TREASURY DEPARTMENT
UNITED STATES COAST GUARD

ADDRESS REPLY TO:
COMMANDANT
U.S. COAST GUARD
HEADQUARTERS
WASHINGTON 25, D.C.

MVI-3
(HESS MARINER c-7)
15 JUL 1963

Commandant's Action

on

Marine Board of Investigation; engine room casualty and subsequent foundering on 2 October 1961 of the SS HESS MARINER, O.N. 247229, in position Lat. 30°42' North, Long. 79°30' West

1. The record of the Marine Board of Investigation convened to investigate subject casualty, including its Findings of Fact, Conclusions and Recommendations, has been reviewed.

2. At about 1948 hours, 1 October 1961, the SS HESS MARINER, a T-2 tank vessel, while approximately 110 miles east of the Georgia coast, suffered a disintegration of the main turbine generator. The fragments ruptured the main condenser and turbine, resulting in the flooding of the after spaces and eventual foundering of the vessel. One crewman, the oiler on watch in the engine room, was injured by the flying fragments of the generator. The remaining crewmembers together with the injured oiler were safely removed from the vessel.

3. The HESS MARINER was enroute Perth Amboy, New Jersey, out of Houston, Texas, with a cargo of Number 6 fuel oil. All cargo tanks were full except Number 4 port and starboard and Number 6 tanks across which were empty, and Numbers 2 and 9 centers which were slack. The vessel's draft was estimated at 28.95 feet forward and 30.95 feet aft at the time of the casualty.

4. Just prior to the casualty, while underway at 88 RPM's, the Second Assistant Engineer, then on watch and standing near the main switchboard, heard the main turbo-generator accelerate. He went to the maneuvering station, and moved the governor control lever to the idle position. However, the turbine continued to accelerate. He then pulled the emergency turbine trip several times with no apparent results. Upon proceeding aft toward the throttle valve, the main generator began to disintegrate, throwing metal fragments through an opening between the casing and the end bell. He then departed this area via the lower engine room into the

fire room and up to the bulkhead steam stop valves where he secured the steam to the main turbine. The lights went out just as he reached the fire room. Due to the electrical failure, the fires in the boilers went out. The oiler on watch also tried the emergency trip subsequent to the attempt by the Second Assistant with no apparent effect. While leaving the space and passing the main generator turning motor, the oiler was struck in the leg by a piece of flying debris sustaining a cut on his right foot. However, he was able to proceed through the lower engine room into the shaft alley, where he awaited assistance.

5. Following the casualty, all engineers and various other members of the engine department proceeded into the machinery space. The emergency generator was started and a survey of the machinery space revealed the following:

a. The forward and after end of the main generator casing had been pushed out and down.

b. Sections of the main generator casing on the port side were missing and the casing was bulged and torn.

c. The coils, windings, and other internal parts of the main generator were scattered throughout the engine room.

d. The main turbine casing was split across the top between inspection plates. The turbine relief valve located on the top of the casing was missing. The port and starboard inspection plates on the turbine were loose.

e. There was a hole (est. 12 to 24 inches) in the inboard side of the port bunker tank, about three feet above the generator flat and approximately in line with the center of the main generator.

f. The ship service generators were apparently undamaged.

g. Water was flooding the engine room through the ruptured main turbine casing, the inspection plates, the turbine glands, and through the fractured condenser.

