GLMS - 24

Roll 5 (PDF)
GL2-40

Coast Guard Investigation,

EDMUND FITZGERALD Sinking
MARINE BOARD OF INVESTIGATION
OF SINKING OF THE SS EDMUND FITZGERALD
ON LAKE SUPERIOR 10 NOVEMBER 1975

The bulk freighter EDMUND FITZGERALD, owned by the Northwestern
Mutual Life Insurance Company of Milwaukee, Wisconsin, and on long-term
lease to the Oglebay Norton Company, Cleveland, Ohio, sank on November
10, 1975. She was lost on the east end of Lake Superior off Crisp Point
nearly on the International Boundary Line with her entire crew of twenty-
nine men and a cargo of taconite ore.

The United States Coast Guard Marine Board of Investigation convened
on November 18, 1975. It was held in the auditorium on the 31st floor of
the Federal Office Building, 1240 East Ninth Street, Cleveland, Ohio. The
Board was composed of Rear Admiral Winfred W. Barrow (Chairman), Captain
Adam S. Zabinski (member), Captain James A. Wilson (member), and Commander
C. S. Loosmore (recorder). The hearings adjourned on December 13, 1975.

It should be stressed that the purpose of the inquiry was not to fix
criminal or civil liabilities. Rather, it was called to determine the
cause of the casualty, to the extent possible, to permit the taking of ap-
propriate measures for future promotion of safety of life and property at
sea.

The transcript of the investigation and related items were made
available to the Center for Archival Collections, Bowling Green State
University, for microfilming through the authority and forethought of
Captain James A. Wilson, United States Coast Guard. His intent is to
insure the availability of the document for future generations of scholars
involved in Great Lakes studies.
DISTRICT COMMANDER INSTRUCTION 3120.3F

Subj: Ninth Coast Guard District Vessel Employment Schedule

1. Purpose. To promulgate vessel employment policies and the schedule for the period 1 January 1975 through 31 March 1975.

2. Cancellation. District Commander Instruction 3120.3E is cancelled 1 January 1975.

3. Definitions.

a. The following code titles are used to designate the status of units:

   BRAVO 2 - Standby status. Ready to proceed within two hours.
   BRAVO 6 - Standby status. Ready to proceed within six hours.
   BRAVO 24- Standby status. Ready to proceed within twenty-four hours.
   CHARLIE - Maintenance status. Maintenance, repair, or overhaul.
   YARD    - Shipyard availability. Drydocking, repair, overhaul, etc. at a designated ship repair facility.

4. Discussion.

a. The assigned BRAVO status is for the primary purpose of maintaining an effective readiness posture for search and rescue, and does not alter the Abstract of Operations reporting procedures as prescribed by Commandant Instruction 3123.7 series.

b. Consistent with maintaining adequate search and rescue coverage, performing other missions (A to N, icebreaking, etc.) yet have available suitable vessel maintenance time, and, additionally provide adequate crew rest without jeopardizing the aforementioned requirements the following policies will be implemented.

   (1) CGC MACKINAW and CGC WESTWIND will be assigned BRAVO 6 or BRAVO 24 when not in maintenance as follows:

   (a) During the icebreaking season, 15 December to 1 May, the vessels will be scheduled for BRAVO 6 status and BRAVO 24 status as appropriate. Generally, the MACKINAW will be in BRAVO 6 to insure SAR response in late December when WLBS are heavily engaged in withdrawing aids and during February and March to be available for ice operations in the Straits and lower St. Mary's River.
4.b.(1)(b) From 1 May to 15 December, the vessels will be scheduled for BRAVO 24 status or CHARLIE status dependent on projected commitments and/or past workload.

(2) The WYTM's are the only class of Ninth District vessel having SAR as a primary mission. Except for icebreaking missions and occasional regatta patrols, logistics missions and public relations cruises, they have less workload (underway time). Consequently they will be assigned a greater proportion of BRAVO 2 status.

(3) The WLB's have aids to navigation, icebreaking, logistics missions and occasional regatta and public relations cruises. As a result they have a heavier workload (underway time), than do the WYTM's. Consequently they will generally be assigned BRAVO 6 or BRAVO 24 status when not in maintenance. When necessary, because WYTM's are not available for BRAVO 2 status due to unscheduled maintenance or operational missions outside their SAR area, the WLBs will be assigned BRAVO 6 status as back-up SAR vessels.

(4) CGC POINT STEELE is the only vessel to provide suitable SAR coverage on Lake Ontario. She will be assigned BRAVO 6 status when not in maintenance during the "navigation" season (1 April to 16 December), and BRAVO 24 status when not in maintenance the remainder of the year. In this regard it is noted that CGC POINT STEELE is normally icebound during the winter months.

c. Implementation of the above policies will provide the following SAR coverage:

<table>
<thead>
<tr>
<th>(1) Lake Superior</th>
<th>SAR Vessels</th>
<th>Backup SAR vessels</th>
<th>SAR Standby Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGC 'NAUGATUCK'</td>
<td>CGC BUCKTHORN</td>
<td>(1) One SAR vessel will be in BRAVO-6 status at all times.</td>
<td></td>
</tr>
<tr>
<td>CGC WOODRUSH</td>
<td></td>
<td>(2) The other SAR vessel will be in BRAVO-24 status when not in maintenance.</td>
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<td></td>
<td></td>
<td>(3) The CGC BUCKTHORN will be in BRAVO-6 status whenever one of the SAR vessels is in CHARLIE status. At all other times it will be in BRAVO-24 status when not in maintenance.</td>
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</table>

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<thead>
<tr>
<th>(2) Lake Michigan</th>
<th>SAR Vessels</th>
<th>Backup SAR vessels</th>
<th>SAR Standby Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGC ARUNDEL</td>
<td>CGC MESQUITE</td>
<td>(1) One SAR vessel will be in BRAVO-2 status at all times.</td>
<td></td>
</tr>
<tr>
<td>CGC RARITAN</td>
<td></td>
<td>(2) The other SAR vessel will be in BRAVO-24 status when not in maintenance.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3) CGC MESQUITE will be in BRAVO-6 status whenever one of the SAR vessels is in CHARLIE status. At all other times it will be in BRAVO-24 status when not in maintenance.</td>
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</tbody>
</table>
4.c.(3) Lake Huron

<table>
<thead>
<tr>
<th>SAR Vessels</th>
<th>Backup SAR vessels</th>
<th>SAR Standby Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGC SUNDEW</td>
<td>None</td>
<td>(1) One SAR vessel will be in BRAVO-6 status at all times.</td>
</tr>
<tr>
<td>CGC ACACIA/MARIPOSA</td>
<td></td>
<td>(2) The other SAR vessel will be in BRAVO-24 status when not in maintenance.</td>
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<td>(3) If the BRAVO-6 vessel proceeds beyond 6 hours from the Lake area or is given an</td>
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<td>emergency CHARLIE period, the BRAVO-24 vessel will be moved up to BRAVO-6 status.</td>
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(4) Lake Erie

<table>
<thead>
<tr>
<th>SAR Vessels</th>
<th>Backup SAR vessels</th>
<th>SAR Standby Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGC KAW</td>
<td>CGC MARIPOSA</td>
<td>(1) One SAR vessel will be in BRAVO-2 status at all times.</td>
</tr>
<tr>
<td>CGC OJIBWA</td>
<td></td>
<td>(2) The other SAR vessel will be in BRAVO-24 status when not in maintenance.</td>
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</table>

(5) Lake Ontario

<table>
<thead>
<tr>
<th>SAR Vessels</th>
<th>Backup SAR vessels</th>
<th>SAR Standby Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGC POINT STEELE</td>
<td>None</td>
<td>(1) CGC POINT STEELE will be in BRAVO-6 status during the navigation season (1 April to December) when not in maintenance.</td>
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<tr>
<td></td>
<td></td>
<td>(2) She will be in BRAVO-24 status the remainder of the year (17 Dec to 31 Mar) when not in maintenance.</td>
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</tbody>
</table>

d. Vessels in standby status will not commence any repairs or overhauls which might preclude getting underway as required by paragraph 3.a.

e. Only for the most urgent SAR cases will a vessel in BRAVO-6 status be ordered underway in less than six hours; and a vessel in BRAVO 24 status be ordered underway in less than twenty-four hours.

f. Vessels moored at other than assigned homeport shall assume whatever status is consistent with their current mission and the intent of this instruction unless otherwise directed by CCGDNSF9990.

g. It is expected that commanding officers whose vessels are in BRAVO status will, on their own initiative, conduct such underway training as they consider necessary to maintain a high degree of operational readiness. Permission to get underway is not required from the District Commander as long as the vessel remains in its normal operating area. Movement reports must be submitted. Current fuel conservation requirements shall be considered.
5. Action.

a. Vessels shall assume the operational status scheduled in enclosure (1) effective 0800 local time on the date indicated. Message reports are not required when entering/leaving each status except that vessels under the OPCON of a Task Group Commander or Group Commander shall CHOP to the District Commander upon assuming CHARLIE status, and CHOP back to the Task Group Commander or Group Commander upon resuming BRAVO status.

b. Vessels shall advise CCGDNINE(o) by priority message in accordance with Appendix 1 to Annex Victor, CCGDNINE OPLAN 1-FY under the following conditions:

(1) The vessel has suffered an equipment casualty that seriously impairs the vessel's ability to perform its assigned missions. The message shall include the estimated time required to effect repairs.

(2) The fuel on board drops below sixty per cent of normal capacity.

(3) The stores and/or potable water aboard drops below that required for three days sustained operations.

(4) For any other reason the vessel cannot assume or maintain the scheduled BRAVO status.

c. Group Commanders and vessel commanding officers should review this employment schedule upon receipt and report any discrepancies to CCGDNINE(o).

d. Vessels that CHOP to Task Group Commanders for Domestic Icebreaking shall assume status B-2 as required by ANNEX W to CCGDNINE OPLAN 1-FY. Task Group Commanders may reduce this standby status (B-2 to B-6, B-2 to B-24, etc.) if the situation permits. This reduction shall not exceed the limits imposed by the published vessel employment schedule (enclosure (1)).

e. The intent and provisions of this Instruction shall not be amended by Group Commanders or Commanding Officers of vessels without permission of CCGDNINE(o).

f. Future vessel employment schedules will be published quarterly by CCGDNINEMOTE 3120(series).

6. Effective Date. This instruction is effective for planning purposes immediately, and for operations on 1 January 1975.

J. S. GRACEY

Encl: (1) CCGDNINE Employment Schedule 1st Quarter CY 75
Dist. See SDL No. 99
NINTH DISTRICT ONLY
A: cdjkmn
B: a(COMPT(G-CMA)(4),(G-O)(1), c(All divisions & branches),e,f,n (1)
C: a,b (1)
D: d(l)
E: o(l)
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<th>VESSEL</th>
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<th>JANUARY 1975</th>
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<td>B-24</td>
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<td>WOODRUSH</td>
<td>B-24</td>
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<tr>
<td>OJIBWA</td>
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<td>PT. STEELE</td>
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<td>MARCH 1975</td>
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<tr>
<td>MACKINAW</td>
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<td>PT. STEELE*</td>
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* PT. STEEL WILL ASSUME CHARLIE STATUS WHEN ICEBOUND
<table>
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<th>Charlie</th>
<th>Shipyard Availability</th>
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<tr>
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<td>Joodruss</td>
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<td>M. Rundel</td>
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<tr>
<td>Tariq</td>
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<td>Jibwa</td>
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<td>T. Steele</td>
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BACKGROUND

On 10 November 1975, the Great Lakes ore carrier S/S EDMUND FITZGERALD was lost in the southeast end of Lake Superior. Owned by the Northwestern Mutual Life Insurance Company, and operated by Oglebay-Norton Company of Cleveland, the vessel had departed Superior, Wisconsin the preceding day with a crew of 29 and a load of 26,116 tons of taconite pellets. A winter storm was moving over Lake Superior during the transit period, with reported winds of 50 to 60 knots and waves of 20 to 30 feet. No distress call was received and there were no known survivors.

At first word that the FITZGERALD was in distress, the Coast Guard immediately attempted to contact her and, within the prevailing weather conditions, to initiate surface and aerial search. This search effort was continued through the evening of 13 November. Despite the intensive search efforts, no survivors were found nor bodies recovered. A considerable quantity of debris, some identified as being from the FITZGERALD, was recovered.

On 14 November, a Magnetic Anomaly Detection equipped U. S. Navy aircraft made a series of runs over the general location covering an area of approximately 100 square miles. The aircraft had calibrated its magnetic anomaly detection equipment on a vessel similar to FITZGERALD and carrying the same cargo. One significant contact was made which was later determined to be the FITZGERALD hulk.

Side-scan sonar equipment, owned and operated by the Coast Guard, was brought to the scene to locate and attempt to verify the object on the bottom of the lake. A Coast Guard range-range navigation system was provided for surface positioning. This first search was successful in locating what was believed to be the wreck of the FITZGERALD. Careful analysis of the sonar traces revealed that two pieces of shipwreck were visible on the sonar traces.

Shortly after the loss, the Commandant, U. S. Coast Guard, convened a Marine Board of Investigation with RADM Winford W. Barrow, USCG, as chairman to investigate the cause of the sinking. The Board took testimony from 19 through 26 November and again from 10 through 13 December. During the period 22-24 November, the U. S. Navy Supervisor of Salvage (who had previously been contacted by the Coast Guard to provide search consultation) and its primary search and recovery contractor, Seaward, Inc., conducted a second side-scan sonar search of the loss area to gain as much additional detail as possible for action by the Board. Operations were limited by weather
conditions and the onset of the winter season on the lake.

To provide further data in determining the cause and manner of the FITZGERALD sinking, the Commandant, at the request of the Chairman of the Board, authorized the Commandant, Ninth Coast Guard District, RADM James S. Gracey, to form a Task Force that would document by underwater photography, and television, the verification of the location of the FITZGERALD and the condition of the wreck. This Task Force, under my command, again requested the services and resources of the U. S. Navy Supervisor of Salvage. These consisted of navigation and side-scan sonar from Seaward, Inc. for the accurate relocation of the wreck and subsequent setting of a moor over the site; the deep diving, tethered submersible CURV III from the Naval Undersea Center, San Diego, which would be used to obtain photographic and television documentation; and the preparation of the technical report that would document the investigation and the observations made.

The Task Force members on scene were: representatives of the Coast Guard Marine Board of Investigation, the Operational Commander, the Commanding Officer of the Coast Guard Cutter WOODRUSH and technical representatives of the Commandant of the Coast Guard, the National Transportation Safety Board, the Navy Supervisor of Salvage, the Navy Undersea Center and Seaward, Inc. A complete listing of names of these members is contained in the full report.

Several types of special equipment were used in the operation including a sophisticated navigation system, two sonar systems and the Navy's CURV III, a Cable-controlled Underwater Recovery Vehicle.

The CURV III system is composed of an underwater vehicle, cable, surface equipment and support ship. The vehicle is capable of making recorded observations, recovering small objects and performing other light work tasks at depths to 7,000 feet. The cable and surface equipment enable the vehicle to be deployed and remotely operated from the support ship.

Serving as the survey platform for the sonar search operations and as the support platform for CURV III was the Coast Guard Cutter WOODRUSH, a 180-foot buoy tender reinforced for icebreaking. The buoy deck of the WOODRUSH carried CURV III, the control console, the maintenance van and the cable carriers. The ship's boom was used to launch and recover the vehicle.

During 12 to 16 May, a third side-scan sonar survey was made of the area in which the hulk, suspected to be the
FITZGERALD was located to reestablish the accurate position of the wreckage for the photographic survey and define the planned mooring radius for anchor placement clear of the wreck.

The wreck was relocated and its position verified using the Trisponder horizontal positioning system. A total of 85 sonar traces were made. Following the sonar operations, WOODRUSH set the moor over the wreck and returned to port.

During the week of 12 May, the Task Force members and equipment assembled at Sault Ste. Marie, Michigan. CURV III, with its control and support vans and associated equipment, was flown from San Diego, California to Kinchloe Air Force Base, St. Ignace, Michigan in a C-130 aircraft from the Coast Guard Air Station in San Francisco, then transported by truck to Base Sault Ste. Marie and loaded aboard the WOODRUSH.

WOODRUSH, with the FITZGERALD Task Force aboard, departed Base Sault Ste. Marie at midnight on 19 May 1976. By 6:00 a.m. she had positioned herself over the wreck and reestablished her moor.

From 20 to 28 May, CURV III made 12 dives, logging 56 hours, 40 minutes bottom time. It recorded over 43,000 feet videotape and almost nine hundred 35mm color slides.

Support for the WOODRUSH was provided by the Coast Guard cutter PT. STEELE which made three trips to the operation site, transporting personnel and delivering equipment and provisions. Additional support was provided by helicopters from Coast Guard Air Station, Traverse City, Michigan. The helicopters picked up exposed 35mm film taken during each day's operations and delivered it to Marquette, Michigan, where overnight processing had been arranged, and transported it back to the WOODRUSH the next day.

