communicate, vessel returns to routine operations after brief period.

TABLE 8. POET - Hazard Probability Categories

CODE	DESCRIPTION OF SITUATION (Given what is known of vessel, weather, sea conditions, this hazard appears:)
J	Very likely to have occurred. Not a "sure thing," but almost 80-98% probability.
K	Quite possibly could have occurred. Conditions favorable to occurrence of this hazard were present.
L	Possible, but not likely. Some conditions favorable to occurrence present, but, on the whole, doesn't seem likely to have happened.
M	Highly improbable. Possibility so small as to be negligible. Very remote chance.

TABLE 9. POET - Hazard Ranking

ACCIDENT EVENT SEQUENCES	Hazard Categories	
	Severity	Probability
1. Capsizing of vessel due to instability in following or quartering seas.	A	K[1]
2. Capsizing or foundering of vessel due to flooding of No. 1 hold	A-B	L
3. Loss of vessel due to structural failure	A	L-M
4. Capsizing or foundering of vessel due to shifting of cargo	B-C	K
5. Foundering of vessel due to flooding of Machinery Space	B-C	K
6. Loss of vessel due to boiler explosion	B	L
7. Loss of vessel due to fire in quarters area	C	K
8. Loss of vessel due to fire in galley	C	K
9. Loss of vessel due to Machinery Space fire	C	L
10. Loss of vessel due to flooding of empty ballast tanks	C-D	L
11. Loss of vessel due to collision with submerged object or another vessel	A-D	M
12. Loss of vessel due to sabotage	A-D	M
13. Loss of vessel due to Act of War	A-D	M
14. Hijack of vessel	D	M

[1]Probability rating for capsizing based on results of CAPSIZE computer simulation.

Accident Event Sequence 1--Capsizing Due to Instability in Following or Quartering Seas

In terms of severity, sudden capsizing of the POET due to a loss of transverse stability in following or quartering seas could result in no distress message being sent or received, no survivors reaching lifeboats or liferafts and in fact no lifeboats or liferafts surviving the capsizing. The probability of such an event occurring depends on the validity of the model discussed in Section 13, Technical Studies, and the validity of the assumptions used in exercising the model; i.e., following or quartering seas of 23-foot significant wave height, vessel speeds in the range 5 to 8 knots. If the CAPSIZE model is valid, then there is a probability that the POET capsized suddenly due to a loss of transverse stability in following or quarterng seas, which POET should have encountered early on 26 October 1980.

Accident Event Sequence 2--Capsizing or Foundering Due to Flooding of No. 1 Hold

The Board theorized that flooding of No. 1 hold could occur in one of the followings ways:

a. Suddenly due to the structural failure of No. 1 hatchcover; that is, the hatchcover was stove in and was no longer effective in keeping water out of the hold.

b. Suddenly due to No. 1 hatchcover being swept away.

c. More slowly due to the gradual leakage of water into No. 1 hold around or through the hatchcover. In this case, the hatchcover would still be partially effective in keeping water out.

In terms of severity, it appears that the sudden flooding of No. 1 hold could lead to foundering or capsizing of the vessel. The technical studies conducted for the Board show that with No. 1 hold completely flooded, the deck at the side would be immersed just aft of the forecastle resulting in reduced freeboard and reduced reserved buoyancy. Figure 2 on page 39 also shows that the maximum righting arm is reduced to 0.13 feet and the range of positive stability is reduced to 17 degrees. In this condition, the vessel might be relatively easily capsized, due to wave forces, or founder due to loss of reserve buoyancy. The severity of a gradual flooding of No. 1 hold is much less. It seems likely that the crew would, in time, discover such a condition and take action to reduce the flooding through pumping the loose water out of No. 1 hold using the ship's installed bilge system and altering course to reduce amount of water taken forward. Such a condition would also probably have resulted in the sending of a distress message or at least a message to alert other vessels in the area of a possible hazardous condition. It does not appear likely that the flooding of No. 1 hold would have led to the vessel breaking in two. Results of the technical studies done for the Board and presented in Table 3 indicate that the bending moment, shear force, and resulting stresses with No. 1 hold would still be well below the levels where failure of the vessel's primary hull structure would be expected.