6. Under the direction of the Chief Engineer, the suction and overboard discharge valves and all other sea valves to the machinery space were reportedly closed. However, flooding through the ruptured condenser still continued. The after bilge pump in the shaft alley was started, and suction was taken from the engine room. Shortly thereafter the shaft alley fire pump was started and the bilge pump was secured. Preparations were made to relight the boilers; however, as soon as the electric forced draft fan was started all the power and lights failed, the emergency

generator stopped and the emergency generator room filled with smoke. Subsequent to the emergency generator tripping out, no further attempts were made to start any machinery or to stop the flooding through the ruptured condenser. The watertight doors between engine room and fire room, engine room and shaft alley and the watertight hatch from the shaft alley to the fire room were closed and these spaces were abandoned. From the upper levels of the engine room and fire room, periodic inspections of the machinery spaces were made at about half-hourly intervals. At about 2300 the engine room was found to have flooded to within thirteen feet of the main deck, and the flooding rate was estimated at about twenty to twenty-four inches per hour. At about 0200, 2 October, the water in the engine room had reached the main deck level and water was noted above the floor plate in the fire room. At about 0230 the vessel was abandoned, and at 0926, 2 October 1961 the vessel was observed to break in half and sink. The safe recovery of all hands was accomplished by the SS TEXACO NEVADA and the ESSO SUEZ.

REMARKS

1. Concurring with the Board, it is considered that the loss of the vessel resulted from the disintegration of the main turbine generator, flying fragments from which ruptured the main condenser and turbine casing, allowing flooding of the engine room and progressive flooding of adjacent spaces.

2. That the initial cause of the casualty was the failure of excitation to the main generator is concurred in. However, it is considered that the actual cause of the casualty was the failure of the speed control system and the overspeed safety devices to operate properly, thus permitting the main turbine, with its attached generator, to overspeed to destruction when the electrical load was dropped through failure of excitation. The reason for the failure of the excitation, and of the speed control and overspeed devices, was not determined.

3. The Board concluded that a possible explanation for the failure of the turbine speed control devices was leaking stop valves or non-return valves in the steam reducing stations and extraction systems, thus allowing live steam to enter the turbine directly through these systems. It is recognized that, even had the speed control devices operated properly, they could have been by-passed through a malfunction of a check valve in the steam extraction system. Such a malfunction would permit live steam to enter the turbine directly, and so cause overspeeding. The record, however, does not support this conjecture; therefore, this conclusion is not concurred in.

4. The Board's conclusion that the failure of the closed sea valves to control the engine room flooding may have been caused by pieces of damaged condenser tubes jamming the sea valves is not concurred in. The probability of any parts of the condenser tubes passing through the tube sheets of the condenser and then entering the sea valves is remote. The ingress of water from the sea through the sea valves, into and through the ruptured condenser would tend to keep the sea valves free of any of the tube parts. The reason for the failure of the closed sea valves to control the flooding was not determined.

5. The record contains considerable evidence concerning the closure of sea valves in general; however, testimony relating specifically to the status of the low and the high main injection valves is vague and uncertain. In fact, under direct examination (page 120, transcript of testimony) the Junior Third Assistant Engineer stated: "I started closing the lower sea suction, I mean the upper sea suction on the high suction. I had to stand up on the lower sea suction in order to reach the high one." In response to further questioning (page 124, transcript of testimony) he stated: "I knew it was shut off from the sea. I knew the higher valve was completely closed, the lower suction was always closed, and I saw the First Assistant close the upper suction, I mean the discharge."

6. From the above, it appears that any check of the low injection valve may have been of a visual nature rather than manual. Thus, it appears possible that this valve may not have been fully closed. In fact, considering the apparent volume of water emanating from the broken turbine casing and condenser, the probability of such a condition existing is well founded.

7. Based on this casualty and subsequent examination of similar vessels, the Board recommended that specific areas be inspected on all T-2 and T-3 tank vessels relative to watertight integrity. In this regard Navigation and Vessel Inspection Circular No. 2-62 was promulgated. This circular is considered adequate to accomplish this recommendation.