WOODRUSH's moored position over the wreck was changed to allow CURV III maximum accessibility to the major sections of the wreck and to specific portions of a section.

On the first day of underwater operations, at roughly 12:30 p.m., the wreck was positively identified as the EDMUND FITZGERALD. (videotape). Her name and home port were clearly read on the stern, which lay upside down.

During the operation, the following observations were made and recorded on film and videotape:
The stern section is separated at approximately frame 178 and is lying upside down on the after superstructure. At the stern end, the overhead of the spar deck (the underside of the poop deck) is lying approximately even with the mud level—the remainder of the after superstructure is buried. The stern section is lying approximately 10 degrees from the vertical. The section is resting on a portion of deck, which is visible extending out from the ship's port side. The rudder, propeller, and exposed bottom appear undamaged. All blades of the propeller are in place. The rudder is positioned no more than 10 degrees from center.

The bow section is sitting nearly upright, approximately 15 degrees from the vertical. Separation of the bow section is at about frame 75, between hatches 8 and 9. The starboard side of the hull at the separation is bent in and folds under the deck. The bow superstructure is intact, but damaged. Mud, and in some instances mud and taconite, is spread and stacked over all deck spaces (the deck edge on the port side is completely covered with mud). The main deck and main deck equipment, including hatch coamings, are extensively damaged. Extending outward from the separations at the stern and bow sections are areas of extensive debris which, for the most part, appear to be from the interior of the vessel. At the stern section it is probable that this debris extends upward through the bottom mud from a portion of the deck still attached to the stern.

Bottom mud shows extensive disruption through the wreck location. In some bottom locations, mud is sitting in large mounds. Mud is stacked at the forward end of the bow section on both port and starboard sides to about the 27 foot draft marks. The mud against all hull surfaces shows no even pattern, but rises and falls in mounds and depressions.

#######
SUMMARY OF RESULTS OF SURVEY OF WRECKAGE OF EDMUND FITZGERALD

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################
On 10/17/74, C&P dock, on board vessel this date, to conduct an examination of the vessel's spar deck, in company of Mr. Bob Nash, ABS, and Mr. Dick Feldt, Columbia Transportation.  

Spar deck was satisfactory. Steel oil containment seems to be adequate except for the fixed containers or portable. The size does not conform to 19 inches and 5-gal capacity.
From: Recorder, Marine Board of Investigation  
To: Chairman, Marine Board of Investigation  

Subj: Revised Page of Draft of Findings of Facts  

Ref: (a) Telecon, RADM Barrow, CDR Loosmore, 3/4/77  

1. I have revised page 42 of the draft Findings of Fact in accordance with Ref. (a) and a copy is enclosed.

C. S. LOOSMORE  

Encl: (1) Revised page 42, Findings of Fact  

Copies to:  
CAPT A. S. Zabinski, w/copy of encl  
CAPT J. A. Wilson, w/copy of encl
Under the Search and Rescue Plan, Annex I to CCGDNine Operation Plan NRI-(FY), the Coast Guard Air Station at Traverse City, MI, provides fixed wing air coverage for all of the Great Lakes and rotary wing coverage for Lake, Superior and the northern parts of Lake Huron and Lake Michigan. Under this plan, USCG Air Station Traverse City is required to have one HU-16 fixed wing search aircraft and one HH-52 helicopter in status Bravo-0 (capable of being launched in 30 minutes) or ALFA (airborne) at all times, and personnel on board capable of launching either the HU-16 or the HH-52 immediately.

The first Coast Guard aircraft, an HU-16, was launched at 2206 after a minor delay to put flares on board, and was on scene at 2253. An HH-52, fitted with a Night Sun, an externally mounted, remote controlled, focusable, 3.8 million candlepower, Xenon arc, searchlight, was launched at 2223, and was on scene at 0100, 11 November. A second HH-52 was launched at 2249 and was on scene at 0005, 11 November. A Canadian C-130 was launched at 0037.
DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

DISTRIBUTION INSTRUCTION 3120.3F

Subj: Ninth Coast Guard District Vessel Employment Schedule

1. Purpose. To promulgate vessel employment policies and the schedule for the period 1 January 1975 through 31 March 1975.

2. Cancellation. District Commander Instruction 3120.3E is cancelled 1 January 1975.

3. Definitions.
   a. The following code titles are used to designate the status of units:
      BRAVO 2 - Standby status. Ready to proceed within two hours.
      BRAVO 6 - Standby status. Ready to proceed within six hours.
      BRAVO 24 - Standby status. Ready to proceed within twenty-four hours.
      CHARLIE - Maintenance status. Maintenance, repair, or overhaul.
      YARD - Shipyard availability. Drydocking, repair, overhaul, etc. at a designated ship repair facility.

4. Discussion.
   a. The assigned BRAVO status is for the primary purpose of maintaining an effective readiness posture for search and rescue, and does not alter the Abstract of Operations reporting procedures as prescribed by Commandant Instruction 3123.7 series.

   b. Consistent with maintaining adequate search and rescue coverage, performing other missions (A to N, icebreaking, etc.) yet have available suitable vessel maintenance time, and, additionally provide adequate crew rest without jeopardizing the aforementioned requirements the following policies will be implemented.

      (1) CGC MACKINAW and CGC WESTWIND will be assigned BRAVO 6 or BRAVO 24 when not in maintenance as follows:

      (a) During the icebreaking season, 15 December to 1 May, the vessels will be scheduled for BRAVO 6 status and BRAVO 24 status as appropriate.
      Generally, the MACKINAW will be in BRAVO 6 to insure SAR response in late December when WILBRs are heavily engaged in withdrawing aids and during February and March to be available for ice operations in the Straits and lower St. Mary's River.
4.b.(1)(b) From 1 May to 15 December, the vessels will be scheduled for BRAVO 24 status or CHARLIE status dependent on projected commitments and/or past workload.

(2) The WYTM's are the only class of Ninth District vessel having SAR as a primary mission. Except for icebreaking missions and occasional regatta patrols, logistics missions and public relations cruises, they have less workload (underway time). Consequently they will be assigned a greater proportion of BRAVO 2 status.

(3) The WLBS have aids to navigation, icebreaking, logistics missions and occasional regatta and public relations cruises. As a result they have a heavier workload (underway time), than do the WYTM's. Consequently they will generally be assigned BRAVO 6 or BRAVO 24 status when not in maintenance. When necessary, because WYTM's are not available for BRAVO 2 status due to unscheduled maintenance or operational missions outside their SAR area, the WLBS will be assigned BRAVO 6 status as back-up SAR vessels.

(4) CGC POINT STEELE is the only vessel to provide suitable SAR coverage on Lake Ontario. She will be assigned BRAVO 6 status when not in maintenance during the "navigation" season (1 April to 16 December), and BRAVO 24 status when not in maintenance the remainder of the year. In this regard it is noted that CGC POINT STEELE is normally icebound during the winter months.

c. Implementation of the above policies will provide the following SAR coverage:

1. Lake Superior

<table>
<thead>
<tr>
<th>SAR Vessels</th>
<th>Backup SAR vessels</th>
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<tbody>
<tr>
<td>CGC NAUGATUCK</td>
<td>CGC BUCKTHORN</td>
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<tr>
<td>CGC WOODRUSH</td>
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SAR Standby Policy
(1) One SAR vessel will be in BRAVO-6 status at all times.
(2) The other SAR vessel will be in BRAVO-24 status when not in maintenance.
(3) The CGC BUCKTHORN will be in BRAVO-6 status whenever one of the SAR vessels is in CHARLIE status. At all other times it will be in BRAVO-24 status when not in maintenance.

2. Lake Michigan

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<tr>
<th>SAR Vessels</th>
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<tbody>
<tr>
<td>CGC ARUNDEL</td>
<td>CGC MESQUITE</td>
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<td>CGC RARITAN</td>
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SAR Standby Policy
(1) One SAR vessel will be in BRAVO-2 status at all times.
(2) The other SAR vessel will be in BRAVO-24 status when not in maintenance.
(3) CGC MESQUITE will be in BRAVO-6 status whenever one of the SAR vessels is in CHARLIE status. At all other times it will be in BRAVO-24 status when not in maintenance.
4.c.(3) Lake Huron

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<th>SAR Vessels</th>
<th>Backup SAR vessels</th>
<th>SAR Standby Policy</th>
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<tr>
<td>CGC SUNDEW</td>
<td>None</td>
<td>(1) One SAR vessel will be in BRAVO-6 status at all times.</td>
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<tr>
<td>CGC ACACIA/MARIPOSA</td>
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<td>(2) The other SAR vessel will be in BRAVO-24 status when not in maintenance.</td>
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<td>(3) If the BRAVO-6 vessel proceeds beyond 6 hours from the Lake area or is given an</td>
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<td>emergency CHARLIE period, the BRAVO-24 vessel will be moved up to BRAVO-6 status.</td>
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(4) Lake Erie

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<th>SAR Vessels</th>
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<tr>
<td>CGC KAW</td>
<td>CGC MARIPOSA</td>
<td>(1) One SAR vessel will be in BRAVO-2 status at all times.</td>
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<tr>
<td>CGC OJIBWA</td>
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<td>(2) The other SAR vessel will be in BRAVO-24 status when not in maintenance.</td>
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<td>(3) CGC MARIPOSA will be in BRAVO-6 status whenever one of the SAR vessels is in CHARLIE status. At all other times it will be in BRAVO-24 status when not in maintenance.</td>
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(5) Lake Ontario

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<tr>
<td>CGC POINT STEELE</td>
<td>None</td>
<td>(1) CGC POINT STEELE will be in BRAVO-6 status during the navigation season (1 April to 16 December) when not in maintenance.</td>
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<td>(2) She will be in BRAVO-24 status the remainder of the year (17 Dec to 31 Mar) when not in maintenance.</td>
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d. Vessels in standby status will not commence any repairs or overhulls which might preclude getting underway as required by paragraph 3.a.

e. Only for the most urgent SAR cases will a vessel in BRAVO-6 status be ordered underway in less than six hours; and a vessel in BRAVO 24 status be ordered underway in less than twenty-four hours.

f. Vessels moored at other than assigned homeport shall assume whatever status is consistent with their current mission and the intent of this instruction unless otherwise directed by CCG/ININE(o).

g. It is expected that commanding officers whose vessels are in BRAVO status will, on their own initiative, conduct such underway training as they consider necessary to maintain a high degree of operational readiness. Permission to get underway is not required from the District Commander as long as the vessel remains in its normal operating area. Movement reports must be submitted. Current fuel conservation requirements shall be considered.
5. Action.

a. Vessels shall assume the operational status scheduled in enclosure (1) effective 0800 local time on the date indicated. Message reports are not required when entering/leaving each status except that vessels under the OPCON of a Task Group Commander or Group Commander shall CHOP to the District Commander upon assuming CHARLIE status, and CHOP back to the Task Group Commander or Group Commander upon resuming BRAVO status.

b. Vessels shall advise CCGDNINE(o) by priority message in accordance with Appendix 1 to Annex Victor, CCGDNINE OPLAN 1-FY under the following conditions:

(1) The vessel has suffered an equipment casualty that seriously impairs the vessel's ability to perform its assigned missions. The message shall include the estimated time required to effect repairs.

(2) The fuel on board drops below sixty per cent of normal capacity.

(3) The stores and/or potable water aboard drops below that required for three days sustained operations.

(4) For any other reason the vessel cannot assume or maintain the scheduled BRAVO status.

c. Group Commanders and vessel commanding officers should review this employment schedule upon receipt and report any discrepancies to CCGDNINE(o).

d. Vessels that CHOP to Task Group Commanders for Domestic Icebreaking shall assume status B-2 as required by ANNEX W to CCGDNINE OPLAN 1-FY. Task Group Commanders may reduce this standby status (B-2 to B-6, B-2 to B-24, etc.) if the situation permits. This reduction shall not exceed the limits imposed by the published vessel employment schedule (enclosure (1)).

e. The intent and provisions of this Instruction shall not be amended by Group Commanders or Commanding Officers of vessels without permission of CCGDNINE(o).

f. Future vessel employment schedules will be published quarterly by CCGDNINENOTE 3120(series).

6. Effective Date. This instruction is effective for planning purposes immediately, and for operations on 1 January 1975.

J. S. GRACEY

Encl: (1) CCGDNINE Employment Schedule 1st Quarter CY 75

Dist. See SDL No. 99
NINTH DISTRICT ONLY
A: cdjkmo
B: a(COMDT(G-CMA)4),(G-O)(1), c(All divisions & branches),e,f,n (1)
C: a,b (1)
D: d(1)
E: o(1)
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* PT STEELE WILL ASSUME CHARLIE STATUS WHEN ICE BOUND
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| **MACINAW**       | B-24|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| **WESTWIND**      | B-6 | B-24|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| **WOODRUSH**      | B-24|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| **NAUGATUCK**     | B-6 | B-24|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| **BUCKTHORN**     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| **ARUNDEL**       | B-24|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| **RARITAN**       | B-2|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| **MESQUITE**      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| **SUNDEW**        | B-24|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| **ACACIA**        | B-6 | B-24|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| **MARIPOSA**      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| **KAW**           | B-24|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| **OJIBWA**        | B-2 | B-24|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| **PT. STEELE**    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | B-24|

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* PT STEEL WILL ASSUME CHARLIE STATUS WHEN ICEBOUND
Traverse at 1 in 80
either H152-07
H0 160

Aircraft Carriage
Requirements Analysis
| NOVEMBER 1975 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
|--------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| MACKINAW     |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| WESTWIND     |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| WOODRUSH     |   |   |   |   |   |   |   |   |   |    |    | B - 6 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| NAUGATUCK    |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | B - 24 |    |    |
| BUCKTHORN    |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | B - 24 |
| ARUNDEL      |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | B - 2 |    |
| RARITAN      |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| MESQUITE     |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | B - 24 |
| SUNDew       |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| BRAMBLE      |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | B - 6 |    |
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| KAW          | B - 2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| OJIBWA       | B - 24 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | B - 2 |    |
| PT. STEELE   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | B - 6 |    |    |    |

Dockside Availability |
Shipyard Availability | Charlie  |
From: Recorder, Marine Board of Investigation  
To: Members, Marine Board of Investigation  
Subj: Revised Exhibit No. 108 (Final Field Sheet 3908)  

1. The enclosures, which are self-explanatory, are forwarded.

C. S. LOOSMORE

Distribution:  
CAPT A. S. Zabinski  
/ CAPT J. A. Wilson

Encl: (1) Revised Exhibit No. 108  
(2) Copy of ltr from Chairman, Marine Board of Investigation, to Commandant (G-MMI/83), dated 26 May 1977

Copies to:  
Chairman, Marine Board of Investigation  
Mr. Thomas O. Murphy  
Thompson, Hine & Flory  
1100 National City Bank Bldg.  
Cleveland, OH 44114  
Mr. Ted Hoeflinger  
3326 Westchester Road  
Toledo, OH 43615
*From:* Chairman, Marine Board of Investigation  
*To:* Commandant (G-MMI/83)  

*Subj:* Revised exhibit to Marine Board

1. The enclosure, Final Field Sheet 3908, is a more complete rendition of the results of the hydrographic survey conducted in eastern Lake Superior than was the earlier preliminary Field Sheet 3908 which was admitted as Exhibit 108 to the Marine Board. Analysis of the enclosure shows no differences between it and the preliminary field sheet which are significant to the Findings of Fact, Conclusions and Recommendations of the Marine Board.

2. The preliminary Field Sheet previously admitted as Exhibit 108 should be removed from the exhibits and the enclosure substituted therefor.

W. W. BARROW

Encl: (1) Final Field Sheet 3908 (original and 1 copy)

Copies:
Captain A. S. ZABINSKI  
Captain J. A. WILSON  
CDR C. S. LOOSMORE
LAKE SUPERIOR SURVEY - CSS, BAYFIELD
FINAL FIELD REPORT - 1976
APRIL 5 - JULY 9
JULY 27 - OCTOBER 6
PROJECT FILE NUMBER 6600-76-2
F.L. DE GRASSE - H.I.C.
P. RICHARDS, M. CRUTCHLOW
SUB-PARTY CHIEFS
LAKE SUPERIOR SURVEY
CSS BAYFIELD
FINAL FIELD REPORT
APRIL 5 - JULY 9
JULY 27 - OCTOBER 6
1976

PROJECT FILE NUMBER 6800-76-2

F.L. DE GRASSE
HYDROGRAPHER-IN-CHARGE

P.D. RICHARDS
M.R. CHUTCHLOW
The sinking of the S.S. EDMUND FITZGERALD in the eastern end of Lake Superior on November 10, 1975 and the subsequent loss of twenty-nine lives, comprising the total complement of officers and crew, prompted Mr. Leask, Regional Director, C.C.G./H.O.T. to request the Canadian Hydrographic Service to carry out a modern hydrographic survey of the offshore shoal area between Caribou and Michipicoten Islands. The track of the stricken vessel reportedly lies within the limits as stated above.