In terms of probability, the likelihood of rapid flooding of No. 1 hold due to a hatchcover structural failure or hatchcover being swept away appears small. Results of the analysis of the strength of the No. 1 hatchcover performed for the Board and the results of the seakeeping analysis to predict the amount of water on deck support this conclusion in the Board's view. The outstanding repairs to the No. 1 hatchcover and the continuing repairs of the hatchcover skirt plates done in Philadelphia do not appear to be factors which might have led to either the sudden or gradual flooding of No. 1 hold. There was no indication in the testimony of previous problems with leakage of water into any of the holds due to a poor condition of the hatchcover, gaskets, or dogs, but an undiscovered hatchcover defect cannot be ruled out.

Accident Event Sequence 3--Loss of Vessel Due to Structural Failure

In terms of severity and effect on the vessel and crew, a major structural failure causing the hull to break in two might result in both halves sinking very rapidly. It is also possible that the stern section of the vessel might have enough reserve buoyancy to remain afloat for some period of time, perhaps long enough to permit launching of lifeboats and the sending of a distress signal. In terms of probability of major structural failure, comparison of estimated still water and wave-induced loads and resulting stresses to accepted design values and estimated ultimate strength of the hull indicates the resulting stress levels are relatively low and well below the levels at which one might anticipate major hull structural failure. Assuming that the scantlings used in this analysis, based on the 1976 gaugings, are indicative of the overall condition of the vessel, the probability of a major hull structural failure resulting in the vessel breaking in two appears fairly low. However, the possibility exists that some undiscovered hull structural defect might have resulted in initiation of a structural defect leading to a major hull structural failure.

Accident Event Sequence 4--Capsizing or Foundering Due to Shifting of Cargo

There are two categories of occurrences related to possible shifting of cargo. The first of these is that the POET's grain loading was done in accordance with the International Grain Regulations (IGR), a shift of grain occurred, but the vessel's angle of heel due to the grain shift was limited to 12 degrees or less. Such a sequence, although it could have occurred, would be unlikely to lead to rapid loss of the vessel. A second possibility is that grain loading was not done in accordance with the IGR (i.e., significant undetected underdeck voids existed), and a shift of grain severe enough to lead to sudden capsizing occurred. In the Board's view, the probability of occurrence of a grain shift severe enough to result in sudden loss of the vessel is very low in view of the vessel's design, the methods used to load the ship, the inspections made by NCB surveyors, and the final stowage factor achieved. The validity of the current IGR is, in the Board's view, well established and nothing was found which raised any questions concerning these standards.

Accident Event Sequence 5--Foundering Due to Flooding of Machinery Space

The technical studies indicate that complete flooding of the machinery space and double bottom tanks between frames 146 and 172 would be unlikely

to cause sudden loss of the vessel. Sufficient freeboard, reserve buoyancy, and righting energy would remain to keep the vessel afloat for some period of time. Also, the Board believes that the probability of occurrence of sudden flooding of the machinery space is low in view of vessel design, drydock inspections, and vessel maintenance program described by Chief Engineer McNANEY.

Accident Event Sequence 6--Loss of Vessel Due to Boiler Explosion

Two types of boiler explosions were considered by the Board. Rupture of pressure-containment envelope could lead to sudden release of energy stored in the boiler. Such an occurrence is unlikely in view of installed safety devices, but if it were to occur, the most severe consequences possible would be rupture of shell plating and flooding of the machinery space (Accident Event Sequence 5 discussed above). A fuel oil firebox explosion would also be possible, though unlikely to release enough energy to cause significant damage to the vessel's hull structure. Both types of boiler explosion appear to have a very low probability of leading to sudden loss of the vessel. There is no evidence to support such an occurence.

Other Possible Accident Event Sequences

As indicated in Table 9, the Board evaluated a number of other possible accident sequences, all of which are considered to be of lower probability and severity than those discussed above. And in selecting the possible accident event sequences shown in Table 9, the Board considered and eliminated a number of less plausible possibilities.

4. UNCERTAINTIES IN THE EVALUATION OF ACCIDENT EVENT SEQUENCES

In evaluating the possible accident event sequences, the Board has taken into account a number of uncertainties.

