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UNITED STATES COAST GUARD

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



•MVI
25 September 1952
(FORT MERCER - a-1 Bd)

From: Chief, Merchant Vessel Inspection Division
To: Commandant
Via: Chief, Office of Merchant Marine Safety

Subj: Marine Board of Investigation; structural failure of tanker
FORT MERCER off Cape Cod on 18 February 1952, with loss of
life

1. Pursuant to the provisions of Title 46 C.F.R. Part 136, the record of the Marine Board convened to investigate subject casualty, together with its Findings of Fact, Conclusions, Opinions and Recommendations, has been reviewed and is forwarded herewith.

2. The steam tanker FORT MERCER of 10,266 g.t., built by the Sun Shipbuilding and Dry Dock Company in 1945 and owned by the Trinidad Corporation, departed from Norco, La., with a full cargo on board on 12 February 1952, bound for Portland, Maine. On 18 February 1952, approximately 27 miles east of Pollock Rip Light Vessel during a severe storm with winds up to gale force and heavy seas the FORT MERCER incurred a major structural failure causing the vessel to break in two. The stern section made port safely. As a result of this casualty the following 5 crew members perished:

John V. O'Reilly, Radio Operator
Jack T. Brewer
Hurley W. Newman
Louis Culver
Jerome C. Higgins

3. The Board made the following Findings of Fact:

"1. That at or about 1205, 18 February 1952, at a point approximately 27 miles east of Pollock Rip Light Vessel, the tank steamer FORT MERCER incurred a major structural failure resulting in a complete failure of the hull girder and causing the vessel to break in two parts in the way of number five cargo tank and resulting in the loss of five lives.

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- "2. That the tank steamer FORT MERCER, official number 24884, gross tons 10266, owner Trinidad Corporation, New York, N.Y., Frederick C. C. Paetzel, master, was built at Chester, Pennsylvania in the year 1945 and was last regularly inspected by the Coast Guard at Galveston, Texas on 14 July 1951.
- "3. That the FORT MERCER was a tank vessel of the T2 SE A1 type, commonly referred to as a "T2 tanker" built on the longitudinal framing system with 9 cargo tanks, tanks Nos. 2 to 9 inclusive being divided by two longitudinal bulkheads so that there were 2 wing tanks, port and starboard, and a center tank; tank No. 1 was divided by a center line bulkhead into 2 tanks.
- "4. That the dimensions of the FORT MERCER were: length 503', beam 68', depth 39'3", draft 30'2", freeboard 9'2-3/4", tonnage 10266 gross, cargo capacity in barrels 141,158.
- "5. That the propelling machinery comprised a single propeller driven by a turbo electric motor of 6000 horse power and the machinery was located aft.
- "6. That the FORT MERCER was of all welded construction and that modification of the structure in the nature of 4 crack arrestors as described in exhibit 29 were installed at Galveston, Texas in January and February 1948. These crack arrestors were located 23'9" from the center line, port and starboard, in the bottom of the vessel, and 26'2" from the center line, port and starboard, in the deck and consisted of a slot cut in the deck from the vicinity of frame 67 to frame 31, a plate then being riveted over the slot.
- "7. That the bilge keels were modified by cutting out sections in way of shell plate butts and drilling holes adjacent to hull in way of butts in bilge keels.
- "8. That the FORT MERCER was manned and equipped in accordance with her certificate of inspection and at the time of the casualty there were 43 persons on board, including the master, as listed on Exhibit No. 32.

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"9. That the FORT MERCER loaded a cargo of No. 2 fuel oil and kerosene at Norco, Louisiana on 12 February 1952, the cargo being distributed among the several tanks as set forth below:-

	Ullages taken from		
	Port	Center	Starboard
Tank No. 1	empty	-	empty
" No. 2	4' 6"	4' 9-3/4"	4' 4 1/2" kerosene
" No. 3	4' 6"	5' 0"	4' 6 1/2" "
" No. 4	4' 10"	13' 4"	4' 11" "
" No. 5	4' 8"	5' 1-3/4"	4' 5-3/4" No. 2 fuel oil
" No. 6	3' 2"	4' 4-3/4"	5' 1-3/4" "
" No. 7	4' 10"	4' 2-3/4"	4' 4-3/4" "
" No. 8	4' 5 1/4"	4' 8 1/2"	4' 5" "
" No. 9	empty	35' 2"	40' 11-3/4" "

Draft 30' 0" forward in fresh water
" 30' 0" aft in fresh water.