On receipt of the above request, the Canadian Hydrographic Service readily gave approval to carry out this assignment during the 1976 summer field season. Consequently, a survey using the most modern equipment available was mounted in late April to conduct a bathymetric survey of that area described above, in addition to the shoal area known as Southwest Bank - a 6½ fathom shoal lying S.W. of Caribou Island.

The purpose of the survey project was to confirm the existence and depth of shoals as portrayed on Chart Number 2310 and to determine if any hazards existed. It should be noted that the most recent chart available is based on Canadian Hydrographic Surveys carried out in 1919 and 1920.

The survey was carried out during the period May to September using a high powered Mini-Fix chain and the automated Integrated Navigation Data Acquisitioning and Processing System (INDAPS) to portray the bathymetric data. All shoal areas were fully developed to obtain minimum depths.

Our findings show no significant changes to the existing chart except that C.H.S. Charts 2310 and 2300 show a 7 fathom shoal bearing 292 deg. (T) at 3½ n.m. from Caribou Island Light - the 1976 least depth is 10½ fathoms.
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MAJOR EQUIPMENT

CSS BAYFIELD

Bell 206 Jet Ranger Helicopter

one Ambassador station Wagon

POSITIONING SYSTEMS

one high power Mini-Fix chain
three shore transmitters
ship and aircraft receivers

COMMUNICATION SYSTEMS

one Interdata Model 70
one ADDS Consol Model 580
one Centronics printer
two Panasonic CRT monitors
one Interface unit
two CAT tape drives
one Houston plotter

SOUNDING SYSTEM

one Atlas Deso 10 sounder
one Atlas Edig digitizer
one Raytheon DE-719 sounder
### PERSONNEL

#### C.H.S.

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<td>P. Richards</td>
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<td>M. Crutchlow</td>
<td>Party Chief</td>
<td>September 6 - 30</td>
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<td>B. Power</td>
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<td>J. Dixon</td>
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<td>G. Macdonald</td>
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<td>G. Fenn</td>
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<td>D. Livingstone</td>
<td>Hydrographer</td>
<td>June 10 - 12</td>
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<td>L. Cram</td>
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#### OAS ELECTRONIC TECHNICIANS

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<td>September 30 - October 5</td>
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<td>R. Coons</td>
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<td>S. Kowalczyk</td>
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<td>D. Pyatt</td>
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<td>W. Montgomery</td>
<td>Electronic Technician</td>
<td>September 15 - October 1</td>
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DEVELOPMENT GROUP

R. Tripe
P. Millette

M.O.T. (Helicopters)

G. Brown  Pilot  May 27 - 28
A. Perley  Pilot  June 7 - 9
          July 29 - 31

D. Smith  Engineer  May 5 - June 21
K. Mulronncy  Engineer  August 15 - October 2
M. Takacs  Engineer  July 27 - August 15
T. Jaskela  Engineer  May 5 - June 2
          June 2 - July 12
          July 27 - August 22
T. Mackenzie  Pilot  August 22 - October 2
A. Veilleux  Engineer  April 5 - 9
          April 5 - 9
CHRONOLOGY OF EVENTS

April 5 - 9
Self accompanied by Capt. Birchall of CSS BAYFIELD and B. Waldock, electronic technician, assisted by Parry Sound based Ministry of Transport Jet Ranger helicopter C-PCGO, carry out reconnaissance in the working area for suitable harbours for berthing ship and shore based Mini-Fix sites. Helicopter unserviceable for 1½ days.

April 10-19
At Headquarters at CCIW planning survey and readying equipment.

April 20-21
Self to CHS Headquarters in Ottawa. Arrange with Geodetic Survey of Canada, EM&R, to locate a control point/Slave site on Davieaux Island by satellite receiver. NOTE: Davieaux Island lies close by and south of Michipicoten Island.

April 22
Self accompanied by CHS staff members D. Livingstone and G. Fenn accompany two G.S.C. employees of Surveys and Mapping Branch, EM&R, to Nawa preparing to locate Slave station control point by translocation.

April 23
M.O.T. helicopter (212) from Dartmouth, N.S. Transport staff and equipment to Davieaux Island.

April 24-25
Measuring Doppler satellite passes and complete survey for Slave II.

April 26
Return to CCIW, Burlington.

April 27 - May 3
At CCIW.
May 4
(a) Rental 3 ton truck away from CCIW with the Mini-Fix positioning system and survey equipment.
(b) Self and party chief P. Richards to Wawa - arrive in evening.
(c) Jet Ranger helicopter C-FCGL arrived in Wawa for summer assignment.

May 5
(a) Staff member B. Power arrived in the working area.
(b) Complete reconnaissance, obtain storage space, etc.

May 6-9
(a) Establish horizontal control for Mini-Fix Master and Slave I.
(b) CHS Tellurometers become unserviceable - borrow a set from a G.S.C. survey party working in the area in exchange for transportation by helicopter.

May 10
(a) Observations complete. P. Richards departs for CCIW to continue preparations and system trials aboard BAYFIELD.
(b) Crew members R. Gammon and J. Stewart arrive in Wawa to assist in mobilizing Tx towers for Mini-Fix chain.
(c) Electronic technicians R. Waldock and S. Kowalczyk arrive re electronic positioning system.

May 11
(a) Crew and staff assisted by helicopter mobilizing and activating Mini-Fix station Slave II on Davieaux Island. Board and lodging supplied by the local lighthouse keeper. Local power used for Tx.
(b) Electronic technical on seasonal assignment arrived in p.m.
(c) CSS BAYFIELD delayed in departing CCIW.

May 12
Mini-Fix Slave II mobilization completed and put on standby. Shore power used on a land rental agreement.
May 13
(a) All personnel returned from Davieaux Island (Slave II) in a.m.
(b) Commence mobilizing Mini-Fix Master station at Coldwater River. Ancillary power supply made operational.

NOTE: This site located in Superior Provincial Park with permission of the Parks Superintendent.

May 14
(a) CSS BAYFIELD with party chief P. Richards aboard depart CCIW for the working area in the p.m.
(b) Complete ground wire mat at Slave I in Manainse.

May 15
All shore based exercises completed.

May 16
(a) R. Gammon, quartermaster, leaves for CCIW.
(b) Mini-Fix system made operational.

May 17-18
(a) CSS BAYFIELD unserviceable in Sarnia en route to Lake Superior with refrigeration problems.
(b) Commence calibrating Mini-Fix chain - fly Master and Slaves baseline extensions with good results and 200 watt power output.
(c) Continue calibrating positioning system at known geographical points in the working area.
(d) Compute velocity of propagation or radio waves peculiar to the Mini-Fix chain.

May 19
(a) CSS BAYFIELD arrived in Sault Ste. Marie.
(b) Seaman J. Stewart departs shore party and rejoins ship.
(c) Self and electronic technicians meet ship in Sault Ste. Marie to calibrate sonar and positioning equipment.
(d) Loan Mini-Fix receiver to the MV SEPTUIGE, COLUMBIA TRANSPORTATION - a contractor employed to investigate hazards that might have caused the sinking of the SS EDMUND FITZGERALD.
May 20

(a) Technicians Mallock and Kowalczyk return to CCIW in late p.m.
(b) BAYFIELD mooring reference buoys - entangle wire cable in starboard propeller - wire cleared at 1730 hours by local divers.
(c) Experiencing some problems with fluctuating voltage on laboratory power supply.
(d) Helicopter unserviceable in p.m.

May 21

(a) Helicopter still unserviceable.
(b) Ship mooring reference buoys.
(c) Calibrate Atlas Deso 10 echo sounder at 90 m - velocity of sound waves in water established at 1415 m/sec.

May 22

(a) Helicopter establishing pattern readings on reference buoys.
(b) Problems with diesel generators at Master.

May 23-24

(a) BAYFIELD in Sault Ste. Marie - R/T problems.
(b) Observe Sunday and Monday holiday.

May 25-26

(b) Helicopter establishing pattern readings on reference buoys.

May 27

(a) Self and new term employee join ship in Sault Ste. Marie at 1500 hours - self carry on to Wawa by helicopter.
(b) R. Tripe of CHS Development Group arrived aboard ship in p.m. solving data processing problems.

May 28

Self and R. Tripe return to Burlington arriving in late evening.

May 29-31

Ship logging bathymetric data but processor still unserviceable.
June 1-2
(a) Collecting bathymetric data - processor unserviceable.
(b) Experiencing some problems with helicopter.

June 3
(a) BAYFIELD to Quebec Harbour for repairs to logging system.
(b) Carry out revisory work in Quebec Harbour.
(c) Some problems with transmitter at Slave 1 (Station CAN) - effect repairs.

June 4
Ship at anchor in Quebec Harbour - continue with revisory work.

June 5
Processing bathymetric/navigation data.

June 6-7
Collecting data.

June 8-9
(a) Carry out repairs to Master generator and Atlas Deso 10 sounder
(b) Having problems with processing.

June 10-12

June 13-14
Data collecting.

June 15-19
(a) Data collecting - electrical storms on June 15th.
(b) Ship overnight off Caribou Island and in Quebec Harbour during rougher weather.

June 20-25
(a) Collecting data - periodically having problems with processing.
(b) Master mechanic from CCIW carry out repairs to Master diesel generator on June 20th.

June 26-28
(a) Ship at Sault Ste. Marie for break.
(b) Technicians repair ship's radar.
June 29 - July 8  (a) Ship collecting data full time.
(b) Shut down Mini-Fix chain at 2000 hours on July 8th - ship depart working area for duties at Olympics at Kingston. Staff return to Burlington.

July 27  Electronic technician and helicopter C-FCGL return to Wawa to activate Mini-Fix positioning system. BAYFIELD in drydock at Kingston for repairs.

July 28  (a) Helicopter supplying fuel cache for Master diesel generators.
(b) Recalibrate positioning system.
(c) Lake Superior staff readying for return to project.

July 29-31  (a) Ship out of drydock on July 30th.
(b) Electronic technician to ship re tape drives on processing equipment.
(c) Ship arrives at CCIW on July 31st.

August 1-3  Repairs to processing system being carried out at CCIW.

August 4  BAYFIELD depart CCIW for Lake Superior at 1150 hours.

August 7  (a) Staff rejoin ship at 1400 hours.
(b) Ship departs Sault Ste. Marie at 2000 hours for working area.

August 8-19  Ship running mainline sounding, interlines and shoal examinations.


August 22-26  Data collecting.
August 27-29  
(a) Ship in Michipicoten Harbour for repairs and because of gale force winds.  
(b) Self to Wawa re program.

August 30 - Sept. 3  
Data collecting.

Sept. 4-6  
(b) L. Cram, U.S. Exchange, join ship at Sault Ste. Marie on September 4th.

Sept. 7-16  
(a) Data collecting - mainline sounding, interlines and shoal examinations.  
(b) Mr. Kerr visits ship on September 8th and 9th.  
(c) Electronic technician W. Montgomery on board September 11th and 12th.  
(d) Staff member J. Dixon to Wawa from ship on Sept. 14th.

Sept. 17-18  
(a) Ship at Sault Ste. Marie.  
(b) Electronic technician D. Pyatt joined ship, R. Coons returned to CCIW.

Sept. 19-30  
(a) Data collecting - interlines, shoal examinations, checklines, and bottom samples.  
(b) Complete ship operations at 1700 hours on Sept. 30th.

October 1-6  
(a) Demobilize Mini-Fix chain.  
(b) Return to CCIW on October 6th.

FIELD OPERATIONS TERMINATED
PLANNING

Planning for a bathymetric survey of the shoal ridden area bounded by Southwest Bank and the southern limits of Michipicoten Island began immediately on receiving an urgent request from the Ministry of Transport for a modern survey of shoal infested waters lying immediately north and adjacent to Caribou Island. It was originally thought that the ill-fated S.S. EDMUND FITZGERALD may well have holed herself on a rock (known or unknown) while making passage on a previously thought reliable route between Michipicoten and Caribou Islands.

Mr. F.L. DeGrasse, Hydrographer-in-Charge of CSS BAYFIELD, accompanied by Captain Birchall and Mr. B. Waldock, electronic technician, assisted by a Jet Ranger helicopter from M.O.T., Parry Sound, visited the area during the period April 5-9th to carry out reconnaissance for a shore based electronic positioning system, berthing/anchorage facilities, field headquarters, etc. -- all parameters required prior to designing a working plan.

Project Instructions were duly issued by the Regional Hydrographer, Central Region, in early May, 1976. The objective of the instructions was that we were to chart the offshore area within the limits as described above for the production of a new or revised edition of CHS Charts 2310 and 2300.

Additionally, "The bathymetric data shall be portrayed on a UTM projection with geographical graticules at a natural scale of 1:50,000. The main lines of bathymetry will be oriented North-South at a line interval of 500 metres and closer where the water depth tends to lessen in order to produce a true representation of the-bottom topography. The sounding lines are to be run as near as possible to the shoreline at the discretion of the Captain. It is imperative that all shoal areas be fully developed to obtain minimum depths in the potentially hazardous to shipping area between Caribou and Michipicoten Islands. Particular attention should be given to the Southwest shoal and waters in close proximity.

All data will be recorded and portrayed in metric units and the final product machine-drawn on the Gerber plotter."
OPERATIONS

Use of the high powered Mini-Fix positioning system made it necessary for us to extend horizontal control on the N.A. 1927 datum to accommodate the shore based transmitter sites as selected on the earlier reconnaissance trip.

Because of the lack of control and instrumentation to establish same in the Michipicoten-Davieaux Islands area, Geodetic Survey of Canada, EMGR, agreed to establish a control point for us by translocation satellite receiver. Myself, assisted by two engineers from EMGR and two hydrographers, completed this work for Slave II during the period April 22nd to April 25th -- this was an "around the clock operation."

We returned to CCIW to continue survey preparations during the period April 26th to May 3rd.

Field operations began on May 4th with the departure from CCIW of myself, party chief P. Richards, assistant B. Power, electronic technician and temporarily assigned crew members.

During the period May 4th - 18th, the survey party established horizontal control for Master and Slave I stations. The Mini-Fix chain was mobilized, calibrated and made operational for the arrival of CSS BAYFIELD on May 19th. Because of problems with refrigeration, the ship was three days late arriving in the working area.

Two of the 70 foot T.V. antennas at the shore transmitting sites were raised into position by helicopter while the tower at the other site - Slave II on Davieaux Island was erected into place by ginpole and the expert assistance of R. Gammon.

Calibrations of the chain were carried out on May 17th and 18th by flying the Master and Slave baseline extensions. This exercise enabled us to compute the new velocities of propagation which were found to be 299,244. and 299,480 km/s for the respective patterns. Thereafter, calibrations were carried out at known geographical points within the working area - system pattern reading as compared to computed patterns differed only by 0.1 and 0.2 lanes.
At this stage, a monitor Mini-Fix recorder was located at Michipicoten (Maurepas) Island east lighthouse to determine pattern stability. Also, pattern reference buoys borrowed from the Operations Group, I.W.D., were located by taut wire moorings in the project area. Pattern readings were placed on the buoys by helicopter.

Prior to starting data collecting, a rendezvous was made in Sault Ste. Marie with the M.V. NEPTUNE of the Columbia Transportation Company - a private surveying contractor retained to confirm the existence of a 6 fathom (10.7 m) shoal bearing 355 deg. (T) at approximately 6.5 n.m. from Caribou Island lighthouse or any other hazard to shipping in the vicinity. Their findings by conventional methods and diver were passed on to us and confirmed at a later date.

The initial logging attempts were not successful. Consequently, Mr. R. Tripe, of the Development Group, arrived in Sault Ste. Marie on May 27th to correct system software logging faults. It was found that the tape drives and the previously recorded program tapes were not operating properly. Mr. Tripe prepared new program tapes to enable logging of navigation and bathymetry data. Processing at this time was not possible. However, sounding was begun on May 29th. Data was logged with satisfactory results.

During the period June 10th to 12th, Mr. G. Macdonald of the Development Group paid a visit to the ship in Sault Ste. Marie and revised the processing software program enabling us to log, process and machine draw the bathymetric data on the ship-borne Calcomp plotter. Hence, the backlog of bathymetric data was duly processed without any loss of ship time.

It was originally conceived that we could productively maintain a twenty-four hour operation with 200 watts of power being generated by the Mini-Fix chain. However, the long distances from the chain to the working area (70 n.m.) combined with unavoidable poor grounding at the transmitting sites, allowed only a dawn to dusk operation.
The C.H.S. complement of staff aboard ship comprised two staff and one term employee; support from shore based personnel in Wawa consisted of an electronic technician and a Jet Ranger helicopter. This arrangement worked well for a 12 hour operation. However, had we been able to operate around the clock, one additional staff would have been required.

Data collecting and processing continued throughout June on a routine basis with priority being given to completing the shoal area north of Caribou Island. During the period the Mini-Fix positioning system operated practically trouble-free except for some minor problems with a diesel engine. However, some difficulties were experienced with the tape drives and the sounder digitizer. These problems were corrected and operations continued until early July.