Actual weather and sea conditions encountered by the POET may have been different from the after-the-fact estimates made by NTSB and NOAA. To the extent that these estimates are in error, they may affect the validity of the results of the technical studies including the capsizing, seakeeping, and longitudinal strength studies.

The actual speed and course of the vessel may have been different than that indicated in the vessel's departure message and the assumption of the Board in establishing criteria for technical analyses.

Uncertainties concerning the validity of the CAPSIZE simulation program have not been resolved by the Board, and validation of this simulation program, either through documentation of accidents or near-misses or full-scale experiments, is likely to be very difficult.

The longitudinal strength analysis is based on the 1976 gaugings and to the extent that those gaugings may not represent the vessel's actual hull condition at the time of its departure from Philadelphia on 24 October 1980, the longitudinal strength analysis may be in error.

The possibility exists that there was some undetected hull structural defect present in the POET when it left Philadelphia which may have been a causal factor in a structural failure at sea. The presence of such a defect, possibly in the way of one of the double bottom ballast tanks, could have been a contributing factor to loss of the vessel. Similarly, an undetected defect affecting the integrity of No. 1 cargo hatch could produce failure of the hatchcover and flooding of the hold.

No distress signal or message was received from POET, even though the ship was equipped with a number of radio transmitting systems and an emergency position-indicating radiobeacon or EPIRB, all designed to alert others of a distress and to summon help for those in need of it. Logically, this could only occur if:

No radio distress signal or message was sent, either because none of the vessel's radio equipment would function or because there was no time to send a message before the vessel went down, or

A signal was sent, but no one heard and recognized it as a distress signal or message, and

In addition, the EPIRB either failed to deploy and send out a signal, or if it did transmit a signal, the signal was not received.

In the Board's view, it is unlikely that the failure to receive a distress message is due to failure of the vessel's radio equipment. Evidence indicates all of the radio equipment was functioning when the vessel left Philadelphia. The redundancy of transmitting equipment and power sources, including the lifeboat radio, make it unlikely that radio equipment failure is the reason why no distress message was received.

It is possible that an attempt was made to send a radio distress message. The partial auto alarm signal received and logged by the operator of radio station WMH, Baltimore, Maryland, may have come from POET. This series of 4-6 four-second dashes was apparently not of sufficient duration to set off auto alarm signals of other vessels. The Board examined radio logs from a number of vessels in the general vicinity of POET's estimated position and found no indication of any auto alarms being set off or any corroboration of the signals heard by WMH. Evidence indicates that auto alarm keyers are occasionally accidently activated. This occurred on POET while the ship was in Philadelphia when the auto alarm keyer was inadvertently turned on. The presence of a partial auto alarm signal by itself does not indicate much; however, in conjunction with other factors, it may be significant--i.e., the adverse weather conditions and the failure of POET to submit their USMER message on 26 October and failure to communicate with the owners on 27 October. The above suggests that the auto alarm signal heard at 0000 EDST, 26 October 1980, could have come from the POET.

No EPIRB signal was received from POET, meaning the EPIRB didn't deploy, it deployed but failed to transmit, or it transmitted but no one received the signal.

Evidence indicates that it was normal procedure for the EPIRB to be taken inside the pilothouse when the vessel was in port. The EPIRB on board POET was small and light and, according to testimony, subject to pilferage. Once inside the pilothouse, it was placed in an area where the mate would almost "trip over it." This situation acted as a reminder to the mate to put it back out on the bridge wing during the testing of the bridge equipment prior to the vessel getting underway. There was no evidence indicating that this was not accomplished prior to departing.

The EPIRB container is designed to allow the EPIRB to float free when the container becomes submerged in water--the lid floats off, allowing the EPIRB to be released and float to the surface. The EPIRB was stowed in such a manner that there were no obstructions overhead that should have prevented the EPIRB from floating free if the vessel was in a near-upright position when the container was submerged. The Board cannot determine how this arrangement would have functioned if the vessel capsized. A casualty of the magnitude probably encountered by POET could have caused considerable damage to topside equipment. It is quite possible that the EPIRB could have broken loose during the casualty and fallen to the main deck or overboard in its own box or that it was damaged to such an extent that it would not transmit a signal.