"10. That the vessel departed Norco, Louisiana on 12 February 1952 for Portland, Maine and that at time of departure in addition to the above listed cargo, the vessel's bunker fuel tanks and water tanks were full, except for the forward deep tank.

"11. That on the 17th and 18th of February 1952 the FORT MERCER encountered a severe storm with winds up to gale force and heavy seas.

"12. That at 0800 on the 18th of February 1952, the vessel was on a course of approximately 25° and the propeller was turning at 64 revolutions per minute and maintaining its position. The vessel did not appear to be pitching and rolling excessively.

"13. That at about 0810, 18 February 1952, a sharp crack was heard and oil was observed seeping up from below the surface of the water on the starboard side in the vicinity of No. 5 cargo tank.

"14. That at the time the oil was observed as noted above, the speed of the propeller was reduced to about 45 revolutions per minute and the master sent a message to the Coast Guard requesting assistance and the crew alerted.

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"15. That at about 0905 the USCG Cutters EASTWIND and UNIMAK which were approximately 120 miles south of Nantucket Light Vessel were directed to proceed to assist the FORT MERCER and other Coast Guard units were alerted for possible rescue efforts.

"16. At about 1030, 18 February 1952, a second sharp report was heard without evidence of an increase in leakage. The Chief mate reported that number 5 starboard tank was losing oil as the ullage had dropped several feet.

"17. That at about 1050 the FORT MERCER sent an urgent message requesting vessels in the vicinity to stand by and at 1104 the FORT MERCER was advised that the cutters EAST WIND, UNIMAK and McCULLOCH were enroute to assist him. At 1113 the USCG Cutter ACUSHNET was directed to proceed and assist.

"18. That at about 1140 the 18th of February, a third loud report was heard and it was observed that a crack extended up the starboard side in way of number 5 tank to several feet above the water line from which oil could be seen leaking out in spurts.

"19. That at about 1158 an S.O.S. was sent out by the FORT MERCER stating that the hull was splitting.

"20. That at about 1205, 18 February 1952, the hull structure in way of number 5 tank broke in two parts, the bow section swinging sharply to starboard and the after end of the bow section submerging to the boat deck.

"21. That in the stern section when the fracture occurred, the engines were stopped and all electrical connections to the forward end secured. It became necessary to back the engine for a short period to avoid collision with the bow section which was apparently drifting toward the after section.

"22. That the vessel bore 83° true, 27 miles from Pollock Rip Light Vessel at the time of the casualty.

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"23. That there were nine members of the crew on the bow section at the time of the complete fracture of the hull, to wit:-

Captain Frederick C. C. Paetzel	- Master
Mr. Jack T. Brewer	- Chief Mate
Mr. Willard F. Fahrner	- 2nd Mate
Mr. Vincent A. Guldin	- 3rd Mate
Mr. John V. O'Reilly	- Radio Operator
Mr. Edward E. Turner, Jr.	- Purser
Mr. Hurley W. Newman	- Able Seaman
Mr. Louis Culver	- Able Seaman
Mr. Jerome C. Higgins	- Ordinary Seaman

"24. That the remaining 34 members of the crew were on the stern section.

"25. That at the time of the casualty the radio apparatus was made inoperative by the inrush of water to the forward house and shortly thereafter the two forward lifeboats were carried away.

"26. That the men on the forward section remained in and about the chart room until about 2330 on the 18th of February, all this time without heat, light or means for making signals, other than by means of the emergency blinker. At about 2330 the men made their way from the bridge to the forecastle head by climbing down a line improvised from signal flags, which was lowered from a port hole in the forward side of the wheel house.