In mid-June, it was learned that CSS BAYFIELD would be required to cease operations by July 9th and carry out reconnaissance for future revisory surveys in Lake Ontario and appear at the Olympic games in Kingston during the Prime Minister's visit.

On August 7th, CSS BAYFIELD returned to the working area after having been drydocked at Kingston for hull repairs and stopping at CCIW for modifications and repairs to the tape drives.

On the second phase of the project, data collecting continued commencing August 8th after a one month delay which necessitated a second calibration to the positioning system which was carried out by helicopter on July 28th. The second calibration showed no significant difference in velocity of propagation values and the original values were used throughout the entire survey period. During the second week of August, the linear amplifier at Slave I failed and resulted in the chain being operated at reduced power until a replacement was obtained.

Problems still plagued the survey in the form of INDAPS failures. R. Coons, the electronic technician, made repairs which enabled another 10 days of work before another failure occurred. R. Coons once again reactivated the system but processing was held up because of a defective cartridge tape. Processing was not brought up to date until September 9th.
The Atlas sounding digitizer (EDIG 10) was a source of frustration for the hydrographers throughout the season. Random bad depths were appearing in the records at random and these depths had to be checked against the appropriate sounding rolls to prove or disprove their existence. The staff had to be particularly careful in the shoal areas so as not to leave any misleading depths which might be taken for shoals. Problems were also encountered with the digitizer in water deeper than 100 metres. The digitizer had difficulty in digitizing the true bottom, and on occasion this would cause the INDAPS to abort the logging function.

During August, most of the operational time was spent on shoal areas with some mainline sounding completed.

Mr. P. Richards left the BAYFIELD on September 2nd to return to university, and Mr. M. Crutchlow joined the BAYFIELD to replace P. Richards as sub-party chief. At the same time, Mr. L. Cram, the U.S. Exchange hydrographer, joined the BAYFIELD to participate as a working field hydrographer standing a regular sounding watch.

Sounding was resumed on September 7th after the long weekend break. The shoal areas were finished and mainline sounding resumed.

Mr. A.J. Kerr, Regional Hydrographer, visited the BAYFIELD on September 8th and 9th. Transportation was via our M.O.T. helicopter from Wawa to Quebec Harbour and return thereby losing no ship time. During the latter part of the season, Captain Birchall had decided to return to Quebec Harbour because of the unpredictable weather conditions that plague Lake Superior.

INDAPS hardware problems continued to be a problem, particularly the tape drives. W. Montgomery was sent from Burlington to sort the system out. During Mr. Montgomery's two day stay aboard the BAYFIELD, the tape drives were adjusted to the correct specifications for speed and the Atlas sounder and digitizer were adjusted to be less sensitive to extreme noise in the sounding system. Although this helped somewhat, problems were still experienced with "deep water" soundings.
On September 14th, Mr. J. Dixon left the BAYFIELD to join the shore based support operation in Wawa. Mr. R. Coons, the electronic technician, departed for Burlington and was subsequently replaced by Mr. D. Pyatt. Because of the electronic problems experienced aboard the BAYFIELD, it had been decided to have the electronics technician remain aboard ship for the remainder of the survey.

By September 30th, all recovery work had been completed on Field Sheet 3908. Demobilization of the Mini-Fix chain began on the morning of October 1st and was completed on October 6th, when all personnel returned from the field.
SUMMARY

No significant differences could be found between this year's soundings and those of Chart 2310. All shoals within the field sheet limits were examined thoroughly by electronic and mechanical means using Atlas and Raytheon sounders and leadline for depths, for verification.

A high powered Mini-Fix chain in the hyperbolic mode was used exclusively for horizontal positioning. Calibration of the chain was performed prior to the commencement of bathymetric data collection and again midway through the survey period. Reference buoys were placed throughout the survey area to provide a convenient check on the integrity of the Mini-Fix readings aboard the BAYFIELD.

Although two field sheets had originally been detailed for this survey, only one was completed. This resulted from the loss of the BAYFIELD to the survey midway through the season. The second field sheet was to have been done on an opportunity basis and was not contained within the area outlined by the Canadian Coast Guard as a priority area.

The results of the survey were forwarded to the Ministry of Transport at the conclusion of the field season. This was in the form of two sheets. The first sheet showing only shoalest depths was provided in September and the second sheet showing complete sounding coverage was provided at the beginning of December.
RECOMMENDATIONS

A) EQUIPMENT

1. Mini-Fix

The Mini-Fix chain itself worked quite well except for the fact that it could only be utilized for 12 hours a day instead of the anticipated 24 hours. Because of the nature of the terrain and long distances involved, this could not be avoided. In future surveys involving the BAYFIELD with Mini-Fix positioning, the chain should be located so as to allow a 24 hour a day operation. This would double productivity while at the same time almost halve the cost per sounding mile.

2. INDAPS

Faulty tape drives were the main source of trouble with the INDAPS. Whenever tape drives were changed, it usually meant problems with the existing tapes. Problems were encountered reading and writing from one drive to the other. This delayed the processing on several occasions and at one point caused the loss of two days of bathymetric data. These tape drives need to be made reliable before the start of the next season.

Mechanical parts which are prone to failure or simply wear out because of continuous use, should be replaced as preventative maintenance or carried as spare parts along with the equipment. A worn O-ring on the Centronix printer took weeks to fix because of the lack of a spare part.

3. Sounder

The only problem encountered with the Atlas sounding system emanated from the EDIG 10 digitizer. In waters deeper than 100 metres, the digitizer would become overly sensitive to noise in the water column or at times fail to give any depth reading at all. The results of both of these were:

a) erroneous depths appearing on the plot
b) fatal alarms in the INDAPS
These erroneous depths have to be deleted from the Field Sheet which means that every sounding must be verified manually. Undoubtedly, some of the less obvious errors may not be detected and will remain as valid depths.

B) BAYFIELD

Some of the following recommendations for the BAYFIELD have or will be undertaken for the 1977 field season.

A larger work boat should be kept on the BAYFIELD in place of the small aluminum boat now used. The aluminum boat had a limited load carrying capability as well as being unsafe in rough water. This is a definite disadvantage when having to transport personnel and equipment or using it for shoal searches in open water.

The lab. on the boat deck is the only work space available for hydrographic operations. During this past season, it has been a very limited area with only enough room for the equipment and limited storage space. Any office work or hand work on plots had to be done on the dining table which is not a very satisfactory arrangement. The new lab. hopefully will alleviate the lack of working space.

Staff accommodation is very cramped for more than one person per room. Because of the design and size of the cabins, very little, if anything, can be done about this except to limit the cabins to single occupancy for surveys that require extended periods away from port. One of the aft cabins could be converted to a single berth with a desk for the hydrographer-in-charge. This would provide a work area for such things as writing reports and managing accounts.

Co-operation from the BAYFIELD's officers and crew was excellent throughout the survey and in large part, led to the successful completion of this year's work.
APPENDIX A

- MINI-FIX CHAIN PARAMETERS -
## MIN - FIX CHAIN PARAMETERS

<table>
<thead>
<tr>
<th></th>
<th>MASTER</th>
<th>SLAVE I</th>
<th>SLAVE II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(COLD)</td>
<td>(CAN)</td>
<td>(GEOD)</td>
</tr>
<tr>
<td>Geographic Lat (N)</td>
<td>47-27-58.965</td>
<td>47-02-10.015</td>
<td>47-41-40.590</td>
</tr>
<tr>
<td>Co-Ords Long (W)</td>
<td>84-47-20.367</td>
<td>84-46-59.155</td>
<td>85-48-18.133</td>
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<tr>
<td>U.T.M. N Co-Ords</td>
<td>5,259,144.19</td>
<td>5,211,343.99</td>
<td>5,282,830.89</td>
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<td>Zone</td>
<td>666,626.65</td>
<td>668,429.87</td>
<td>589,665.88</td>
</tr>
<tr>
<td>E</td>
<td></td>
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</tr>
<tr>
<td>Zone</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Horizental Datum</td>
<td>NA 1927</td>
<td>NA 1927</td>
<td>NA 1927</td>
</tr>
<tr>
<td>Vertical Datum</td>
<td>IGLD 1955</td>
<td>IGLD 1955</td>
<td>IGLD 1955</td>
</tr>
<tr>
<td>Baseline Length</td>
<td></td>
<td>47,836.81 M</td>
<td>80,538.88 M</td>
</tr>
<tr>
<td>Transmitted Freq.</td>
<td></td>
<td>1703.0 KHZ</td>
<td>1703.0 KHZ</td>
</tr>
<tr>
<td>Speed of Propagation</td>
<td></td>
<td>299.480</td>
<td>299.244</td>
</tr>
<tr>
<td>KM/sec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total No. of Lanes</td>
<td>544.05</td>
<td>916.69</td>
<td></td>
</tr>
<tr>
<td>Lane Width</td>
<td>87.927 M</td>
<td>87.858 M</td>
<td></td>
</tr>
<tr>
<td>Transmitted Power</td>
<td>200 Watts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B - 1 & 2

APPENDIX B1 SHOWS THE FIELD SHEET AREA IN RELATION TO LAKE SUPERIOR

APPENDIX B2 SHOWS THE MINI-FIX CHAIN LAYOUT AND THE HYPERBOLIC PATTERN GENERATED OVER THE WORK AREA
APPENDIX C

- FIELD SURVEY STATISTICS -

FROM APRIL 5TH TO JULY 9TH

AND FROM JULY 27TH TO OCTOBER 6TH
<table>
<thead>
<tr>
<th>Project Name</th>
<th>Project Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAKE SUPERIOR SURVEY</td>
<td>6600-76-2</td>
</tr>
</tbody>
</table>

**Sources:**

- Number of Hydrographers  - 5/315
- Number of Scientists    - n/a
- Number of Electronic Technicians - 3/153
- Number of Student Assistants and Casuals - 1/107
- Number of Support Personnel (Ship's Crew, Etc.) - 18/1403
- Total Personnel - 27/1978
- Number of Ships - 1
- Number of Launches - 0
- Number of Land Vehicles - 1
- Number (and type) of Aircraft - HELICOPTER 1
- Number of Minor Support Staff - 9

*Could provide two figures separated by a slash. The first figure being the average number on strength and the second being the man days. For number of Hydrographers: 5/100 (an average of 5 Hydrographers spent 100 man days on the project).*
<table>
<thead>
<tr>
<th>Establishment</th>
<th>Project Number</th>
<th>Project Number</th>
<th>Project Number</th>
<th>T.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAKE SUPERIOR SURVEY</td>
<td>6600-76-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F.L. DE GRASSE</td>
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<td></td>
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**Ship Survey Only**

<table>
<thead>
<tr>
<th>Description</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total operational days</td>
<td>124</td>
</tr>
<tr>
<td>Actual field work</td>
<td>67</td>
</tr>
<tr>
<td>Lost (weather)</td>
<td>4.5</td>
</tr>
<tr>
<td>Lost (Sat. Sun. Holidays)</td>
<td>21</td>
</tr>
<tr>
<td>Lost (Equipment failure)</td>
<td>23.5</td>
</tr>
<tr>
<td>Lost in Transit</td>
<td>8</td>
</tr>
<tr>
<td>Lost in port for Supplies, Bunker, etc.</td>
<td>0</td>
</tr>
<tr>
<td>Lost, other causes</td>
<td>n/a</td>
</tr>
</tbody>
</table>

| Total Man days in period (staff) | 422  |
| Total Man days worked (staff)    | 376  |

**Man Days (Staff)**

- (a) Sounding: 104
- (b) Shoal Examinations: 56
- (c) Wharf surveys: n/a
- (d) Oceanography: n/a
- (e) Geophysics: n/a
- (f) Tides & water levels: n/a
- (g) Collecting bottom samples: 8
- (h) Horizontal Control: 15
- (i) Shorelining & Low Watering: n/a
- (j) Data processing & office admin.: 85
- (k) Sailing directions: n/a
- (l) Place Names: n/a
- (m) Current observations: n/a
- (n) Photo-Ident.: n/a
- (o) Others (specify): CHART REVISION: 9

**Survey Mobilization & Demobilization**

- Survey Mobilization: 87
- Survey Demobilization: 12
- Servicing Mini-Fix Sites: 12
<table>
<thead>
<tr>
<th>Establishments</th>
<th>LAKE SUPERIOR SURVEY</th>
</tr>
</thead>
<tbody>
<tr>
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<td>F.L. DE GRASSE</td>
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<tr>
<td>Project Number</td>
<td>6600-76-2</td>
</tr>
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<table>
<thead>
<tr>
<th>Sounding (Linear Nautical Miles/KM):</th>
<th></th>
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<tbody>
<tr>
<td>Ship Sounding</td>
<td>9476 km</td>
</tr>
<tr>
<td>Launch Sounding</td>
<td>n/a</td>
</tr>
<tr>
<td>Other (specify)</td>
<td>n/a</td>
</tr>
</tbody>
</table>

| Total sounding                      | 9476 km |
| Reconnaissance (Track) sounding     | n/a  |
| Area sounded (N.M²) (Km²)           | 2500 Km² |

| Shoals Examined:                    | |
| Shoal Examinations (Ship)           | SHOAL AREAS 12 |
| Shoal Examinations (Launch)         | n/a |
| Shoal Examinations (Sweep)          | n/a |
| Shoal Examinations (other) specify  | n/a |
| Shoal Examinations (Total)          | SHOAL AREAS 12 |

<p>| Navigational Aids:                  | |
| Shore Aids Positioned (including ranges) | n/a |
| Floating Aids Positioned             | n/a |
| Navigational Ranges Sounded         | 1 (for chart revision only) |
| Navigational Ranges Drifted         | n/a |
| Sector Ranges Positioned             | n/a |
| Navigational Aids Established       | n/a |</p>
<table>
<thead>
<tr>
<th>Establishment</th>
<th>LAKE SUPERIOR SURVEY</th>
<th>Project Number</th>
<th>Project Number</th>
<th>Project Number</th>
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<tbody>
<tr>
<td>N.I.C.</td>
<td>F.L. DE GRASSE</td>
<td>6600-72-6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Shore Control:**
- Signals built: 6
- Signals re-built: 0
- Towers built (MINI-FIX POSITION. SYST.): 3
- Number of Stations occupied: 10
- Number of Stations re-occupied: 0
- Number of stations permanently marked: 3
- Distance Traversed (N.M.) (K.M.): 16 KM

**Other (specify):**

<table>
<thead>
<tr>
<th>Calibrations:</th>
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<tr>
<td>No. of Calibration Stations: n/a</td>
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<tr>
<td>Albedo, Decca, Hi-Fix, Mini Fix,oran, Decca Navigator,</td>
</tr>
<tr>
<td>No. of F/C's marked and referenced: 3</td>
</tr>
<tr>
<td>MINI-FIX MONITOR: 1</td>
</tr>
<tr>
<td>Establishment</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>H.I.C.</td>
</tr>
</tbody>
</table>

**Tide and Current Data:**

- Recording gauges established
  - n/a
- Recording gauges recovered
  - n/a
- Staff gauges established
  - n/a
- Bench Marks Recovered
  - n/a
- Bench Marks Established
  - n/a
- Bench Marks Levelled
  - n/a
- Distance Levelled (N.M.) (Km)
  - n/a
- No. of Current Meters Set Out
  - n/a
- No. of Current Meters recovered
  - n/a
- No. of hours of Current Measurements
  - (Other than with Moored Meters)
  - n/a

**Oceanography:**

- No. of Oceanographic stations
  - n/a
- Gravity Profiles-survey (N.M.) (Km)
  - n/a
- Gravity Profiles-track, (N.M.) (Km)
  - n/a
- Magnetic Profile-survey (N.M.) (Km)
  - n/a
- Magnetic Profile-track, (N.M.) (Km)
  - n/a
- Seismic Profile-survey (N.M.) (Km)
  - n/a
- Seismic Profile-track (N.M.) (Km)
  - n/a
- Number of Water Samples
  - n/a
<table>
<thead>
<tr>
<th>Establishment</th>
<th>Project Number</th>
<th>Project Number</th>
<th>Project Number</th>
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<tr>
<td>F.L. De Grasse</td>
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</tbody>
</table>

**Bottom Samples:**

- Number of bottom samples (Grab) 65
- No. of bottom samples (underway) 0
- No. of bottom samples (Armed Lead) 7
- No. of Cores 0
- No. of Samples retained 0

**Miscellaneous:**

- No. of Dangers to Navigation, rocks, ruins, pilings, etc., fixed. 0
- Shoreline checked (N.M.) (NM) n/a
- Harves surveyed n/a
- No. of Reference buoys streamed 7
- No. of Reference buoys recovered 0
- No. of Shore Stations Established: 3

**MINI-FIX**

- Helicopter flying hours
<table>
<thead>
<tr>
<th>Project Number</th>
<th>Project Number</th>
<th>Project Number</th>
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Data submitted from the field:

(Include file numbers:)

1 field sheet number 3908
2 books sounding notes 70717
1 book observation notes 70720
1 book computation notes 70718
1 book miscellaneous notes 70719

Quebec Harbour Michipicoten Island
revisory work

1 book sounding notes 70763
1 book miscellaneous notes 70764
APPENDIX D

THE FOLLOWING FOUR GRAPHS SHOW FOUR DAYS OF MINI-FIX MONITOR RECORDINGS TAKEN AT THE EAST END OF MICHIPICOTEN ISLAND AT THE LIGHT HOUSE.