Two months prior to the casualty, the EPIRB was tested by an FCC inspector. This test procedure included checking the frequency output and checking for leakage by immersing the EPIRB in water. The EPIRB operated satisfactorily during the test.

Little information is available on the effects of severe wind and sea conditions on EPIRB performance. It is possible that the POET's EPIRB deployed and transmitted but the signal went unnoticed due to the lack of an appropriately equipped aircraft flying close enough to the beacon to receive the signal before the batteries were exhausted.

With regard to the failure to receive any radio distress signal or message from POET, the Board believes the most likely explanation is that the vessel was lost so rapidly that there was no time to send a radio distress message with any of the ship's transmitters or the lifeboat radio. Failure of EPIRB to provide distress notification could be due to deployment failure, EPIRB malfunction or damage, or to the simple lack of a receiving station close enough to receive the signal.

CONCLUSIONS

1. It is concluded that the POET was lost at sea after departure from Cape Henlopen, Delaware, on 24 October 1980, while enroute to Port Said, Egypt, via the Straits of Gibralter. The 34 crewmen aboard the POET when the vessel left Cape Henlopen, Delaware, are missing and presumed dead.

2. The precise time and location of the vessel's loss are unknown and cannot be determined. The Board concludes that the POET was most likely lost during the period when it encountered the most severe weather conditions between the morning of 25 October and the evening of 26 October. Based upon the weather analyses conducted by NTSB and NOAA and the weather observations made by the SS COLUMBIA, the Board concludes that POET encountered the worst weather conditions at approximately 0000 on 26 October 1980 at an approximate position of 38 degrees 30 minutes north latitude, 64 degrees west longitude on her intended track line. POET likely encountered winds of up to 60 knots and seas with a significant wave height of up to 30 feet. Wind and sea had veered from southeast to south and at 0000 on 26 October were from south to southwest. POET's intended track would have placed the vessel in an area where peak storm conditions were intensified by the effects of the Gulf Stream North Wall.

3. The Board has been unable to obtain or develop sufficient factual data in which to base conclusions as to the proximate cause of the casualty. However, based on the information obtained, the Board has reached certain conclusions regarding possible accident event sequences and related causal factors. The most likely of the possible explanations of the POET's disappearance are capsizing due to instability in following or quartering seas, capsizing or foundering due to flooding of No. 1 hold, and loss due to hull structural failure. One causal factor common to all of the most prominent possible accident event sequences is the adverse weather. From a study of the available facts, the Board concludes:

a. That a credible possibility exists that the vessel capsized due to instability in a following or quartering sea. The conditions needed for this to occur cannot be verified by the Board in two respects. Firstly, the computer program CAPSIZE upon which this conclusion is based may not accurately predict full-scale ship performance and, secondly, the ability of the POET's navigating officers to recognize and avoid conditions leading to capsizing due to synchronous rolling cannot be determined. Specific information regarding this hazard was not included in stability information available to the master on board the vessel.

b. That a credible possibility also exists that the vessel was lost due to flooding of No. 1 hold. The conditions needed for this to have occurred include a major failure of the hatchcover. There is evidence that several repairs to the hatch had been accomplished during the preceding two years, and that permanent repair remained deferred at the time the vessel sailed on its last voyage. The liklihood of additional undetected hatchcover structural defects of a serious nature has not been ruled out. It is the Board's view that a major failure of the No. 1 hatchcover could go undiscovered by the ship's crew until the vessel was in great jeopardy. Loss of the vessel could occur quickly under the prevailing sea conditions.

c. That a credible possibility exists that a major hull structural failure occurred. A detailed critical analysis of design and actual hull strength serves to discount this possibility, but other considerations are of concern to the Board, including the possibility of an undiscovered hull structural defect of a size and nature adequate to lead to a major hull structural failure under the loading the vessel was subjected to on 25 and 26 October 1980. The Board is aware of a number of serious ship casualties which have been traced to undetected structural defects and does not rule out the possibility in this case.