"27. That Mr. John V. O'Reilly, radio operator, while lowering himself down the improvised line failed to land on the catwalk and was washed overboard and lost, the remaining 8 men reaching the forecastle safely.

"28. That at about 1400, 18 February the MSTS vessel SHORT SPLICE arrived on the scene but was unable to render immediate assistance due to the severity of the weather. The MSTS vessel SHORT SPLICE remained in the vicinity with the view of assisting as much as possible until dismissed at 1507, 19 February by the officer in tactical command.

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"29. That the USCGC YAKUTAT, Cdr. Joseph W. Nabb, Jr., commanding officer, arrived in the vicinity of the bow section at about 1829, 18 February 1952, and made repeated unsuccessful attempts to put a line on board aided by flares dropped from the PB-1G 77249 from Floyd Bennett Field. The weather at this time was extremely bad with winds of force 8 to 9, heavy seas and intermittent snow squalls.

"30. That after the unsuccessful attempt to place a line on board at about 0156 on the 19th of February, the YAKUTAT made a further attempt to remove the men by means of a string of well lighted rafts being floated down from windward. Three members of the crew of the FORT MERCER bow section, namely Messrs. Jack T. Brewer, Hurley W. Newman and Louis Culver jumped overboard and tried to reach the rafts without success and were lost. This attempt to remove the men was unsuccessful and was abandoned, the YAKUTAT rounding to in close proximity to the bow section, at which time Jerome C. Higgins jumped overboard and was also lost. The YAKUTAT, at about 0200, the 19th of February then lay off awaiting daylight and moderation in the weather.

"31. That at daybreak, the weather having moderated somewhat, the YAKUTAT made preparations to launch a monomoy surfboat. The four men remaining in the bow section of the FORT MERCER were advised by means of loud speaker that a boat would be sent over and would tell them when to jump and they would be picked up from the water.

"32. That at about 0830 the surfboat from the YAKUTAT was launched under extremely adverse and dangerous conditions and proceeded to the bow section of the FORT MERCER. The master of the FORT MERCER being in very poor physical condition was the first to jump and was picked up out of the water in about one minute. The surfboat made a second pass and picked up the purser. During these operations the boat came in contact with the FORT MERCER and received some damage. The wind began to increase in force and the seas in height, making it necessary for the surfboat, which was shipping water and leaking to return to the YAKUTAT.

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"33. That the lifeboat with the survivors was hoisted on board and preparations made to remove the remaining two men from the FORT MERCER by means of a life raft. This was accomplished by shooting a line across the bow of the FORT MERCER and drifting the raft down to the vessel in the bight of the line. After considerable difficulty due to the raft having been capsized, the two men managed to enter it and were eventually hauled to the YAKUTAT and taken on board with the assistance of crewmen on the cutter. The bow section of the FORT MERCER capsized at about 1051, twenty minutes after the last man left it.

"34. That the YAKUTAT remained in the vicinity of the bow section of the FORT MERCER throughout the day of 19 February 1952 and at about 0030, 20 February 1952 was released by the OTC and having been relieved by the USCGC UNIMAK, proceeded to Portland, Me. with the four survivors, arriving there at about 1820 on 20 February 1952.

"35. That at 1650, 20 February, with the sanction of the owners and authority from the Commander, Eastern Area, the UNIMAK sank the bow section of the FORT MERCER by gun fire, as a menace to navigation.

"36. That after breaking in two the stern section of the FORT MERCER remained afloat in a generally upright and stable condition. Steam was maintained in one boiler and it was possible to use the engine to maneuver. Watches were set and whistle signals blown throughout the night of 18 February 1952. There were 34 members of the crew on board this part of the vessel.

"37. That at 1055, 19 February 1952 the USCGC EASTWIND arrived at the stern section of the FORT MERCER. The EASTWIND sent a walkie-talkie to the FORT MERCER by means of a line and established communications. The chief engineer being the senior officer on the stern of the FORT MERCER advised that a number of the seamen desired to be taken off.