8. Subject to the foregoing remarks, the record of the Marine Board of Investigation is approved.

[redacted]

D. McG. MORRISON
Vice Admiral, U. S. Coast Guard
Acting Commandant

UNITED STATES COAST GUARD

ADDRESS REPLY TO:
COMMANDER
7th Coast Guard District
150 S.E. Third Avenue
Miami 32, Florida

A25
MAR 16 1962

From: Marine Board of Investigation
To: Commandant (MVI)

Subj: SS HESS MARINER, O.N. 247229; sinking of on 2 Oct 1961 in the Atlantic Ocean

Findings of Fact

1. The SS HESS MARINER, O.N. 247229, AT2-SE-A1 tankship, while on a voyage from Houston, Texas, to Perth Amboy, New Jersey, suffered a casualty to its main propulsion generator and turbine at about 1948 hours, 1 October 1961, in position 30.42 North and 79.30 West by dead reckoning. The casualty caused rupture of the turbine casing, the main condenser, the port wing tank, the hull and eventual critical flooding of the vessel. The vessel sank at 0930, 2 October 1961 in over 100 fathoms of water. No lives were lost in the casualty, but one man was seriously injured and several crew members suffered minor bruises and strains.

2. The SS HESS MARINER was a T-2 tankship owned and operated by the Hess Tankship Company, Perth Amboy, New Jersey. The vessel was built at Sausalito, California, in 1945. The vessel completed her biennial inspection at Baltimore, Maryland, 25 July 1961, and completed her last dry-dock inspection at Baltimore, Maryland, 24 July 1961. The vessel is a single screw, turbo electric drive vessel. She was equipped with two water tube boilers operating at 450 psi, and 750 degrees F., superheat, and one Elliott Company propulsion turbo-generator motor unit. Other particulars of the vessel follow:

Gross tons - - - - - -	10,564	Net tons - - - - - -	6,380
Dimensions - - - - - -	503.9 ft X 68.1 ft X 39.1 feet		
Shaft horsepower - - -	6,000 h.p. at 90.5 r.p.m.		
Turbo-generator unit -	5,400 k.w. at 3,715 r.p.m., 3-phase AC synchronous generator and motor		

3. The vessel departed Houston, Texas, 28 September 1961, bound for Perth Amboy, New Jersey, with 104,000 barrels of cargo. Specific gravity of cargo, No. 6 oil, was 10.1. All cargo tanks were full with the following exceptions: No. 4 port and starboard; No. 6 port, center, and starboard were empty; No. 2 center and No. 9 center were slack. At departure, 2,470 barrels of bunker were in the port and starboard after bunker tanks, and approximately 160 tons of fresh water was aboard. The draft forward was 30 feet, aft 32 feet, mean 31 feet in fresh water.

4. The following-named officers and crew members of the SS HESS MARINER on her last voyage, showing names, position, and address, were taken from the Hess Company crew list. All were questioned concerning the casualty:

[redacted]	Master	[redacted]
	Ch. Mate	
	2nd Mate	
	3rd Mate	
	Rad. Off	
	Bosn	
	Dk Mt/AB	
	AB	
	AB	
	AB	
	AB	
	AB	
	AB	
	OS	
	OS	
	OS	
	Ch. Engr	
	1st Engr	
	2nd Engr	
	3rd Engr	
	3rd Engr	
	Ch Pumpman	
	2nd Pumpman	
	Oiler	
	Oiler	
	Oiler	
	FWT	
	FWT	
	Wiper	
	Wiper	
	Ch Steward	
	Ch Cook	
	2nd Cook	
	Saloon Mess	
	Pantryman	
	BR Util	
	Company DC	
	Instructor	

5. The following officers and crew were designated parties in interest:

a. [redacted] - - - - - - - - - - Master
b. - - - - - - - - - - Ch Engineer
c. - - - - - - - - - - 1st Engineer

d. [redacted] - - - - - - - - - - - - - - - - 2nd Engineer
e. [redacted] - - - - - - - - - - - - - - - - 3rd Engineer
f. [redacted] - - - - - - - - - - - - - - - - 3rd Engineer

6. The vessel had nine main cargo tanks; No. 1 was sub-divided into two tanks, port and starboard, and the remaining tanks were sub-divided into three individual tanks by two longitudinal bulkheads. Forward of the cargo tanks was a pumproom, cofferdam, dry cargo hold, deep tank, and fore peak area. These spaces were not considered significant except for providing buoyancy.