VALUES WERE RECORDED EVERY 10 MINUTES ON A PAPER PRINTER AND THESE VALUES ARE SHOWN ON THE GRAPH. THE INTERPOLATION BETWEEN THESE PRINTS IS NOT NECESSARILY CORRECT.

WHAT THESE GRAPHS DO SHOW IS THE GENERAL TRENDS OF MINI-FIX STABILITY OR LACK OF IT DURING EACH TIME PERIOD.

IT SHOULD BE NOTED THAT THERE WAS CONSIDERABLE LAND PATH BETWEEN MONITOR AND SLAVE I. THIS SHOULD EXPLAIN THE MORE UNSTABLE READINGS ON PATTERN I.
APPENDIX E

- PHOTOGRAPHS OF THE FIELD OPERATIONS -
SEPTEMBER 21

A snow storm keeps the helicopter on the ground. Winter comes early in Lake Superior.

Erection of the Mini-Fix towers was made much easier by the use of the Jet Ranger helicopter. Time, equipment and manpower were saved by this method.
A cone was used for calibration of the hydrographic and ship's sounders. In the relatively cold deep waters of Lake Superior, very little change was noticed in the speed of propagation of sound in the water.

A Shipek grab sampler was used for retrieval of bottom sediments in the survey area. A leadline was used for the shoal samples.
THE M/V NEPTUNE WAS CHARTERED BY COLUMBIAN TRANSPORTATION TO INVESTIGATE THE SHOAL AREAS NORTH OF CARIBOU ISLAND TO DETERMINE IF THE "EDMUND FITZGERALD" HAD STRUCK BOTTOM IN THIS AREA. SOUNDINGS WERE BY LEADLINE AND ECHO SOUNDER WITH VISUAL OBSERVATIONS BY DIVERS.

Laying reference buoys with the BAYFIELD for Mini-Fix checks.

OR

Hand me the paint and I'll mark an X on the water.
SUPPLEMENTARY ITEMS
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Bareboat Charter Covering S/S EDMUND FITZGERALD
BAREBOAT CHARTER

THIS BAREBOAT CHARTER, dated as of September 1, 1958, between
THE NORTHEASTERN MUTUAL LIFE INSURANCE COMPANY, Milwaukee, Wis-
consin, a mutual insurance corporation organized under the laws of the
State of Wisconsin (hereinafter called the "Owner"), and OGLEBAY NORTON
COMPANY, Cleveland, Ohio, a Delaware corporation (hereinafter called
the "Charterer"):

WITNESSETH:

WHEREAS, the Owner is the sole owner of the bulk cargo vessel
known as S. S. EDMUND FITZGERALD, documented at Milwaukee, Wisconsin,
under the laws of the United States, and bearing the United States
Bureau of Customs official number 277437 (hereinafter called the
"Vessel"); and

WHEREAS, the Charterer desires to charter the Vessel at the
charter hire and for the term and upon the conditions hereinafter pro-
vided;

NOW, THEREFORE, in consideration of the premises and of the
charter hire to be paid and the covenants hereinafter mentioned to be
performed, the Owner hereby lets and demises, and the Charterer hereby
hires, the Vessel upon the following terms and conditions, namely:

1. Acceptance of Vessel. The Charterer hereby accepts the
Vessel and acknowledges full performance by the Owner of all its obli-
gations in respect of the seaworthiness and satisfactory condition of
the Vessel. The Charterer further acknowledges that the Vessel has a
full unexpired highest classification issued by the American Bureau of Shipping for vessels of the same size and type and has all other required certificates. At all times during the continuance of this Charter, the Vessel shall, for all purposes, be deemed to be in the exclusive possession of the Charterer.

2. **Charter Period.** Unless sooner terminated as hereinafter provided, this Charter shall run for an initial period of 25 years, commencing with the date hereof (hereinafter called the "Original Period"), and may, at the option of the Charterer, be extended for an additional period of 15 years (hereinafter called the "Extended Period"). Such option shall be exercised by giving written notice thereof to the Owner not less than 90 days prior to the end of the Original Period.

In the event that the Original Period, or the Extended Period in case this Charter is extended, expires on a date which falls within the Great Lakes season of navigation, the Charter shall nevertheless continue in effect for the balance of such season. Any such extension for the balance of a season of navigation shall, for purposes of this Charter, be deemed to be a part of the Extended Period.

3. **Charter Hire.** The Charterer agrees to pay to the Owner as charter hire for the Vessel the following amounts in cash:

   A. $570,000 per annum during the Original Period, payable annually in advance commencing with the date hereof.
B. $241,000 per annum during the Extended Period, if any, payable annually in advance commencing with the first day of the Extended Period. Charter hire shall be paid in advance at the same rate for any unexpired portion of a season of navigation during which this Charter is continued in effect as provided in Paragraph 2 hereof.

It is the purpose and intent of the parties that the charter hire hereinbefore provided for shall be absolutely net to the Owner so that this Charter shall yield, net, to the Owner, the amounts so specified, and that all costs, expenses and obligations of every kind and nature whatsoever relating to the Vessel (except certain taxes of the Owner referred to in Paragraph 7 hereof) which may arise or become due during the Original Period or Extended Period, if any, shall be paid by the Charterer.

All payments provided for herein shall be made in such coin or currency of the United States of America as at the time of payment shall be legal tender for the payment of public and private debts. All payments shall be made at the Owner’s office, Attention: Bcnd Department, at 720 East Wisconsin Avenue, Milwaukee 2, Wisconsin, or at such other place or places as the Owner shall hereinafter designate in writing to the Charterer.

4. Trading Limits. The Charterer may employ the Vessel throughout the Great Lakes and their connecting and tributary waters
and, upon completion of the St. Lawrence Seaway, through the St. Lawrence River and the Gulf of St. Lawrence as far east as a line drawn north and south through the west end of Anticosti Island, in any lawful trade for which the Vessel is suitable, including the transportation of iron ore, limestone, coal and grain.

The Owner shall cooperate with the Charterer in the renewal or procurement of all such documents, licenses and certificates in the issuance of which the Owner's cooperation is or may be necessary in order that the Charterer may operate and navigate the Vessel in trade between such ports within the waters hereinabove mentioned which the Vessel may be capable of navigating.

5. **Equipping and Manning.** The Charterer shall, at its own expense and by its own procurement, man, victual, navigate, operate, supply, fuel, maintain and repair the Vessel and shall pay all other charges and expenses of every kind and nature whatsoever incident to the use and operation of the Vessel under this Charter.

6. **Maintenance and Inspection.** The Charterer shall, at its own cost and expense, maintain and keep the Vessel, her machinery, boilers, auxiliaries, equipment, furnishings and spare parts in good order and repair (ordinary wear and tear excepted) and in efficient operating condition and in accordance with good commercial maintenance practices, and shall keep the Vessel at all times tight, staunch, strong and well and sufficiently tackled, apparelled, furnished and equipped,
and in all respects seaworthy, with full unexpired classification and other required certificates. The Charterer shall be allowed a reason-able time in all instances to effect any required repairs, corrections or replacements. As used herein, the term "good commercial maintenance practices" shall mean those practices commonly observed by owners and operators of similar vessels engaged in similar trade.

Without limiting the foregoing, the Charterer agrees, at its own expense to keep the Vessel in such condition as will entitle it to the highest classification and rating of the American Bureau of Shipping (or other classification organization selected by the Charterer and approved by the Owner) for vessels of the same size, age and type, and shall furnish to the Owner upon request photostatic copies of all certificates issued by the American Bureau of Shipping (or such other classification organization) evidencing the maintenance of such classification. Without limiting the foregoing, the Charterer will furnish to the Owner on or before the fifteenth day of May in each year during the continuance of this Charter, a certificate of the American Bureau of Shipping (or such other classification organization) showing that the Vessel has such classification.

The Vessel shall be repaired and overhauled by the Charterer whenever necessary and the Charterer shall make such renewals and replacements as may be required in order to maintain the classification
required by this Paragraph 6. The Vessel shall be drydocked, cleaned and bottom-painted by the Charterer whenever necessary and whenever required by the regulations of the United States Coast Guard or by any other agency or regulatory body that may be authorized to make rules and regulations with respect to such drydocking. The Owner shall be given notice of the time and place of each such proposed drydocking at least 15 days in advance thereof in order that the Owner, if it so desires, may, at the sole cost and expense of the Charterer, have a representative present at such drydocking and otherwise inspect the Vessel. The Charterer shall furnish the Owner with full information regarding any casualties or other accidents involving, or damage to, the Vessel, (except, in the case of any Owner hereunder other than The Northwestern Mutual Life Insurance Company, any casualty involving another vessel owned, operated or chartered by such other Owner) and such reports with respect to the use, operation, maintenance and repair of the Vessel as the Owner shall from time to time reasonably request. The Owner shall have the right at any time, upon reasonable notice and without interruption of the Charterer's use of the Vessel, to inspect the Vessel at the Charterer's expense, to ascertain her condition and to satisfy itself that the Vessel is being properly maintained in accordance with the requirements of this Charter. The Charterer shall also permit the Owner to inspect the Vessel's logs upon reasonable request.

Except as changes may be necessary to comply with applicable laws, rules or regulations, or classification requirements, the Charterer shall make no structural changes in the Vessel or her machinery and boilers without in each instance first securing the written approval
of the Owner. If in order to comply with applicable laws, rules or regulations, or classification requirements, any part, equipment or appliance on the Vessel shall be required to be changed or replaced, or any additional or other part, equipment or appliance shall be required to be installed on the Vessel, the Charterer shall make such changes, additions or replacements at its own cost and expense, and all parts, equipment or appliances so installed shall be considered accessions to the Vessel and title thereto shall be immediately vested in the Owner.

Subject to the Owner's written approval, the Charterer may fit any additional auxiliaries and equipment required for the Charterer's use, such work to be done at the Charterer's expense and such equipment to be considered its property, and the Charterer shall have the right to remove such additional auxiliaries and equipment at its expense during or at the expiration of this Charter, subject to the Charterer's obligation under Paragraph 14 hereof to redeliver the Vessel in the same condition as when received, ordinary wear and tear excepted.

Any dispute or difference of opinion arising between the parties hereto with respect to the Charterer's compliance with the provisions of this Paragraph 5 or in connection with the joint survey required by Paragraph 14 hereof shall be referred to three arbitrators at Cleveland, Ohio, one to be appointed by the Owner, one by the Charterer and the third by the two so chosen, and the decision of a majority of such arbitrators shall be binding upon both parties hereto. Such decision may be made a rule of court, and a judgment or decree may be entered thereon.
7. **Taxes.** The Charterer agrees that, during the continuance of this Charter, in addition to the charter hire herein provided, it will promptly pay all taxes, assessments and other governmental charges levied or assessed upon its interest in the Vessel or upon its use or operation thereof or its earnings arising therefrom, and will promptly pay or reimburse the Owner for all taxes, assessments and other governmental charges levied or assessed against the Owner on account of its ownership of the Vessel or on account of the earnings arising therefrom (exclusive, however, of any such taxes on the charter hire herein provided for, except any such tax on the charter hire which is in lieu of, or relieves the Charterer from, the payment of taxes which the Charterer would otherwise be obligated to pay or reimburse as hereinbefore provided), including any sales or similar taxes payable on account of the chartering of the Vessel hereunder; but the Charterer shall not be required to pay the same so long as it shall in good faith and by appropriate legal or administrative proceedings contest the validity or amount thereof unless thereby, in the judgment of the Owner, the rights or interests of the Owner will be materially endangered.

8. **Liens and Indemnification.** Neither the Charterer nor the Master shall have any right, power or authority to create, incur or permit to be placed or imposed upon the Vessel, any lien whatsoever other than liens for crew's wages or salvage.
The Charterer shall indemnify and hold harmless the Owner against any lien of whatsoever nature on the Vessel and against any claim, founded or unfounded, made against the Owner of whatsoever nature arising out of the use or operation of the Vessel while subject to this Charter, including, without limitation, fines and penalties arising from violation of any applicable laws and any claim or suit on account of any accident in connection with the use or operation of the Vessel while subject to this Charter (whether or not involving defects in construction of the Vessel) resulting in damage to property or injury to any person, notwithstanding that the Charterer carried insurance in accordance with Paragraph 10 hereof.

If a libel shall be filed against the Vessel or the Vessel shall be otherwise levied upon or taken into custody by virtue of any proceedings because of any liens or claims, the Charterer shall, at its own expense, within 20 days thereafter, cause the Vessel to be released and any such lien or claim to be discharged, and shall furnish such bond or other security as may be necessary for such purpose, except that if the claim be one indemnified against by the Owner, the bond or security shall be furnished by the Owner. In the event that the Vessel is levied upon or taken into custody or detained by any authority whatsoever, the Charterer shall forthwith notify the Owner thereof.

The Owner shall indemnify and hold harmless the Charterer against any damage, loss or expense which the Charterer may incur by reason of the assertion by any third person of any lien or claim of whatsoever nature against the Vessel arising at or after the time of her delivery to the Charterer hereunder as a result of any act or omission of the Owner.
9. **Notice of Charter.** The Charterer shall place and keep prominently displayed on the Vessel a notice reading as follows:

"This Vessel is the property of The Northwestern Mutual Life Insurance Company. It is under charter to Oglebay Norton Company, and under the terms of the Charter, neither the Charterer nor the Master, nor any other person, has any right, power or authority to create, incur or permit to be imposed upon the Vessel any lien whatsoever except for crew's wages or salvage."

A properly certified copy of this Charter shall be carried with the Vessel's papers and shall be exhibited on demand to any person having business with the Vessel and to any representative of the Owner.

10. **Insurance.** The Charterer shall, at all times at its own expense,

A. maintain marine insurance on the Vessel covering her hull and machinery against marine risks and, if necessary, on the interests of the parties in anticipated profits, increased value or other interests in the venture in such aggregate amounts as will be sufficient to provide, upon an actual total loss or constructive total loss of the Vessel (within the meaning of such insurance policies) during any year of the Original Period, or the Extended Period, if any, a sum at least equal to the amount indicated in Schedule A hereof applicable to such year;
B. keep the Vessel insured against all other risks usually insured against by companies owning and/or operating vessels of a similar character, within the trading limits described in Paragraph 4 hereof, in such amounts as are customary for such vessels;

C. upon the written request of the Owner, cause the Vessel to be insured, under customary policy forms and up to the amount required in subparagraph A hereof to the extent available from the United States or any department or agency thereof or responsible insurance companies, underwriters or funds, against war risks and against loss or damage caused by strikers, locked-out workmen, or persons taking part in labor disturbances, riots or civil commotions, or persons acting maliciously, or against any of such risks;

D. maintain marine protection and indemnity insurance with respect to the Vessel in at least such amount as such insurance is usually carried by companies engaged in the ownership and/or operation of vessels of a similar character, within the trading limits described in Paragraph 4 hereof, but in no event less than $150.00 per gross ton; and

E. maintain such workmen's compensation or similar insurance as may be required under the laws of any jurisdiction in which the Vessel is operated.

All insurance herein provided for shall be effected under a valid and enforceable policy or policies issued by insurance companies,
underwriters or funds satisfactory to the Owner or by the United States or any department or agency thereof. All such insurance shall be taken out in the names of the Charterer and the Owner as their interests may appear. Any insurance herein provided for may be included in a blanket or fleet policy covering other vessels owned and/or chartered by the Charterer.

Notwithstanding any provisions herein to the contrary, the Charterer shall not be obligated under subparagraph A or subparagraph C hereof to maintain insurance in amounts in excess of the full commercial value of the Vessel unless such excess value insurance is available from responsible insurance companies, underwriters or funds (or, in the case of war risk insurance, the United States or any department or agency thereof) at rates not materially above generally prevailing rates for total loss or increased value insurance on vessels of similar character.

Unless otherwise required by the Owner by written notice to the Charterer and underwriters, although the following insurance shall be payable to the Owner, (1) any loss under any insurance on the Vessel with respect to protection and indemnity and collision liability risks shall be paid, without the Owner's consent, directly to the Charterer to reimburse it for any loss, damage or expense incurred by it and covered by such insurance, or to the person to whom any liability covered by such insurance has been incurred, and (2) in the case of any loss (other than the loss covered by (1) above or other than an actual or constructive total loss) under any insurance with respect to the Vessel involving any damage thereto, the underwriters, without the Owner's consent, shall pay directly for the repair, salvage or other charges involved or, if the Charterer shall have first fully repaired the damage, shall pay the
Charterer as reimbursement therefor. Any insurance proceeds paid to the Owner upon written notice as hereinbefore provided shall, unless the Charterer shall be in default in the performance or observance of any of the terms, covenants or conditions of this Charter, be paid by the Owner to the Charterer to the extent necessary to reimburse the Charterer for any payments for repairs, salvage or other charges, or to discharge any liability, covered by such insurance proceeds.