The Board's definition of undetected structural defects includes defects which can be detected by ordinary inspection practices but are not, and defects which cannot be detected by ordinary inspection practices. An example of the former would be possible visible defects in way of No. 3, 4, 5, and 6 port and starboard double bottom ballast tanks which were not examined during the 1980 drydocking. An example of the latter would be the possible reduction of the tensile strength of the steel plate exposed to fire and water quenching similar to the circumstances of the fire in POET's No. 2 hold in February 1978.

The Board concludes that while some shifting of grain cargo may have occurred in conjunction with capsizing of the vessel due to instability in following or quartering seas or flooding of No. 1 hold, shifting of the grain cargo was not a significant factor in the loss of the vessel.

4. The POET failed to make any of the normally-expected reports by radio to USMER or to the vessel operators after the departure messages were sent and received on 24 October 1980. The Board concludes that uncertainty over what significance to place on the POET's failure to make these reports, coupled with the lack of any distress message, resulted in delays in recognizing the vessel had encountered problems and that assistance might be required. The present maritime search and rescue system is based on the premise that persons in distress can make their plight known to others, primarily by means of radio communications on 500 kHz or by means of an EPIRB, either manually or automatically activated. It appears to the Board that it was unclear in the mind of the vessel owner, Mr. [redacted] whether the failure to communicate should be interpreted as a sign that the vessel was in trouble and needed help, or that the vessel was merely out of contact due to radio equipment problems or the occurrence of atmospheric conditions making radio communications impossible. The Coast Guard approach to such uncertainty is to categorize potential SAR cases of this nature as either overdue or unreported or both depending on the circumstances. For vessels unreported but not overdue at destination, extensive efforts are first undertaken to locate the vessel by methods other than physical search. This procedure is apparently born of the necessity to conserve limited SAR resources which would otherwise be expended on account of unreliable ship communication, as opposed to distress situations. The Board believes efforts can and must be directed at eliminating uncertainties over the significance of such failures to communicate on the part of relatively large oceangoing vessels such as the POET and to improvements to radio distress alerting and locating systems.

In their present form, AMVER and USMER are not intended to function as "distress alerting by failure to make required report" systems. AMVER is a

search and rescue "assistance locating" system. Participation in AMVER is open to ships of any nationality but is voluntary and ships participating make only initial reports at the start of a voyage with follow-up reports if there is a substantial change in their intended trackline. AMVER has no "report check" feature. USMER is a "location monitoring" system covering vessels of interest to the U. S. government. Although participation by U. S. vessels engaged in foreign commerce is required, U. S. vessels in coastwise trade are not required to participate and the system at present has no real-time "report check" feature.

Although it is conceivable that these systems might be modified to make them "distress alerting by failure to make required report" systems, there are some significant potential problems. One of these is false alarms due to communications reliability problems. Another is that for such a system to be most effective, participation should be required. SAR resources to respond to alerts will also be a significant problem in some portions of the world--what do you do once you are aware that a ship operating in a remote area has failed to make a required report? Nevertheless, the Board believes there is a need to carefully evaluate the feasibility of a "distress alerting by failure to make required report" system for oceangoing merchant vessels, and to consider measures to make participation in AMVER by U. S. merchant vessels over 1600 gross tons on ocean or coastwise voyages mandatory.

No radio distress message was received from the POET, either via the 500 kHz distress system or the emergency position indicating radio beacon (EPIRB) operating at the 121.5 and 245 MHz distress frequencies, although it is possible that the partial auto alarm signal heard at 0000 EDT, 26 October 1980, by the station WMH operator could have come from the POET. The Board concludes that it is likely that the lack of any radio distress message was due to the loss of the ship being so sudden that there was no time to send a distress message on 500 kHz using the main or emergency radio transmitters or the lifeboat radio. The EPIRB either did not float free and start transmitting or did float free and start transmitting but was not received.

The Board believes there is a need for a review of current EPIRB requirements to evaluate validity of the "float-free" idea and the reliability of this equipment. Most of the examples of EPIRB use that the Board is aware of, involved activation of the EPIRB by persons in distress, rather than by automatic means.