7. The vessel's after bunker tanks are wing tanks located outboard, port and starboard of the engine room. The level of these tanks are equalized through a six inch line and manifold. The capacity of each tank was 2,494 barrels.

8. The following large watertight spaces were located aft of the cargo tanks:

a. Port and starboard pumproom located on main deck with access by dogged doors.
b. Cofferdams outboard of the pumproom with access through small watertight hatches fitted on main deck, approximately two feet high.
c. Engine room with access from main deck passage by two non-watertight doors, port and starboard, from the boiler flat by a hinged quick acting watertight door and from the shaft alley by a hinged quick closing watertight door.
d. Fireroom, access from main deck passage through two non-watertight doors, port and starboard, and through steering-engine flat by one dogged watertight door.

9. The forward engine-room bulkhead, separating the engine room and pump room is penetrated by three cargo pump shafts. The after engine-room bulkhead separating the engine room and shaft alley is penetrated by the main propulsion shaft. Glands, fitted with packing, protected the watertight integrity of these bulkheads.

10. The SS HESS MARINER was driven by a turbo-electric propulsion unit consisting of the following units:

a. A ten stage steam impulse turbine operating at 450 psi steam at 750 degrees F., and exhausting into a 28.5 inch vacuum formed by a condenser located directly below the turbine.
b. A main propulsion generator was rated at 5400 kw, at 3715 rpm, 3-phase AC. Field current as was provided from a DC generator on the shaft of either of the vessel's two ship's service generator units.

The generator is driven by the main turbine through a solid coupling and has one bearing on the forward end. The other end of the shaft is supported from the forward turbine bearing. The rotor of the generator is constructed as follows: The field core is a solid forged shaft in which slots have been milled to receive field winding. This winding is of concentrically wound coils, insulated and blocked to prevent movement during operation. They are held in the slots by heavy metal wedges, and on the ends by forged steel rings shrunk into position. Radial slots are provided to aid cooling air flow. Air gap between rotor and armature is 1.125 inches. The armature assembly is surrounded by steel plates and baffles which serve both to guide airflow and to protect the winding from water drippage. The generator is cooled by a surface air cooler installed aboard the stator windings, and by two motor-driven fans located in the upper generator casing.

The main motor is a three-phase, AC synchronous motor, 6600 h.p. at 93 rpm. The field is separately excited from one of the two auxiliary generator units, power factor 1.00 full.

11. Examination of similar T-2 vessels, and the Elliott Company Instruction Book, GM 5665, on the turbine, by the Board as a body and by individual members, disclosed the following: The vessel's turbine was equipped with a high pressure, intermediate pressure, and low pressure extraction system.

a. The high pressure extraction system bleeds relatively high pressure steam (91 psi at 3720 rpm) from a point in the turbine casing just behind the first row of moving blades. This extraction line is equipped with a stop valve and a swing type non-return valve is fitted between the turbine casing and the stop valve. This extraction line connects to the 70 pound line which is used in various heat exchangers and sealing devices. This system is connected to the boilers through steam reducing valves.

b. The intermediate extraction system bleeds off steam at the third stage of the turbine at 35 psi at 3720 rpm. This system is also provided with a non-return valve and a stop valve. The intermediate extraction system connects with the back pressure system which operates normally at about 12 psi. Supply steam to this back-pressure line comes from the intermediate extraction line from the turbine, exhaust steam from the feed pumps, deck machinery and steam stripping pump, and through reducing valves from the boilers.

c. The low pressure extraction system bleeds off the turbine casing at about the eighth stage. This system operates at 3 psi at 3720 rpm.

d. In routine operation of this vessel stops between the 70 pound line, the 12 pound line, and extraction lines are kept closed so that failure of the check valves to function will not result in "feedback" to the turbine from the extraction line. The vessel's engineers advised that these stops were closed on this voyage.