"38. That the EASTWIND removed three men from the stern section of the FORT MERCER by means of a life raft which was drawn back and forth by means of a line. The EASTWIND, due to its type of construction and the heavy seas, was unable to go alongside and remove men.

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"39. That the USCGC ACUSHNET, Lcdr. John M. Joseph, Commanding Officer, arrived on the scene at approximately 1045, 19 February 1952 and was dispatched to the stern section. With permission of the Commanding Officer of the EASTWIND the ACUSHNET proceeded to maneuver alongside the port quarter of the FORT MERCER to remove those seamen who so desired to be taken off. The ACUSHNET which is in effect a large salvage tug was particularly adapted for a maneuver of this kind. With great skill and daring the ACUSHNET in two successive passes removed first 5 and then 13 men. Seven men including the chief engineer, elected to remain in the stern section and six men, due to age, infirmities and other reasons which deterred them from jumping in the ACUSHNET also stayed on board.

"40. That the owners of the FORT MERCER dispatched the sea-going tugs M. MORAN and FOUNDATION JOSEPHINE to take the stern and bow sections in tow. Due to the capsizing of the bow section it could not be towed and the FOUNDATION JOSEPHINE proceeded to assist with the stern section.

"41. At about 1430, 20 February 1952 the tug FOUNDATION JOSEPHINE passed a tow line to the stern of the FORT MERCER. The tug M. MORAN passed a line to the FOUNDATION JOSEPHINE and at about 1540 the tow proceeded toward the lee of Martha's Vineyard rather than toward Boston, Mass. as there were forecasts of Northeasterly winds. The USCGC UNIMAK escorted the tow until 2115, 21 February 1952 when it was relieved by the USCGC SPAR. The SPAR escorted the tow to the harbor of Newport, R. I. where the stern section was moored to a buoy. Oil remaining in the after tanks of the FORT MERCER having been removed, the stern section of the vessel was subsequently towed to New York and placed in a dry dock.

"42. That examination of the fracture in the stern section of the FORT MERCER was made in dry dock on 3 March 1952.

"43. That the fracture occurred in the way of the bulkhead between No. 5 and No. 6 cargo tanks at about frame 59.

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"44. That there were four definite points from which cracks in the hull structure started, viz.:

(a) At a butt weld in the hull plating forming the starboard bilge keel at frame 59. At this point the weld did not fully penetrate. The crack broke the bilge keel in two and ran to a scallop in the bilge keel. The skin of the ship cracked at the end of the scallop and the fracture ran up to the crack arrestor on the starboard side of the deck and down to the crack arrestor in the bottom of the ship inboard of the turn of the starboard bilge.

(b) At the end of longitudinals 21 and 22 in the vicinity of frame 59, the crack ran outboard to the starboard crack arrestor and inboard across the keel to the port crack arrestor below the turn of the port bilge.

(c) At the tripping bracket on longitudinal 16 on the port side, six inches aft of the bulkhead at frame 59.. This crack ran inboard of the crack arrestor and up the port side through the sheer strake and stringer to the crack arrestor on the port side of the main deck.

(d) In the deck plating in the vicinity of the center line girder. This crack ran to the port crack arrestor and to a cutout for an expansion trunk on the starboard side. A crack appeared from this cutout and extended to the starboard crack arrestor, completing the crack about the entire hull.

"45. That with a few minor exceptions of sheering in way of rivet holes, the entire failure was a brittle fracture."

4. The Board made the following Conclusions and expressed the following Opinions.

"1. In arriving at a determination of the cause of this casualty there are three factors which in the opinion of the Board contributed materially to the breaking in two of the FORT MERCER, namely: (1) construction, (2) weather and (3) loading.

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"2. The Board does not propose to go into detail on the construction of the FORT MERCER other than to state that it was a modified design of the standard T-2 tanker, the modification comprising the installation of four large I-beam girders located under the deck and extending from about No. 3 tank to No. 8 tank. This vessel had four crack arrestors installed, 2 on deck and 2 below the turn of the bilge port and starboard. The FORT MERCER was all welded and due to design and type of construction, numerous points of stress concentration occurred, principally at brackets on transverse bulkheads and where welding was defective. It is the opinion of the Board that the initial fracture occurred in a defective weld in the bulb angle of the bilge keel at about frame 59, the crack extending to the scallop in the bilge keel. The second fracture started at the after end of this scallop due to a concentration of stresses as a result of the fracture of the bilge keel, this fracture running up toward the sheer strake and eventually across the deck to the starboard crack arrestor, and downward to the crack arrestor below the turn of the bilge on the starboard side.