It is not clear to the Board whether information on the partial auto alarm reported by the WMH, Baltimore, Maryland, operator to Coast Guard Communications Station NMN, Portsmouth, Virginia, would have influenced decisions made by RCC New York personnel after they were advised of lack of communications with POET. It might have, and the Board believes there is a need to review instructions currently in effect regarding such reports to insure that all information received by the Coast Guard which might be of value in SAR decision-making is forwarded to the appropriate RCC.

The Board believes there is a need to look at safety radio communications with oceangoing ships and the current applicable laws and regulations systematically through preparation of a National Maritime Safety

Communications Plan, similar in concept to the Federal Radionavigation Plan which was jointly developed by the U. S. Departments of Defense and Transportation.

5. The Board concludes that the POET's cargo of bulk corn was loaded in accordance with the requirements of International Grain Regulations and there is no evidence to indicate that shifting of the cargo was a primary factor in events leading to loss of the vessel. There is no reason to suspect any lack of validity in the assumptions upon which the current grain loading regulations are based. The POET was not overloaded with respect to her load line when she departed from Philadelphia on 24 October 1980.

6. Based upon a comparison of the post weather analyses with the weather forecast issued by the National Weather Service, the Board concludes that the NWS forecast adequately described the weather conditions that POET should have encountered and should have been adequate to the needs of the master. It should be noted however that in describing the peak storm conditions most likely encountered by POET, the Board applied the effects the Gulf Stream North Wall would have had on the analyzed conditions. The Board could not determine if POET received the NWS forecast or would have had information on the location or effects of the North Wall of the Gulf Stream. If the master had this information, it is unknown if or how he would have applied this knowledge with respect to maneuvering the POET.

7. Coast Guard personnel performing the last drydock and biennial inspection were not highly skilled in vessel inspection procedures and lacked relevant experience. Further, the previous inspection history of the vessel and information concerning potential problem areas was not available to these personnel and do not exist in useful form. Taken together, these shortcomings cause the Board to conclude that a Coast Guard overview of the vessel's safety status was not totally satisfactory. Within their level of experience, training, and skill, the Coast Guard personnel performed their duties to the best of their abilities and there is no evidence of misconduct, negligence, or inattention to duty on their part. The quality of the Coast Guard inspection program needs to be improved.

8. It is concluded that a gap existed between the efforts of the ship's crew and the safety overview of federal agencies and the classification society. The vessel's owner relied heavily on vessel personnel to provide the initiative for finding and reporting safety deficiencies and although Port Engineers were engaged to represent the owner on specific occasions, for the most part their efforts were limited to responding to requests for repairs from the ship and the requirements of inspecting agencies. This state of affairs heightened the Board's concern that structural defects may have gone undetected. There was no evidence of a violation of law or regulation in this regard.

9. Mr. [redacted], the vessel's operator, did not have an effective communications plan for the vessels to follow or that could be relied upon. [redacted] stated that POET's operating procedures manual required the master to communicate with the owners every 48 hours. Both Captains [redacted] and [redacted] followed a different schedule and sent messages to the owners

every Monday and Thursday. The Board concludes that the lack of an established communications plan may have caused [redacted] to be uncertain as to what significance to place on POET's failure to make expected reports. This uncertainty resulted in a delay of the owner notifying the Coast Guard of the unreported vessel.

10. The Board concludes that the actions taken by the Coast Guard Rescue Coordination Center, New York, and Commander, Atlantic Area, in initiating and conducting search and rescue efforts aimed at locating the POET or survivors from the POET were in accordance with current agency policy. The absence of a distress message or verifiable signal from POET was the single greatest factor in the search effort not being undertaken in time to be of benefit to possible survivors. The reliability of the communication system (including the EPIRB) is fundamental to safety of life at sea and requires further attention.

11. It is concluded that POET was outfitted with lifesaving equipment in accordance with the requirements of law and regulation at the time the casualty occurred. Assuming that the condition of the vessel would have permitted an attempt to launch the lifesaving equipment and that sufficient time was available to do so, it is concluded that the wind and sea conditions at the height of the storm would have made such an undertaking extremely difficult.