12. The following crew members were on watch in the machinery spaces at the time of the casualty: [redacted], Second Asst. Engineer, in charge of the watch; [redacted], oiler; and [redacted], fireman-watertender.

13. Immediately prior to the machinery casualty, the main motor was turning 88 rpm, the main turbine generator 3520 rpm. No. 2 ship's service generator was providing ship's electrical power as well as excitation (DC) current to the main propulsion generator and main propulsion motor. All machinery appeared to be operating normally, both high pressure and low pressure extraction valves open. The equalizing line between the aft bunker tanks was open.

14. At about 1940 hours, Mr. [redacted], Second Asst. Engineer, was in front of the switchboard when he heard the main turbo-generator speeding up. He immediately went to the maneuvering station, a few steps away, pushed the governor control lever to idle position with no apparent result. He then pulled the emergency turbine trip several times, again with no results. He then started aft toward the turbine's throttle, but as he was abreast of the main generator, the generator started throwing pieces of metal through an opening between its casing and the end bell. [redacted], realizing it was dangerous to proceed aft past the turbine, ran back across in front of the main switchboard, down the ladder to the lower machinery space, through the lower engine room, the shaft alley, up a ladder in the shaft alley, through the watertight hatch, and the upper fire-room grating where he proceeded to secure the port and starboard boiler stops with the help of the Chief Engineer who had then arrived on the scene. As Mr. [redacted] recalls, the lights went out as he was at the foot of the ladder in the fire room leading to the upper fire room where the main stem stop valves were located.

15. As [redacted] left the emergency trip, [redacted] could see pieces of metal being thrown out of the generator. [redacted] tried the emergency trip himself, with no apparent result. He then started to follow [redacted], who had left the area. As he was passing the main generator turning motor, he was knocked down. Lying on the deck, he saw the forward end of the generator casing blow out, showering the area with pieces of the generator. [redacted] had been severly injured in the right foot by one or more of these pieces.

16. [redacted] slid and crawled across the engine room in front of the switchboard, down the ladder to the lower engine room, and back to the shaft alley, closing the watertight door between the lower engine room and the shaft alley as he went. He heard several loud reports and the lights went out. Unable to continue, he remained in the shaft alley awaiting help. Help arrived and Gregory was removed in a basket-type litter to his own quarters and put in his bunk. [redacted]'s rescue from the shaft alley was delayed when the first basket litter gave way under his 240 pound weight, and a replacement litter was required. Mr. [redacted], the Second Mate, administered first aid, including morphine to reduce the pain. At about 2030, [redacted] departed the HESS MARINER in No. 3 lifeboat and was taken to the SS TEXACO NEVADA.

17. In response to the distress flares and SOS of the HESS MARINER, THE TEXACO NEVADA, in the vicinity, stood nearby to render assistance. About 2030, Captain [redacted] ordered No. 3 boat away with the Second Mate in Charge; [redacted] and four other crew members were aboard. No. 4 lifeboat was launched about 2100 with eleven crew members aboard. At about 2300, the Captain, in order to reduce the risk to his crew, ordered No. 2 lifeboat launched with all remaining crew members except for himself, the Chief Engineer, First Assistant Engineer, Third Mate, and two seamen. The transfer of the crew on lifeboats Nos. 2, 3, and 4 from the HESS MARINER to the TEXACO NEVADA was uneventful. The remaining crew members were transferred to the ESSO SUEZ about 0230, 2 October 1961 in lifeboat No. 1.

18. The sea and weather conditions during the operation were described as: Sky clear, scattered clouds, wind force 2. The sea had a twelve to fifteen foot swell.