In the event of the actual or constructive total loss of the Vessel (within the meaning of the insurance policies referred to in this Paragraph 10), the proceeds of insurance shall be payable to the Owner and shall be applied by the Owner to the satisfaction of the Charterer's obligation, if any, pursuant to Paragraph 11 hereof, (or, if such obligation shall have been theretofore paid by the Charterer, such proceeds shall be delivered to the Charterer to the extent required to reimburse it for such payment) and the balance of the proceeds shall be retained by the Owner to the extent of the difference between the Charterer's obligation, if any, pursuant to Paragraph 11 hereof, and the sum indicated in Schedule A hereof applicable to the year in which such loss occurs, and any excess shall be paid over to the Charterer.

Nothing in this Paragraph 10 shall prohibit the Charterer from placing additional insurance, whether on anticipated profits, disbursements or any other interest in the venture, provided (i) that such insurance shall not exceed the amount permitted by the warranties or other conditions contained in the insurance required hereunder, (ii) that any such additional insurance under either subparagraph A or C hereof shall be carried only so long as the Charterer carries the insurance required under such subparagraph in the full amount indicated in Schedule A hereof.
(irrespective of the rate applicable to excess value insurance), and (iii) that the Charterer shall immediately furnish the Owner with the particulars of any such insurance effected, including copies of any binders, cover notes or policies relating thereto.

The Charterer will furnish to the Owner (1) on the date of the delivery of the Vessel a detailed report signed by a firm of independent Marine Insurance Brokers acceptable to the Owner (said Brokers may be those acting for the Charterer in arranging the insurance) with respect to the insurance carried and maintained on the Vessel, together with their opinion as to the acceptability thereof and as to whether such insurance conforms to the requirements of this Paragraph 10, and (2) thereafter, at intervals of not more than 12 calendar months, a detailed report signed by such firm with respect to the insurance carried and maintained on the Vessel, together with their opinion as to the acceptability thereof and as to whether such insurance conforms to the requirements of this Paragraph 10. The Charterer will cause such firm to agree to use their best efforts to advise the Owner promptly of any default in the payment of any premium and of any other act or omission on the part of the Charterer of which they have knowledge and which might invalidate or render unenforceable, in whole or in part, any insurance on the Vessel.

11. **Loss of Vessel.** In case the Vessel shall become an actual total loss or a constructive total loss (as "constructive total loss" is defined in the insurance policies referred to in Paragraph 10 hereof) at any time during the Original Period, then, on the sixtieth day thereafter, the Charterer shall pay to the Owner, as damages in lieu of any further claim of the Owner against the Charterer on account of the Vessel or the redelivery
thereof, an amount in cash equal to the then present value (determined as hereinafter provided) of the total remaining charter hire for the Original period which would otherwise accrue under Paragraph 3 hereof.

To determine, for the purposes of this Paragraph 11, the present value of the total remaining charter hire for the Original Period, the charter hire for each remaining charter year shall be discounted at a rate of 5% per annum from the first day of such charter year to the last preceding charter hire payment date.

Upon the making of the payment herein provided for, or in the event that the Vessel shall become an actual total loss or a constructive total loss (as "constructive total loss" is defined in the insurance policies referred to in Paragraph 10 hereof) at any time during the Extended Period, this Charter shall terminate and the Charterer shall be released from all obligations hereunder including the obligation of redelivery, provided, however, that if any act or negligence of the Charterer has the effect of vitiating any of the insurance provided for in Paragraph 10 hereof, the Charterer shall pay to the Owner all losses and indemnify the Owner against all claims and demands which would otherwise have been covered by such insurance.

12. Requisition of Vessel. In the event that the use of the Vessel shall be requisitioned by any governmental authority on a bareboat, time or voyage charter basis or on any other basis not involving the requisition of title or seizure, such requisition shall not be deemed to terminate this Charter, and all of the obligations hereunder
of the Charterer (including, without limiting the foregoing, the obligation to pay charter hire) shall remain in full force and effect in accordance with the terms of this Charter and the Charterer shall be entitled to the requisition charter hire, if any, during the period that the Charterer is obligated to pay charter hire with respect thereto pursuant to Paragraph 3 hereof.

If title to the Vessel shall be requisitioned, seized, or otherwise taken by any governmental authority during the Original Period, or the Extended Period, if any, and such requisition or seizure is not revoked or released within a period of 90 days thereafter, this Charter shall terminate and all obligations of the Charterer hereunder shall cease at the time such requisition or seizure becomes effective. The Owner shall retain the proceeds received by it in satisfaction of its claim against said governmental authority for such requisition or seizure to the extent of the sum indicated in Schedule A hereof applicable to the year in which such requisition or seizure becomes effective, and shall pay any excess of such proceeds over to the Charterer. Before making any settlement of such claims, however, the Owner shall notify the Charterer of the terms thereof and consult with the Charterer as to the advisability of proceeding with such proposed settlement.

13. **Transfer and Possession.** The Owner may, without consent of the Charterer, transfer or assign to any person qualifying as a citizen of the United States of America within the meaning of Section 2 of the Shipping Act of 1916, as amended, all or any part of its interest
in the Vessel or all or any of its rights under this Charter, but shall not transfer or assign such interest or rights in any manner which would frustrate the venture. The Charterer shall be under no obligation to any assignee of the Owner except upon written notice of such assignment from the Owner.

So long as the Charterer shall not be in default under this Charter, it shall be entitled to the possession and use of the Vessel in accordance with the terms of this Charter but, without the prior written consent of the Owner, the Charterer shall not encumber its interest in this Charter or in the Vessel, or assign or transfer either such interest except to an associated corporation into which the Charterer may be merged or with which it may be consolidated, or to which the Charterer shall transfer all or substantially all of its assets, properties and business, if in the latter case the corporation to which such assets, properties and business are transferred shall execute and deliver to the Owner an agreement in writing assuming and agreeing to perform all of the terms, provisions and conditions of this Charter to be performed by or binding on the Charterer. The Charterer shall not, without the prior written consent of the Owner, part with the possession or control of the Vessel, or suffer or allow it to pass out of its possession or control.

14. Redelivery of Vessel. Upon the expiration of the Charter, the Charterer shall forthwith redeliver possession of the Vessel to the Owner in as good order and condition as she was when accepted hereunder, ordinary wear and tear excepted; provided, however, that if the Charter
expires at the end of a Great Lakes season of navigation or on a date within 30 days thereafter, the redelivery shall be made as soon as practicable but, in any event, within 90 days after expiration of the Charter; and further provided, that if the Vessel is under a governmental requisition of use at the expiration of the Charter, the redelivery shall be made as soon as practicable after its release from requisition, but in any event within 90 days after such release. At the time the Vessel is so redelivered to the Owner, it shall (1) comply with all requirements and regulations of all governmental agencies and departments having jurisdiction in the premises, and (2) have all required certificates in effect.

Redelivery shall be made at any Great Lakes port at the Charterer's option. The Charterer shall give the Owner at least 10 days' notice of the time and place of redelivery.

The redelivery of the Vessel as hereinbefore provided is of the essence of this Charter, and upon application to any court having jurisdiction in the premises, the Owner shall be entitled (so far as this Charter is concerned) to a decree requiring specific performance of the covenant of the Charterer so to redeliver the Vessel. Without in any way limiting the obligation of the Charterer under the foregoing provisions of this Paragraph 14, the Charterer hereby irrevocably appoints the Owner as the agent and attorney of the Charterer, with full power and authority, at any time while the Charterer is obligated to redeliver possession of the Vessel to the Owner, to demand and take possession of the Vessel in the name and on behalf of the Charterer from whomsoever shall be at the time in possession thereof.
Within 90 days prior to the redelivery of the Vessel to the Owner pursuant to this Paragraph 14 or otherwise, the Vessel shall be drydocked and bottom-painted, and a joint survey shall be made by the Charterer and the Owner to determine the condition and fitness of the Vessel and her equipment. The cost of such drydocking, bottom-painting and survey shall be paid by the Charterer. All repairs and work shown by such survey to be necessary to put the Vessel in good order and repair, ordinary wear and tear excepted, shall be done and all repairs of damage occurring after such survey shall be made by the Charterer at its own expense prior to the redelivery of the Vessel to the Owner.

15. Default. If, during the continuance of this Charter, one or more of the following events shall occur,

A. default shall be made in the payment of any part of the charter hire provided for in Paragraph 3 hereof and such default shall continue for 10 days;

B. the Charterer shall make or permit any unauthorized assignment or transfer of this Charter or of possession of the Vessel, and shall fail or refuse to cause such assignment or transfer to be cancelled by agreement of all parties having any interest therein and to recover possession of the Vessel within 30 days after written notice from the Owner to the Charterer demanding such cancellation and recovery of possession;

C. default shall be made in the observance or performance of any other of the covenants, conditions and
agreements on the part of the Charterer contained herein and such default shall continue for 30 days after written notice from the Owner to the Charterer specifying the default and demanding the same to be remedied;

D. a decree or order by a court having jurisdiction in the premises shall have been entered

(1) adjudging the Charterer a bankrupt or insolvent,

(2) approving as properly filed a petition seeking reorganization of the Charterer under the Bankruptcy Act or any other state or federal law,

(3) for the appointment of a receiver or liquidator or trustee in bankruptcy or insolvency of the Charterer or of its property or any substantial portion of its property, or

(4) for the winding up or liquidation of the affairs of the Charterer,

and such decree or order shall have remained in force undischarged and unstayed for 60 days;

E. the Charterer shall

(1) institute proceedings to be adjudged a voluntary bankrupt,

(2) consent to the filing of a bankruptcy proceeding against it,

(3) file a petition or answer or consent seeking reorganization or readjustment under the Bankruptcy Act or any other state or federal law, or otherwise invoke any law for the aid of debtors, or consent to the filing of any such petition,

(4) consent to the appointment of a receiver or liquidator or trustee in bankruptcy or insolvency of it or of its property or any substantial portion of its property,
(5) make an assignment for the benefit of creditors, or admit in writing its inability to pay its debts generally as they become due, or

(6) take any corporate action in furtherance of any of the aforesaid purposes; then, in any such case, the Owner, at its option, may

(a) proceed by appropriate court action or actions, either at law, in equity or in admiralty, to enforce performance by the Charterer of the applicable covenants of this Charter or to recover damages for the breach thereof; or

(b) by notice in writing to the Charterer terminate this Charter, whereupon all right of the Charterer to or in the use of the Vessel shall absolutely cease and determine, but the Charterer shall remain liable as hereinafter provided; and thereupon, the Owner may by its agents retake the Vessel wherever found, whether upon the high seas or in any port, harbor or other place, without prior demand and without legal process, and for that purpose may enter upon any dock, pier or other premises where the Vessel may be and take possession of the Vessel and thenceforth hold, possess and enjoy the same free from any right of the Charterer, or its successors or assigns, to use the Vessel for any purposes whatever; but the Owner shall, notwithstanding such retaking of the Vessel, have a right to recover from the Charterer any and all amounts which under the terms of this Charter may be then due or which may have accrued to the date of such termination and also to recover forthwith from the Charterer (i) as damages for loss of
the bargain and not as a penalty a sum which represents the excess of the then present worth, at the time of such termination, of the aggregate charter hire which would otherwise have accrued hereunder from the date of such termination to the end of the then current period of this Charter over the then present worth of the fair charter hire value of the Vessel for such period of time, such present worth to be computed in the case of termination during the Original Period on the basis of a 5% per annum discount, compounded annually from the respective dates upon which charter hire would have been payable hereunder had this Charter not been terminated, (ii) any damages in addition thereto which the Owner shall have sustained by reason of the breach of any covenant or covenants of this Charter other than for the payment of charter hire, and (iii) all costs and expenses incident to the Owner's enforcement of its remedial rights hereunder.

The remedies in this Charter provided in favor of the Owner shall not be deemed exclusive, but shall be cumulative, and shall be in addition to all other remedies in its favor existing at law or in equity or in admiralty. The Charterer hereby waives any mandatory requirements of law, now or hereafter in effect, which might limit or modify any of the remedies herein provided, to the extent that such waiver is permitted by law.

16. **Documentation of Vessel and Citizenship.** The Charterer shall, at its own expense, during the continuance of this Charter maintain the documentation of the Vessel under the laws of the United States
of America. The Charterer shall not permit the Vessel to be documented or operated under a foreign flag or do or suffer or permit anything to be done which can or might injuriously affect the documentation of the Vessel under the laws and regulations of the United States of America.

The Owner and the Charterer each hereby represents that it is, and covenants that it will remain, during the continuance of this Charter, (1) a citizen of the United States of America within the meaning of Section 2 of the Shipping Act of 1916, as amended, and (2) qualified to engage in the United States coastwise trade within the meaning of said Section 2.

17. Notices. Any notice required or permitted to be given by either party to the other shall be deemed to have been given when deposited in the United States mails, first class postage prepaid, addressed as follows:

If to the Owner:

The Northwestern Mutual Life Insurance Company
720 East Wisconsin Avenue
Milwaukee 2, Wisconsin

Securities
Attention: Bonds Department

If to the Charterer:

Oglebay Norton Company
The Hanna Building
Cleveland 1, Ohio

or addressed to either party at such other address as such party shall hereafter furnish to the other party in writing.
18. Execution in Counterparts. This Charter, and any supplement hereto, may be executed in several counterparts, each of which so executed shall be deemed to be an original, and in each case such counterparts together shall constitute but one and the same instrument.

IN WITNESS WHEREOF, the parties have caused this Charter to be signed in their behalf by their duly authorized officers, all as of the day and year first above written.

THE NORTHWESTERN MUTUAL LIFE INSURANCE COMPANY, Owner

By

Vice President

Witness:

Assistant Secretary

OGLEBAY NORTON COMPANY, Charterer

By

Senior Vice President
Transportation & Docks
SCHEDULE A

The following table sets forth the amount payable to the Owner from the insurance or requisition proceeds, as the case may be, for each $1,000,000 of the "Cost of the Vessel" (as defined in the Vessel Construction and Charter Agreement dated February 1, 1957), in the event of loss, requisition or seizure of the Vessel during the charter year indicated. The amount payable for any balance of the Cost of the Vessel not divisible by $1,000,000 shall be computed at the same rate as that applied to each $1,000,000 thereof.

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Report: Weather Conditions in Eastern Lake Superior at Time of Sinking
May 24, 1976

C. S. Loosmore
Commanding Officer
U.S. Coast Guard
Marine Inspection
1519 Alaskan Way S.
Building 1
Seattle, Washington 98134

Dear Commander Loosmore:

This is in response to your request for a detailed analysis of eastern Lake Superior for the time period that the SS Fitzgerald encountered difficulty and ultimately sank.

The data sources for this analysis include observational data from the U.S. Coast Guard installations and the original maps that you provided. The study is attached. The original weather maps are also attached for return to you in accordance with your request in your 30 April 1976 letter to Director, Central Region.

Please let me know if you have any questions concerning the attached analysis or weather related questions concerning this sinking.

Sincerely,

[Signature]

Karl R. Johannessen
Associate Director
National Weather Service

Attachments (2):
Special Study
Original Surface Weather Maps (being returned to Commander Loosmore)
ATTACHMENT 1

THE WEATHER AND SEA CONDITIONS BETWEEN CARIBOU AND MICHIPICOTEN ISLANDS AND NEAR THE ENTRANCE TO WHITEFISH BAY

1. Caribou Island and Michipicoten Island Area — Weather and Sea Conditions

A. 1800Z November 10, 1975 — Winds are predominantly west to southwest at 25 kts to 40 kts. A line of shifting winds, to northwesterly, is about 20 nm west of Caribou.

By interpolation, waves are 5 feet to 8 feet, wave direction southwesterly.

No precipitation reported. Sky conditions are mostly overcast.

B. 2000Z, November 10, 1975

Almost all observational data at this observational time for eastern Lake Superior are missing. However, by interpolation the following is assumed:

Since the wind shift line was moving eastward at a speed of approximately 20-25 kts, winds are assumed to be west to northwesterly at 20 kts to 40 kts and gusty.

Waves west of the wind shift line ranged between 7 feet and 13 feet. It is therefore assumed that the wave direction between the islands are becoming northwesterly and are 7 feet to 11 feet.

Skies are mostly overcast. Light rain is occurring.

C. 2200Z November 10, 1975

Again almost all observational data for eastern Lake Superior are missing and the following information is based on the speed and direction of movement of the wind shift line.

Winds are northwesterly at an estimated speed of 35 kts to 50 kts and gusty.