"3. As a result of the fractures mentioned above, additional stress was placed upon the remaining members and the third crack started at a notch in longitudinal 21 and 22, this notch being formed by the connection with the bracket which passes through the bulkhead at frame 59. Cracks also started at the tripping bracket on longitudinal 16 and at about the center section of the deck plating in way of the center line girder. With the exception of sheer failures between rivet holes in the crack arrestors, all the fractures were brittle fractures.

"4. The Board is also of the opinion that the weather had a vital part in causing this casualty, particularly the temperature and the sea. There was a gale blowing with high seas and while the testimony varies as to the length of the seas, the Board believes that there were times, especially at the height of the storm when the vessel would have the forward and after sections supported on the crests of waves with little or no support amidship.

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"5. Experience has shown that low temperatures tend to increase the notch sensitivity resulting in brittle fractures such as occurred in this case. The temperature of the air was approximately 43°F. and the temperature of the water was approximately 41°F.

"6. The third factor, loading, had a material effect upon the stress setup in the vessel. The record shows that the tanks of the forward end of the vessel, namely No. 1 cargo tank and the peak tanks were empty, which would increase the buoyancy at the forward end. The after tanks were nearly empty, that is No. 9 tank, center tank, had approximately a 35' ullage and No. 9 wing tanks were empty, also a considerable part of the fuel oil carried in port and starboard tanks in the machinery space had been used, as well as most of the fresh water in the double bottom tanks aft, resulting in increased buoyancy at the after end. Tanks Nos. 2 through 8 inclusive were loaded normally.

"7. The condition of loading with considerable buoyancy in the bow and stern and heavy weight in the middle section caused a sagging effect which at times was badly aggravated by the extremely heavy seas.

"8. In view of the foregoing the Board is of the opinion that the fracture of the hull of the FORT MERCER was caused by failure of the material under stress due to low temperature and tension set up by the condition of loading and the situation of the vessel in an extremely rough sea.

"9. The Board is of the opinion that the crack arrestors as presently installed were effective in stopping a crack but will not prevent other cracks from forming; that had the vessel been in calm waters the initial crack in the bilge keel would have stopped at the scallop.

"10. The Board is of the opinion that the vessel was not loaded contrary to the usual practice in the tanker trade.

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"11. That the Coast Guard Units engaged in the rescue of the crew of the FORT MERCER from the forward and after sections performed their duties in a most exemplary manner and maintained the highest tradition of the service.

"12. The FORT MERCER was properly manned and in full compliance with the Coast Guard Regulations governing the inspection of tank vessels and that under the conditions obtaining at the time of the casualty, the master was handling his vessel according to the best practices of seamanship.

"13. There was no incompetence, misconduct, unskillfulness or willful violation of the law or any rule or regulation on the part of any of the licensed officers or seamen, employees, owner or agent of the vessel or any inspector or officer of the Coast Guard which contributed to the cause of this casualty."

5. The Board made the following Recommendations:

"1. That a study of loading and ballasting T-2 tankers be made with the view of determining the best distribution of cargo to reduce sagging and the increase of bending moments to a dangerous degree.

"2. That consideration be given to the installation of additional crack arrestors and the addition of longitudinal strength members in the bottom of the vessel corresponding to those under the deck with the view of decreasing the bending moments of the hull girder.

"3. The Board recommends the installation of a vertical ladder on the forward side of the bridge structure of tankships, near the centerline, for emergency exit from the bridge to the deck or catwalk forward.

"4. The Board notes that appropriate commendations have been awarded to various Officers and men of the Coast Guard who participated in the successful rescue of members of the FORT MERCER crew. With these awards the Board is heartily in accord.