19. After the casualty, all crew members were accounted for. Through competent seamanship on the part of Captain Durbin and his crew, all four lifeboats were lowered and all crew members transferred to rescue vessels. All lifesaving equipment operated properly during this transfer.

20. After the lights failed, the engineers converged on the machinery spaces by way of the steering gear flat, and/or fireroom, as they were unable to go directly into the engine room which was full of smoke and steam. The emergency diesel generator was started. Under emergency lights a quick survey of the engine room revealed the following:

a. The after end plate of the main generator casing had been pushed out and down.

b. The forward end plate of the main generator casing had been pushed inward and down.

c. Sections of the main generator casing, port side was missing, the casing bulged and torn.

d. Parts of coils, windings and other internal parts had spewed out of the openings in the main generator casing.

e. The low-pressure portion of the main generator turbine was split across the top from one inspection plate to the other, approximately three inches at the widest part of split. The turbine relief valve, located on the top of the turbine casing was missing. Both inspection plates, port and starboard, were sprung or loose.

f. A hole was found in the bulkhead, separating the engine room and the port bunker tank, about three feet above the generator flat deck and approximately in line with the center of the main generator. Estimates of the size of this hole vary from twelve inches to twenty four inches in diameter. This hole was in line with the forward butterworth steam valve, the hand wheel of which was broken in half. At this time, no oil or water was coming in through the hole.

g. No apparent damage noted to either No. 1 or 2 ship's service generator.

h. Water was flooding the engine room through the ruptured main generator turbine casing, loosened inspection plates through the turbine glands, and through the fractured condenser.

i. The electric motors driving the main circulating pump, forward bilge pump, forward fire, and butterworth pump, were drowned out.

21. Under the direction of the Chief Engineer, the main condenser sea valves were closed. When flooding continued, all remaining sea valves in the engine room were secured, checked and rechecked. Lube oil was noted leaking from ruptured lines, and the gravity lube oil tank secured. At this time there was no black oil evident in the engine room.

22. The main switchboard was cleared of all unnecessary electrical load. The First Assistant, assisted by the Junior Third, Mr. [redacted], lined up bilge suction to the engine room using first the after bilge pump, located in the shaft alley and later transferring suction to the large fire pump, located in the same space. They then secured the watertight door leading to the lower engine room and went to the fire room.

23. As directed by the Chief Engineer, [redacted], the fireman-watertender, was taking steps to light off a boiler. As soon as he started the electric forced draft fan all power and light failed.

24. The First Assistant, and Junior Third Assistant secured the watertight door between the engine room and fire room, and proceeded to leave the machinery spaces securing watertight doors behind them. In passing the emergency diesel generator room, after the emergency power failed, [redacted], the Third Asst. Engineer, noted that the room was full of smoke, the engine dead.

25. Periodic inspection of the machinery spaces continued. When the engine room was flooded to about the level of the generator flat, oil and water could be seen coming through the hole in the port bunker tank putting a heavy coating of black oil on the surface of the water.

26. At about 2300 hours, by using a sounding tape, the engine room was found to have flooded to within thirteen feet of the main deck. The corresponding freeboard was found to be ten feet. At this time, the flooding rate was estimated at between twenty to twenty four inches per hour.

27. About 2300, the Captain, Chief Engineer, First Assistant Engineer, and Third Mate went down into the fire room to release steam on both boilers. At that time, the fire room bilge was reportedly dry; the watertight door leading to the engine room was tight. The hatch leading down to the shaft alley was discovered open. The shaft alley's condition was noted by the Captain as "clean and dry". The shaft alley hatch was then thoroughly secured.

28. Weathertight doors to the after pump room were dogged down as were the weathertight doors on the main deck leading to the crew's quarters. The condition of the pump room was not determined.

29. At the next inspection of the fire room, water and oil were seen in the fire-room bilge. The source of this leakage was undetermined. The amount of water indicated something greater than a leaking watertight door.