Wave direction assumed to now be that of the wind and heights are probably ranging between 10 feet and 15 feet.

Skies are obscured by a combination of rain and snow. Caribou Island's observational report at 0000Z recorded rain and snow began at 2000Z and ended at 2230Z.
D. 0000Z November 11, 1975

Winds are northwesterly and calculated to be at speeds of 35 kts to 50 kts with gusts.

Wave direction, northwest. Heights are calculated to be between 13 feet and 18 feet.

Skies are mostly overcast.

E. 0200Z, November 11, 1975

Again almost all observational data for eastern Lake Superior are missing. The following information is interpolated from the 0000Z map and 0400Z observations.

Winds are northwesterly at an estimated speed of 35 kts to 50 kts with gusts.

Wave direction northwest. Heights are estimated to range from 13 feet to 20 feet.

Skies are mostly cloudy.

2. Near Whitefish Bay Entry Area

Weather and Sea Conditions

A. 1800Z, November 10, 1975

Winds are south to southwesterly 20 kts to 40 kts with gusts.

Wave direction southwesterly. Heights are 7 feet to 13 feet.

Skies are mostly cloudy. Rain showers are in the vicinity.

B. 2000Z, November 10, 1975

Winds are westerly 30 kts to 45 kts.

Wave direction becoming westerly - 7 feet to 13 feet.

No precipitation reported. Skies are mostly cloudy.
C. 2200Z, November 10, 1975

All data for this observational time in the area of concerned are missing. Based on interpolations the following is assumed.

Winds northwesterly, 35 kts to 50 kts.

Wave direction northwesterly; heights 9 feet to 15 feet.

No precipitation reported. Skies mostly cloudy.

D. 0000Z, November 11, 1975

Winds are northwesterly at an estimated speed of 35 kts to 50 kts with gusts.

Wave direction northwest. Heights are calculated to be between 12 feet and 16 feet.

Skies are mostly overcast.

E. 0200Z, November 11, 1975

Again almost all observational data for this time and area of concerned are missing. The following information is interpolated from the 0000Z map and 0400Z observations.

Winds northwesterly at estimated speeds of 40 to 55 kts with gusts.

Wave direction northwest. Heights are estimated to be between 13 feet and 19 feet.

Skies are mostly overcast.
From: Commandant
To: Recorder, FITZGERALD Marine Board of Investigation

Subj: Evaluation of Self-Igniting Water Lights

1. Attached is the laboratory report of the carbide lights requested by the Board.

2. The remains of the signals have been hand delivered to Captain Zabinski, Board Member.

N. W. LEMLEY
By direction

Attachment

cc: Board Members
U. S. Coast Guard (G-MMT-3/83)
400 Seventh St. SW
Washington, D.C. 20590

Attention: Mr. N. W. Lemley

Subject: Evaluation of Self-Igniting Water Lights

Dear Mr. Lemley:

We have completed the test and examinations outlined in your letter of December 15, 1975 and according to the discussions between yourself and Mr. Kingsbury.

We were unable to determine if either light had ignited and continued to burn as intended. The active components of each light had reacted with water but it was not evident if the gases released had burned.

It was evident that both lights had been made ready for use through removal of the top and bottom seals. The interior and exterior construction was generally as shown on the drawings attached to your letter of December 15, 1975.

The following test record will reflect the work conducted and findings:

TEST RECORD

EXAMINATION FOR INDICATION OF IGNITION

Material (consisting mainly of a whiteish powder) was removed from the vent area (approximately 1-1/2 in. circle with center at vent) by scraping. This material was analyzed quantitatively for phosphorous and calcium.

No significant amount of phosphorous was present in the scrapings. The presence of phosphorous would have indicated that the phosphine produced by reaction of calcium phosphide and water had ignited, leaving a residue consisting of oxides of phosphorous. Since oxides of phosphorous are water soluble, any phosphorous present could have been washed off while the lights were in the water.

A significant amount of calcium was found to be present in the scrapings, probably present as calcium hydroxide which is relatively insoluble in water.
EXAMINATION OF LIGHT CONSTRUCTION

Using an air line and a length of laboratory tubing, an attempt was made to pass a slow stream of air through the lights from their bottom to top opening. Air freely flowed through one light with no apparent obstruction. Only a small amount of air flowed through the other light, indicating some internal obstruction. However, the presence of calcium on the top vent area of both lights, as discussed above, indicates the passageways in both lights were clear at sometime, thus allowing water to enter the bottom and some of the reacting materials (calcium carbide or calcium phosphide plus water) to exit through the top vents.

After visually examining the exterior of the lights, they were cut open and the interiors visually examined. Photographs of the lights before and after opening are attached.

EXAMINATION FOR PRESENCE OF REACTIVE MATERIALS

When the lights were opened as indicated above, the calcium carbide and calcium phosphide residues were found to be damp (one light contained liquid water). It was evident that no residues of calcium carbide or calcium phosphide remained since both of these chemicals reacted vigorously with water.

****

We are terminating Project 73TA92, File USNC52(72). The samples are being returned for your examination. The examination could possibly be furthered by examining a new water light. Should a new water light become available and you wish to pursue the investigation for additional information, tests could be conducted to determine the inherent characteristics of the light.

Reviewed by:  

ROBERT LOESER  
Associate Managing Engr.  
Marine Department

Very truly yours,

JOHN H. LUCIUS  
Project Engineer  
Marine Department
# 3

Statements Concerning Loss of FITZGERALD
United States Steel Corporation

Great Lakes Fleet

400 Missabe Building
Duluth, Minnesota 55802

Vessel: Anderson

Revised Statement of 11/11

Events Concerning Stan E. Fitzgerald
and Stan Anderson 11/10/75

The E. Fitzgerald and Anderson's
departure off Two Harbors mine was
approximately the same time Sunday, 11/9th
on two ships proceeding down the lake
together. We had several conversations
about the weather and what our plans
were. The weather bureau had issued
gale warning on - projection was that
wind force winds, hard on the gale range.
We encountered the deflection
on our transit across the north side
of the lake - We were south of Isle Royale
heading in the direction of 25° 40' 10" north
for a departure south of Isle Royale.

The weather was thinking good
weather - by that I mean the ship
was not laboring and taking green
water on deck - quite a bit of visibility.
We were proceeding at that speed.

The Fitz geometric, in a fast ship,
and geometrically faster ahead of us.
At one time during the early morning
the mate mentioned that the Fitz geometric
had cut back his RPM's by 10 - 15.

When we neared the lakes, we both
heard charters toward the west end of
Michigan Point. The Fitz geometric at
this time was closer to the Canadian
shore than we were, with the wind
still in the 45° to 60° degree true.
On our course toward the West end light we encountered absolutely no weather. In one of our conversations with Fitzgarald about weather she also was making a good run under the lee of the Canadian shore.

At this time the Fitzgarald was 8 to 10 miles ahead of us off the West end light which she was reached for a distance of 17 miles after this day. As we needed to descend the wind distance because I had to 23° so the wind shifted to the W.N.W. very strong and I wanted to make some electoral distance before the sea. So I would sail on course to Whitefish on course change with the sea about 6 points off astern. When we passed the West end light the wind was holding and steady 5 to 6 knots with gusts above 70 knots. Abearing the light I shall sail on a course to clear the dangerous banks (water depth 6-15 fathoms) as seen are longer and breaking over the more shallow water. When we were clean of the banks we came to a bearing of 141° then hold up one degree to 142° true for Whitefish Pt.

The Fitzgarald was cloister in to the West end light and from our approach he headed for Whitefish from this point. She was off the West end when we had the wind shift. (We were at this time having snow flurries and snow off the crests of the waves.) So we never saw the Fitzgarald 
(1889 - Variously again)
When I looked for Whitefish Pit 141° true, the Fitzgerald was on a parallel course but 3 miles plus to west. Our radar and AIS (Were using both of them) were picking up clutter out to 10 miles but beyond that targets were clear. At this time the Fitzgerald was 17 miles ahead of the IT was still visible on our radar screen but beginning to get fuzzy. There were no other ship targets visible on the radar at this time. 

At approximately 1530, the captain of the Fitzgerald called the Anderson. He informed me that his vessel was 40 miles east of Whitefish Pit, 141° true. He had lost his radar contact and that he had lost his depth sounder. He was looking on warden to increase the depth. He said he had a couple of pumps on the tanks. I asked him if he had any pumps on. He said he did and that he would check them. I asked him if he would check them and that he would close the distance between the two ships. He replied, "I don't know if I can get to the Coast Guard now. I don't know if he talked to them or not because I didn't see anyone on the vessel. He called me and I assumed that he was telling his problems to the Coast Guard. (Assumption)
By the time we were near Caribou we were beginning to take considerable water on deck until a following sea and by the time we were clear of the Island the seas were coming across our entire deck. It was in this area when we had damage to our 6th life boat or assume we did as we took a sea that high estimated that occasionally we had a sea up to 25 feet. (We did not know about the life boat until we arrived in shelter as no one was permitted on deck.)

At about 1140 (10th) the mate had a call from the Fitzgibbon saying his radar was out and wanted this position. If we could give it to him.

At this time we had closed to 10 miles (by radar) still not visible by sight also at this time on our radarscope he was in the sea return clutter (this is the worst sea return I have ever encountered as far as being able to pick up a target with the 10 mile range).

The mate gave him a position 15 miles N. of the high land behind Caribou Pt. about 14 miles west of Cap Ferrerriere Pt. The mate asked him how he was making out and his answer was that he was holding his own.

I came to wireless shortly after this call and we lost him in the clutter at about 2 miles.
After this call we tried to recalled looking forward to the behove of Whitefish Bay. Some time later, ½ hour to 45 minutes, we were trying to pick the Fitgerald out of the sea surface clutter and thought we should make out a target once in a while about 7 miles which coincided with the speed at which we had been closing. We then tried to contact the Fitgerald again almost continuously with no success. (The mate has the impression that he thought he heard a chattering type noise from our F.M. radio and there were two or three tones in the receiver.) At about this time the weather became extremely rough.

The reason we were trying to talk to the Fitgerald was that two ships (Coletus) heading up the Bay toward Whitefish and we wanted to alert the Fitgerald of this fact.

The next was a ship with Wart. "Wart Tree"

Ben Tree and another which I did not get the name.

Then called the Wart Tree and asked the pilot if he had two ships on his radar, asked all he saw were one at that time they were running 80 F.P.M.'s and making 3 ½ miles per hour.

At this time we could see them visually - The mate-whaleman and watched both thought they saw a light in line with the whaling.
At this time I became very concerned about the 8 Fitz Gerald - couldn’t see his lights which I would have. I then called the Wm. Elroy Ford to ask him if my phone was picking up a good signal and also if perhaps the Fitz Gerald had rounded the point and was in shelter. After a negative report I called the US Coast Guard because I was sure something had happened to the Fitz Gerald. The Coast Guard were at this time trying to locate a 46 foot boat that I was overdue. I made another call to the Coast Guard about my concern for the Fitz Gerald. They then started the regular procedure for sending a search ship.

We flew down Whiskey Pt at 2057 and we saw a man on Paw Paw's Isle at 2155 at which time I turned around and headed back for a search of the E. Fitz Gerald.

Captain J. B. Cooper

Stew. Arthur M. Andersen
My name is Morgan Killian. I am First Mate on the Ste. Arthur M. Anderson. On Nov. 10, 75, I came on watch at 1520 hrs. At which time we were abeam of Michigan Point West End Light. We were 7.7 miles off West End Light, steaming 125° for Lakehead. The Ste. Clair—Fitzgerald was in a parallel course with us about 17 miles ahead.

At approximately 1540 hrs, the Ste. Fitzgerald called. Captain Cooper took the call. The Fitzgerald said he had a little problem. Captain Cooper asked what had happened? The Captain on the Fitzgerald said he had lost some pumps and was taking water through the hull. Captain Cooper asked if he was using his pumps. The Captain on the Fitzgerald said he had his pumps going and everything was alright. Captain Cooper told him that we would stay with him (Fitzgerald) and would slow down so we could catch up a little. The Fitzgerald said he would.

At approximately 1610-1615 hrs I was talking with the Ste. Fitzgerald at which time he told me his pumps was not working properly. I said I would keep track of him and give him his position when required. He said OK.

At 1700 hrs EST, the Ste. Fitzgerald called for a position fix. I checked his position on our radar and told him he was 3.5 miles 334° from Whitfish Point. He asked that looked good, because he wanted to be 2 to 2 1/2 miles off Whitfish Point.

At 1820 hrs EST I called the Ste. Fitzgerald and asked him what course he was steering? He said he was still steering 141°. I said OK. We were steering 143°.
And you are just to the right of our header marker. We also talked about the size of the line and velocity of the wind, etc. I asked how they were doing and he said alright.

At 1900 hrs, I called the St. Fitzgerald and told him I was picking up the ship band at Cape Point and that he was 15 miles from Cape Point. At that time, the St. Fitzgerald was 10 miles ahead of us, and about 7 1/2 miles to the left of our radar header marker. I told the Fitzgerald as soon as I could pick up Whittaker Point or radar, I would let him know. On about 10 mins (1910 hrs EST), I started cutting a target on radar. 19 miles ahead of us (St. Andrew). At that time, I called the Fitzgerald and told him I had a target 19 miles ahead of us and 9 miles ahead of him. The Fitzgerald at this time was 10 miles ahead of us (St. Andrew). The Fitzgerald asked if I was going to be clear of the upwind ship. We were holding snow clouds. I said yes, he is going to be 30-40 miles to the west of you. Before ending our conversation, I asked him how he was doing with his problem? (List and pumping water, etc.) The Fitzgerald said he was holding his own. I said OK. Keep in touch.

About 10 to 15 mins later, I saw by sight the ship. It was approximately 17-18 miles ahead of us. (It had stopped, however, at this time) I said to the Whittaker and Whìnman that we should see the Fitzgerald because I could see him on radar just under 10 miles ahead of us. For the next 10-15 mins, we tracked the Fitzgerald on radar, once again looking for his lights, etc. At this time, the Fitzgerald was in the area in front of our radar.
We were losing the grip of the Fitzgerald in our search.

At about 1920 to 1922 hrs I started calling the ship Fitzgerald on FM-16 and FM-51. I called her 15 to 20 mins and tried to call the Fitzgerald about 4 to 5 times with no response from the Fitzgerald. During all this time we were looking for the lights of the Fitzgerald.

At no time after our conversation of 1910 hrs did we see any flames or any emergency calls from the Fitzgerald.

At approximately 2000 hrs the Captain called the Coast Guard Control, Great Lakes and told them that we could not contact the Fitzgerald and had lost him in our sea return on radar.

The wind during my watch was WNW 52 with gusts up to 62.64 knots. Seas from 18 to 25 ft.

Morgan C. Ford

First Mate

Stv. Arthur M. Anderson

(1900 hrs on 11-11-75)
United States Steel Corporation
GREAT LAKES FLEET
400 MISSABE BUILDING
DULUTH, MINNESOTA 55802

My name is Roy Anderson. I sailed Mate on the
S/S Edmund Fitzgerald. I ordered the wind @
1150 on 11-10-75. The wind was SSW 80°. At
this time the wind was 114° and Captain went ahead
of Atter C. Light shelf came in at 8 miles off
Michigan in Wind off the NE. Then the wind
of Atter C. Light shelf came in at 3 miles off
Michigan in Wind off the NE. Then the wind
Eldred was ahead of us. I don't recall
precise but the wind was visible for possibly 5 to
10 miles ahead. The wind from the north
Atter C. Light shelf was diminishing and changing
direction. Captain noticed a shift of wind @
approximately 1340 after having been moderated
previously. Since the wind then was expected
towards NE direction. Having logged 7 hours
C. Captain then headed east towards the
southeast to keep well clear of Michigan.
W/E. End. The wind change to 230° and began blowing
an increase & change to NE & we started on 230°
since it was very cold. The wind was increasing
& closed in up to NE 45°. We were experiencing
a slight roll gradually increasing on the bows.
And Captain knew raising the wind had shifted
to NE he had to take action as he could
alter course at 130°. I put the wind more on
the stem & would ride better & be well clear of
Michigan in Wind off the NE. W/E. End. The wind
I am dancing snow squalls & snow. I saw here on
the wind increased to 75° I was never getting some
heavy following ahead but never moved from
this was the proper course. The S/S Edmund
Fitzgerald was visible on wind of approximately
8 to 10 miles ahead. After Captain and I could
change to 230° he called the S/S Edmund
Fitzgerald to discuss such a rapid change in
The 7½ Edmund Fitzgerald said he was rolling a little more that did not elucidate what his next intentions were. Captain Corcoran said I'm going for iron ore.

I got relieved at 1300 and I had lost the contact of the 7½ Edmund Fitzgerald and upon adjusting radar I then saw that under the lead and far off about 16 miles. Not a strong target due to snow and visibility.