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"5. The Board considered recommending that signal flares and emergency radio transmitters be installed or located in the after part of tankships of 350 feet in length and over, having superstructures amidship and propelling machinery aft. These items were submitted to the Merchant Marine Council in the form of proposed amendments to be considered at the meeting of that body on 25 March 1952, therefore are not included herein.

"6. Subject to the foregoing it is recommended that no further action be taken and the case closed."

REMARKS

6. In connection with structural failures, the susceptibility of welded ships to extensive fractures has been known and a serious problem since early in World War II when our shipyards turned to welding as the only means of rapidly building enough ships to support the war effort.

7. The T-2 tanker SCHENECTADY broke in two lying at the dock on 16 January 1943. This fracture, together with a number of less extensive fractures which had occurred in Liberty ships prior to that date, brought a full realization that serious problems were to be encountered as a result of the sudden transition from riveting to welding. The fractures which occurred were carefully investigated by the Coast Guard, the Maritime Commission, and the American Bureau of Shipping, and in addition, when the magnitude of the problem became apparent, the Secretary of the Navy, under whom the Coast Guard functioned at that time, appointed a Board in April 1943, to investigate the design and methods of construction of welded steel merchant vessels.

8. This matter has been the subject of intensive study since that time. As the knowledge of the problem increased, corrective means have been applied to the construction of new ships, and steps have been taken on the existing ships to improve their resistance to this type of casualty. The steps taken on existing ships have included the alteration of certain details of the structure, such as the hatch corners on the Liberty ships, and the bilge keels on both the Liberties and the T-2 tankers, as well as the provision of riveted crack arrestors, designed to limit the spread of a fracture after its inception. The fitting of such crack arrestors at both gunwales of the Liberty ships was completed by June 1947, and in accordance with an American Bureau of Shipping order, 4 such crack arrestors were fitted to the T-2 tankers prior to December 1948.

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9. With regard to the T-2 tankers, reference has already been made to the order sent out by the American Bureau of Shipping in 1947, calling for 4 crack arrestors. It was felt at that time that the measure proposed would provide the means of preventing complete failure of the hull and, that while fractures could still be expected to occur under some circumstances, the ships would be able to get into port. The failures of the FORT MERCER and the PENDLETON have demonstrated that additional measures are necessary to obtain this objective, and the Coast Guard feels that the American Bureau of Shipping has again taken prompt action in the light of this additional knowledge.

10. T-2 tankers will be required to be fitted with the equivalent of 4 additional crack arrestors and the bilge keel attachment to the shell will be changed to a riveted connection. In addition, an increase in the longitudinal strength of the ship will be required, together with a manual of satisfactory loading and ballasting, both of which will bring about a reduction in the stress level in the main hull girder.

11. The knowledge gained by experience, testing, and technical study, is being applied to the design and construction of new ships, and the record of ships built since 1945 has been excellent.

12. With respect to the ships now existing which were built during the war, including the Liberty ships and the T-2 tankers, some of the improvements developed, as for example improved steel specifications, cannot be applied to an existing ship. For these ships the Coast Guard proposes to continue its program of careful analysis of any defects which develop, coupled with prompt action when the need for it is apparent. This, together with research programs to determine the fundamental causes of fractures of ships, should enable us to achieve the standards of safety desired on American ships.

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13. Subject to the foregoing remarks, it is recommended that the Findings of Fact, Conclusions, Opinions and Recommendations of the Marine Board of Investigation be approved.

P. A. Ovenden

P.A. OVENDEN

FIRST ENDORSEMENT to MVI memorandum of 25 September 1952 M

17 October 1952

From: Chief, Office of Merchant Marine Safety
To: Commandant

Subj: Marine Board of Investigation; structural failure of tanker
FORT MERCER off Cape Cod on 18 February 1952, with loss of life

Forwarded, recommending approval. .

H. C. Shepherd
H. C. SHEPHEARD

APPROVED: OCT 20 1952

A. C. Richmond
Rear Admiral, U. S. Coast Guard
Acting Commandant