30. At about 0200 hours, 2 October 1961, the flooding level in the fire room was above the floor plates. Flooding in the engine room had reached the non-watertight doors on the main deck, port and starboard, leading to the port and starboard passageways.

31. About 0230 hours, 2 October 1961, Captain [redacted] and his remaining survivors, abandoned the SS HESS MARINER in No. 1 lifeboat. They were picked up shortly by the SS ESSO SUEZ.

32. The ESSO SUEZ continued to stand by, keeping a watch on the abandoned and settling HESS MARINER. At 0926, 2 October 1961, the SS HESS MARINER had broken in half and sunk. Her position was 31.10 North, 79.09 West, a Loran position taken by the ESSO SUEZ. The CGC SWEETGUM arrived just as the HESS MARINER sank.

33. On departure from Houston, Texas, the vessel's draft was 30.00 feet forward and 32.00 feet aft.

34. The Board estimates the vessel's draft was 28.95 feet forward and 30.95 feet aft at the time of the casualty.

35. At the time of the casualty, there was approximately 1200 barrels of fuel aboard. The fuel was located in the after bunker tanks, approximately 600 barrels in both the port and starboard tanks.

36. From ullage tables and measurements taken on a similar vessel the following information was obtained by the Board:

a. Ullage of port and starboard bunker tanks at 600 barrels level is 27 feet 1 inch.

b. The added weight by flooding the engine room to the main deck, using a permeability factor of 0.9, is 1620 long tons.

c. Total added weight by flooding the engine room and port and starboard bunker tanks is 2286 long tons.

37. Measurements made by the Board on a similar vessel, indicate the distance from the main deck to the generator platform deck is 15 feet.

38. The Board's calculations, based on measurements taken aboard a similar vessel, the SS ZEPHYHILLS, indicates the following:

a. The added weight of flooding the port and starboard after bunker tanks above the 600 barrels ullage with salt water is 666 long tons.

b. The added weight of flooding the engine room to the main deck, using a permeability factor of 0.9, is 1620 long tons.

c. Total added weight by flooding the engine room and port and starboard bunker tanks is 2286 long tons.

39. The Board's calculation, using the lines plane of a similar vessel, estimated draft at time of casualty, and the added weight of flooding the engine room, and after bunker tanks, indicates the following:

a. Mean draft after flooding engine room and after bunker tanks, 32.78 feet.
b. Draft aft after flooding engine room and after bunker t anks, 40.88 feet.
c. Freeboard at port and starboard engine room doors on main deck, 1.43 feet.

40. Examination of several similar T-2 vessels, by this board as a whole and by individual members, disclosed the following violations in the watertight boundaries in the machinery spaces:

a. A four-inch overflow line exists from the contaminated drain tank, located starboard side of fire room at frame 28, and leads through the watertight deck to the lower engine room bilge, near the atmospheric drain tank; no closures exist in this line. The atmospheric

drain tank has a non-watertight top, therefore, flooding of the fire room would result through this line if the engine room was flooded to a point above the top of the atmospheric drain tank. This situation has been noted by the OCMI, Jacksonville, aboard the SS HESS VOYAGER and SS ZEPHYRHILLS.

b. Ventilation ducts to the shaft alley, originally watertight to above the bulkhead deck, have been violated in the machine shop and storeroom areas to provide better ventilation to these areas. These violations eliminate the deck between the fire room, machine shop, stores area, and the shaft alley as a watertight boundary. This situation was noted on all vessels of this class examined recently.

c. A drain line was noted from the fire room to shaft alley with no closing devices in one instance.

d. Drains from the port and starboard boiler casing to the shaft alley were found with no closure devices in one instance.

e. In several instances, small holes were discovered in the engine-room fire-room bulkhead.