12. No lifeboats, liferafts, or any other debris that can be identified as coming from the SS POET have been sighted or recovered. It appears quite possible that if the vessel was lost very rapidly, the lifeboats may well have been secured in their cradles by the gripes and would have gone down with the vessel. It seems likely that even if the vessel capsized very rapidly, some debris or items of the vessel's lifesaving equipment should have floated free. Although European countries have been requested to assist in locating debris which may work ashore, no debris identified as coming from POET has been reported to date.

13. There is no evidence of actionable misconduct, inattention to duty, negligence, or willful violation of law or regulation on the part of licensed or certificated persons. Nor is there evidence that failure of inspected material or equipment, or any personnel of the Coast Guard or any other government agency, contributed to this casualty.

RECOMMENDATIONS

1. The Marine Board of Investigation recommends that the U. S. Coast Guard working with the Maritime Administration, the Federal Communications Commission, and other agencies as appropriate undertake to:

a. Make AMVER participation mandatory for all U. S. vessels of more than 1600 gross tons.

b. Consolidate the USMER and AMVER computer based systems as a single shared system with capability to audit the reporting of individual U. S. ships.

c. Evaluate the reliability of ship to shore safety radiocommunications for oceangoing U. S. vessels of more than 1600 gross tons and revise present maritime Search and Rescue doctrine in terms of reliability of communications.

d. Evaluate the effectiveness of Emergency Position Indicating Radiobeacon (EPIRB) in adverse sea states (heavy weather).

e. Evaluate the feasibility and the need for developing EPIRB's which generate a signal which can be detected by other ships.

f. Evaluate the power and frequency requirements for EPIRB's to be effective in the ocean environment.

Recommendations 1(d), (e), and (f) should be considered during the upcoming demonstration and evaluation phase of the Search and Rescue Satellite-Aided Tracking System (SARSAT) scheduled for the Spring of 1982.

g. Determine the failure rate of EPIRB's installed on oceangoing ships and institute follow-up action for design improvements where indicated. The MARTECK WHALER MODEL EB-2BW EPIRB should be specifically included in this recommended program.

h. Direct all Coast Guard forces which receive information pertaining to possible distress situations such as auto alarm signals pass the information to the appropriate Rescue Coordination Center without delay.

2. Because of the complexity of the problem of improving radio distress and locating system as outlined in paragraph 4 of the Conclusions, the Board suggests that there is a need for a National Maritime Safety Radiocommunication plan. A plan identifying national objectives and tasking agencies would, in the Board's view, be helpful in determining the future course of events relative to paragraph 1 of these recommendations and in improving maritime radio communications toward the state of the art.

3. It is recommended that the Commandant determine the feasibility of validating the CAPSIZE model, risk of capsize in following or quartering seas, and appropriate risk reduction methods. The objective should be to provide shipboard personnel with adequate information.

4. Adequate information on the "North Wall" of the Gulf Stream should be available to ship masters. Publication of the information on the appropriate Pilot Charts should be considered.

5. It is recommended that the Commandant consider improving guidance as to the frequency double bottom tanks of cargo vessels are to be internally examined. This should include a checklist on the Marine Safety Information System (MSIS) record. Further, relevant information regarding the inspection history and areas of special interest for cargo vessels should be made available to the Coast Guard Marine Inspector prior to each inspection visit. The Board is aware the Marine Safety Information System now in the development stage may fulfill this need.

6. That Commandant establish a goal of increasing the skill and experience level of the workforce engaged in the performance of ship inspections. The present trend of delegating elements of the Marine Inspection function to organizations such as the American Bureau of Shipping could be beneficial in this respect.

7. That the Coast Guard supervision of inspection functions delegated outside of the service including the presently delegated load line inspection function be clarified in terms of Coast Guard responsibility in the field.

8. That the Commandant monitor and encourage National and International research and development efforts related to the improvement of lifesaving equipment and related safety procedures that are directed towards the safe abandonment of ships in adverse sea state conditions.

9. That the Commandant consider placing more emphasis on auditing the owner/operator efforts to operate, inspect, and maintain vessels in accordance with safety regulations and accepted marine practices.

10. That a copy of this report be forwarded to the Inter-Governmental Maritime Consultative Organization (IMCO).

[redacted]

H. G. LYONS, Captain, USCG
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W. D. SNIDER, Commander, USCG
Member

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Member and Recorder

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