41. A report on the condition of the overspeed tripping device, manual trip and throttle valve condition on the vessel's main generator turbine and Nos. 1 and 2 auxiliary generator turbine dated 8-29-61 at Charleston, S. C., was sent to Hess Oil Company, Marine Department, as required by a Hess Company direction (see EXHIBITS 3 and 4). This report indicated that the main generator turbine overspeed trip, manual trip and throttle condition was examined and/or tested and found in good condition. It also indicates that the main generator turbine throttle valve was renewed on 26 July 1961.

42. The vessel completed her last drydock inspection and biennial on 24 and 25 July 1961 at Baltimore, Maryland.

43. American Bureau of Shipping records indicate the vessel completed No. 3 Special Survey 6/59.

Conclusions

1. It is the opinion of this Board that this vessel was lost as a result of a machinery casualty in which the main propulsion turbine generator overspeeded to destruction. Fragments from the disintegrated generator holed the vessel's port bunker tank and her hull, split open the turbine casing and ruptured the main condenser and tubes therein. The engine room flooded through the ruptured turbine, condenser, and later through the hole in the bunker tank and hull. Progressive flooding to adjacent machinery spaces through presumed watertight bulkheads and decks ultimately became critical and resulted in the vessel's loss.

2. The initial cause of this casualty was probably failure of excitation to the main generator, causing a complete loss of load on the turbine. The excitation circuit is an involved electrical circuit in which a burned contact, shorted wire, etc., could result in failure of excitation.

3. The speed control system, operated by the governor, or by the safety trip, either of which is a completely independent system, would normally control the generator under no load conditions before destructive speeds were reached.

4. A possible explanation for the apparent failure of the turbines speed control devices is as follows: Leaking stop valves, or non-return valves in the steam reducing stations, and extraction systems, could allow live steam from the boilers to enter the turbine directly. This steam could cause the unloaded turbine to overspeed. In such a situation the overspeed trip, and the speed control governor would be completely ineffective, having been effectively bypassed.

5. Failure of the closed sea valves to control engine-room flooding may have been caused by pieces of damaged condenser tubes jamming the sea valves.

6. The main rotor failed under the abnormal centrifugal force to which it was subjected. It is apparent that a piece of disintegrated rotor had the necessary weight and velocity to penetrate the turbine housing, bunker tank bulkhead, and the hull. From data available, it is probable that the forward, or after retaining rings were the pieces causing the critical damage.

7. After examination of similar vessels since the casualty, the Board is of the opinion that the watertight integrity of the bulkheads adjacent to the engine room were seriously compromised. A four inch contaminated drain line from fire room to lower engine room was discovered to be installed on all examined vessels. This line has no closure devices installed therein. Ventilation in the machine shop in other vessels also compromised watertight integrity of engine room bulkheads. Other penetrations of bulkheads were noted.

8. The Board is therefore of the opinion that flooding progressed until effective buoyancy in the machinery spaces was lost, at which time the after passages and quarters were flooded and the vessel lost.

9. It is the opinion of the Board that had flooding been limited to the engine room the vessel would have been saved.

Recommendations

1. It is the recommendation of this Board, in view of this casualty and subsequent examinations of similar vessels, that the following areas be thoroughly inspected on all T-2 and T-3 vessels, and corrections made at the earliest practicable date:

a. Restore ventilation systems from shaft alley to bulkhead deck to its original watertight condition.

b. Alter overflow drain line from contaminated drain tank in fire room to lower engine room as to restore the watertight integrity of the fire room and engine room watertight boundary.

c. Insure that all drains through the fire-room deck, such as boiler casing drains which drain into the shaft alley area, are capped off or suitable non-return valves installed.

d. Light test all bulkheads adjacent to engine room.

2. This Board recommends that this case be closed with no further action other than as recommended above.

[redacted]
C. W. QUINBY
Captain, U. S. Coast Guard, Chairman

[redacted]
R. B. SCOTT
Captain, U. S. Coast Guard, Member

[redacted]
R. F. HORNBECK
Lieutenant Commander, U. S. Coast Guard,
Member and Recorder