The wind was strong from the NW. Captain shaped course from W-nd of 125° and we would be well clear of 6 fathom depth N.W. of Cadilcan. We therefore passed 2 miles off the tip of Cadilcan when I came back to relieve for show. The seas then had subsided considerably and we were taken there up the deck. I checked the wind @ N/WWSSW which I believe to be the greatest velocity. On my watch I got all MAFORS & LAVERB Bulletin & Captain plotted a weather chart.

[Signature]

Second Mate
11-11-75 - 0000
# 4

Vessel Casualties above Montreal, as Reported to Transport Canada, 1970–1974
**MEMO ROUTING SLIP**

NEVER USE FOR APPROVALS, DISAPPROVALS, CONCURRENCES, OR SIMILAR ACTIONS

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**REMARKS**

Enclosed copy of Canadian Casualties for your file. Perhaps it will be an exhibit — will discuss when we get together —

**FROM**

Capt [Handwritten]

**DATE**

1 OCT 60

**PHONE**

0102 000 6500

**DD FORM**

1 Oct 60 95

**REPLACES DD FORM 94, 1 FEB 50 AND DD FORM 98, 1 FEB 50 WHICH WILL BE USED UNTIL EXHAUSTED.**

**U.S. GOVERNMENT PRINTING OFFICE: 1971-483-984/14**
Canadian Coast Guard
Central Region
1 Yonge Street, 20th Floor
Toronto, Ontario
M5E 1E5
February 6, 1976

United States Coast Guard
Office of Merchant Marine Safety
400 Seventh Street, SW
Washington D.C. 20590
U. S. A.
Attention: Captain Adam S. Zabinski

Dear Captain Zabinski: Re: Casualties in the Great Lakes

During the course of the proceedings of the United States Coast Guard Marine Board of Investigation into the loss of the S.S. "EDMUND FITZGERALD", you requested to be supplied with a list of casualties in the Great Lakes as reported to Transport Canada over the past five years.

Such a list has now been compiled by our Marine Investigation section in headquarters, Ottawa, and we are pleased to enclose a copy. The list includes all casualties reported during the years 1970 to 1974 inclusive, with the exception of minor strikings of lock walls etc. which do not appear to be relevant to the issue involved. Figures for 1975 are still being prepared and will be forwarded when they become available.

We trust the information will be useful to you and that you will not hesitate to call upon us if we can be of further assistance.

Yours truly,

D. S. Whittet

for) George G. Leask
Regional Director

Encl.
No damage reported.

No damage reported.

No damage reported.

No damage reported.

No damage reported.

No apparent damage.

No apparent damage.

No apparent damage.

No apparent damage.

No apparent damage.

No apparent damage.

No apparent damage.

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**Preterminal Inruptcy**

- No damage
- No
- Human Error
- Grounding
- Thunder Bay
- 7.12

- No damage
- No
- Human Error
- Grounding
- 
- 
- 4.12

- No damage
- No
- Human Error
- Grounding
- 
- 
- 6.12

- Grounded in Log
- Yes
- Human Error
- Grounding
- Detroit River
- 5.12

- Collided with "MANTONIUM"
- Yes
- Human Error
- Collision
- Welland Canal
- 3.12

- Collided with "Saint Marcet"
- Yes
- Human Error
- Collision
- Welland Canal
- 3.12

- Remarks
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| REMARKS | PRELIMINARY INQUIRY HELD | |
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| Preliminary Inquiry held | |
| Preliminary Inquiry held | |
| Preliminary Inquiry held | |

- 13 -
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<th>MECHANICAL FAULT</th>
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**REMARKS**
- No leakage found.
- Premmary Injury Held.
- No apparent damage.
- Human error.
- Mechanical fault.
- Fog.
- No damage.

**NOTES**
- Pilot
- Cause
- Nature of casualty
- Location
- Vessel's name
- Port or registry

**DATE**
1977-12-11
**PORT OR REGISTERY**
PORTLAND
**VESSELS NAME**
POLARLAND
**GROSS TONNAGE**
17.7
**WEIGHT**
13.607.7
**CARGO**
CRUSS STONE SAPPHIRE
**BREWERY**
1001
**TIDAL**
THROCKMARTON
**SEAS**
ST. LAWRENCE EAST OF MONTREAL
**ST. LAWRENCE RIVER**
BEAVER
**SAULT STE. MARIE**
BEAVER
**E. B. BAKER**
BEAVER
**MONTREAL**
BEAVER
**OTTAWA**
BEAVER
**SHORES EAST OF BURTON**
BEAVER
**GODFREY**
BEAVER
**FESTUS**
BEAVER
**ST. LAWRENCE**
BEAVER
**SOUTH SHORE CANAL**
BEAVER
**BRITISH COLUMBIA**
BEAVER
**ALICE BOTDEN**
BEAVER
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<td>South Shore Canal, Grounding</td>
<td>Seaway, St. Lawrence</td>
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<td>(South Shore Canal) Marine</td>
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- No apparent damage.
- Mechanical failure.
- Current.
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**CAUSE**

- Human error and human error and some damage to core-peak

**REMARKS**

- Some damage to core-peak

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**ROAD**
With "RULES OF THE ROAD".
Failure to comply.

**Take Action**
1) Take Exite off Collecter.
2) Take Exite off Collecter.
3) Take Exite off Collecter.
4) Take Exite off Collecter.
5) Take Exite off Collecter.

**Comment**
1) Heavy Hull damaged.
2) No Hull damaged.
3) No Hull damaged.
4) No Hull damaged.
5) No Hull damaged.

**Location**
1) 1974
2) 1975
3) 1976
4) 1977
5) 1978

**Date**
1) 1974
2) 1975
3) 1976
4) 1977
5) 1978
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# 5

U. S. Coast Guard: Technical Analysis of Loss of FITZGERALD
Subj: EDMUND FITZGERALD; analysis of

1. Enclosure (1) is the analysis of the EDMUND FITZGERALD which you requested.

Encl: (1) Analysis of EDMUND FITZGERALD
UNITED STATES GOVERNMENT

Memorandum

SUBJECT: Analysis of the SS Edmund Fitzgerald

FROM: Chief, Merchant Marine Technical Division

TO: President, Marine Board on SS Edmund Fitzgerald

1. Enclosed is the analysis of the SS Edmund Fitzgerald as prepared by my technical staff.

2. Members of the staff preparing the report can be made available for further questions or discussion.

D. J. Linde
ANALYSIS OF THE EDMUND FITZGERALD

At the request of the Marine Board, the technical staff performed an analysis of the steamer EDMUND FITZGERALD at the time of her casualty. This analysis using existing computer programs, examined the hydrodynamics of the vessel in terms of motions, longitudinal bending and torsional moments, and stability in terms of capsize potential. This analysis dealt with the ship in an undamaged state and ran comparisons with conceivable damage and flooding. The results which are quite voluminous have been condensed into several graphs and data which are presented in the results section.

The Ship Characteristics

The ship characteristics were synthesized from Coast Guard records, testimony taken before the Board, and a knowledge of common practice on the Great Lakes. Using the design information on file, reversing fore to aft the loading as testified by the dock people, the vessel arrived at a good loading condition in regards to displacement and drafts. However, it was calculated to have 6 inches of deflection in sag. Noting that GL practice is to load to a straight keel or slight sag, the cargo was redistributed within the cargo holds until the sag was reduced to 3 inches. While this was not a straight keel, the bending moment associated with this loading was in line with the bending moment associated with a loaded condition in the loading manual for another loading port. A straight keel condition could be synthesized by further cargo shifts but it would have only depressed the sagging bending moment which was not necessary as it was of a relatively low value.
The Wave Characteristics

The waves used for the dynamic portion of the analysis were irregular waves based on a spectrum having a significant wave height of 20 feet and a period of 8.23 seconds. This was chosen for two reasons. One, the testimony provided observations that the wave height was between 20 and 30 feet and the vessels had two waves under them most of the time which would indicate a wave length of above 350 feet which has a corresponding period of 8.23 seconds. The 20 foot wave height was used because measured and observed wave data points out that observed wave height corresponds to the significant wave height or average 1/3 highest as measured. A second wave spectrum based on a significant wave height of 30 feet and 400 wavelength was used for some analysis but it was found that there was not sufficient climatological factors to support such a size wave. The waves used for the capsize analysis were regular waves of 20 foot height and 350 foot length.

The Computer Programs

The computer programs used were the SHCP (Ships Hull Characteristic Program), a static program which calculates hydrostatics, longitudinal strength, and damage stability; SCORES (Ship Computer Response), a dynamic program calculating dynamic bending moments, torsional moments and motions in the six degrees of freedom; and CAPSIZE, a dynamic program which investigates the potential for capsize of a ship in waves. A computer programs are Coast Guard "in-house" programs and represent what is reasonably available in the present state of the art. Therefore, no outside programs or services were utilized.
Damage Assumptions

The vessel was examined in the undamaged condition and there was no parameter, i.e., dynamic bending moment, motion, etc., that was an extreme value to indicate a possible casualty mechanism. Accordingly, from this and from the testimony, damage assumptions had to be made. It is first assumed that no structural failure occurred prior to the sinking and that the vessel remained structurally integral. It is secondly assumed that flooding took place. This is supported by the testimony.

The physical evidence shows that the remaining vents to the ballast tanks and tunnels are reasonably intact and are presumed closed. Even if open, flooding via this mechanism is so slow, e.g., 206 hours to flood the tunnel through 1 vent continuously, it is not a probable mechanism.

The second mechanism is that of grounding and bottom damage. The vessel did pass through an area in vicinity of a known shoal. If it did strike the shoal, the damage because of the vessel's motion should be limited to the bow and stern area or if the vessel was really down then the entire length of the vessel should show signs of damage. The vessel was initially trimmed slightly by the stern. However, the underwater survey showed no bottom damage in the stern section. Therefore, if there was damage by grounding, it should be confined to the forward area. Because of the configuration of the ballast tanks, the free surface caused by initial flooding is compensated for by the downward change in KG. As the water rises, the effects of free surface are diminished. The contributory rise in KG is not significant. Table 1 presents the static effects of flooding of various ballast tanks forward.
The effect of flooding to ballast tanks forward are noticable and should be reasonably sensible to the master. Because of this and the large capacity of the ballast system which can be brought to bear in dewatering, the flooding of the ballast tanks is not considered to be a significant contributor. Even so we further analyzed the dynamics of the vessel under these flooding conditions and found them not to be significant.

The final damage mechanism left in flooding of the cargo holds is via the cargo hatches. As there is physical evidence that the hatches were not completely battened down and because the pump capacity that can be brought to bear is small in relationship to the cargo hold size, this mechanism is considered the most likely. Accordingly, further analysis was done, examining the effects of flooding of different cargo holds and to different levels. Table 2 is a summary of some of the conditions examined.

Further assumptions are made in regard to the physical properties of the ship and cargo. First, as taconite is relatively spherical and that there are few fines to fill the space interstitially the volume available to flood water in the cargo is 45 percent of the cargo volume. Secondly, flooding was assumed to take place in the cargo hold, relatively close to the KG of the ship so that the effect on gyradius is minor.

**Motions**

The FITZGERALD was synthesized with different flooding conditions and was analyzed as regards to motions with different wave headings. Figure 1 is a graphical representation of pitch and roll for typical different conditions. The response plotted is the average of the highest 1/10 response. It can be seen that there is little difference in pitching response through the range
of wave direction due to differing vessel conditions. It indicates that in
sensible terms, it would be hard for the master to infer damage by observing
the pitching characteristics alone. Likewise, the rolling response from
broad on the quarter to aft does not show much change with differing vessel
conditions. Rolling response from wave forward of the quarter to abeam have
the same sensitivity to angle but broader range of response. This higher
response is due in main to the fact that perdominate wave encounter frequencies
of the spectrum are close to the natural roll frequency which causes some
resonance. The condition #9 has a much lower GM than the other conditions,
therefore, a lower natural frequency and less susceptibility to rolling at
beam or near beam seas.

**Bending Moments**

The dynamic induced longitudinal bending moments were calculated for the
different damage conditions and were typically 90 to 180 K tons depending on
wave direction. These were no conceivable damage conditions which produced
spiking or anomalies in the bending moment pattern.

The dynamic bending moment is not the maximum bending moment the vessel
sees as the dynamic moment must be superimposed over the still water bending
moment. One cannot add algebraically the numerical values of the DEM and
SWBM to get a maximum because each may occur in a different location. The
DEM was examined to provide a check on the quasistatic strength calculations
of SHCP.

The torsional moments calculated by SCORES did not show any peaking or
anomalies. The pattern was reasonably consistent and the maximum values
produced were not of a magnitude to produce significant stress.
The bending moments calculated on SHCP were performed on a quasistatic basis, that is, by balancing the ship on a wave moving down its length and making calculations at different intervals. Only damage condition #9 brought the hull into any significant stress picture. This was flooding of the #2 hold to capacity with water and the highest stress was 9.25 tons/inch² sagging near amidships. This compares to an allowable design stress of 10 tons/inch². Other damage conditions produced a fairly consistent pattern of bending moment. The location of the higher bending moments were not correlatable to observed damage or failure mode. This can be seen on Figure 2. Further, the magnitude of the bending moments were not significant in terms of producing stress near yield or even 1/2 yield.

The program has no facility for calculating or even indicating springing. However, because the vessel natural frequency is far removed from the predominant encounter frequencies of the waves, it is assumed that no significant springing took place. Therefore, the bending moments suffered by the vessel are combined still water and wave bending.

**Capsize**

The FITZGERALD was examined for potential for capsize in three different configurations. Table 3 lists the results. While the program did not indicate capsise, it did produce angles which were above those where there would be a cargo shift. The free surface of flooding water had been taken care of in the KG correction in the input. The righting arm remains positive through these angles.
Angles produced in capsize should not be compared to the roll angles as produced by SCORES. The angles in SCORES are average angles based on statistics and do not show extreme values. The angle produced on CAPSIZE are angles produced in real time by the wave passage with the ship heeled to an initial angle and moving with a given angular velocity. CAPSIZE does, however, show the same relative sensitivity to wave angle and loading as does SCORES.

While CAPSIZE did not show an actual capsize because the cargo remained in place, it does show that there is a capsize potential. Early parametric studies at the undamaged draft on CAPSIZE indicated capsize when the GM was reduced to below 5 feet. A cargo shift in #2 hold (the smallest) will provide a virtual rise in KG of 2.86 feet. A cargo shift in all three holds would provide a virtual rise in KG of 11.31 feet which would reduce the GM to far below 5 feet in all of damage conditions examined. A reduction of GM below 5 feet is not achievable with flooding water alone.
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<td>31.6</td>
<td>29.2</td>
<td>19.55</td>
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<td>31.6</td>
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<td>-337.9</td>
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Damage and reserve buoyancy

The vessel was examined for reserve buoyancy having suffered in one case, breaking at frame 69 and in the other breaking at frame 133. The following are the results as modified by the assumption of the state of the transverse cargo hold and ballast tank bulkheads at the break.

1. With the ship broken at frame 69:
   a. The forward end would float trimmed aft if the cargo space transverse bulkhead and ballast tanks bulkhead at frame 69 remained in place.
   b. The after end would float trimmed forward if the cargo space transverse bulkhead and ballast tanks bulkhead at frame 69 remained in place.
   c. The forward end would float trimmed aft if the above bulkheads did not remain in place and all of the cargo were lost. Trim is such that all the cargo would be lost.
   d. The after end would float trimmed forward if the above bulkhead did not remain in place. Loss of the cargo in #2 hold would affect trim, the vessel would float even if the cargo were not lost.

2. With the ship broken at frame 133:
   a. The forward end would float trimmed aft with the bulkheads at frame 117 intact.
   b. The forward end would float trimmed aft with the cargo bulkhead at frame 117 missing and most of the cargo lost out of #2 hold. With all of the cargo gone out of #2 hold
there is about 1000T reserve buoyancy.

c. The after end would float trimmed forward provided no more than 1200 T of cargo remained in the #3 hold.
SS Edmund Fitzgerald
Marine Board of Investigation

Analysis of flooding through cargo hold covers

1. Summary
   A brief analysis was performed of the conditions encountered by the Fitzgerald on 10 Nov. 1975 and it is likely that sufficient flooding of the cargo hold could have occurred to endanger the vessel. Where necessary to assume any factor, the assumptions were such as to indicate less flooding than would have occurred.

   The analysis shows that in excess of 6000 T of flooding water could have entered the cargo hold between 0200 11/10 and 1900 11/10, a quantity sufficient to endanger the vessel.

2. Detailed Analysis

a. Openings
   1. The underwater survey showed that the hatch clamps were, in general, not damaged, in spite of testimony that all clamps were used in November. It seems most probable that all clamps were in place but only a few - maybe nine - were evenly tight.
For analysis purposes, assume that the result of this arrangement of clamps was such as to create an opening between cover and lining as follows:

\[ \frac{1}{2} \]

for an area of \(36 \text{ in}^2\)

Assume further that only half of the battens have such openings, the other half being watertight, and assume that of those hatches that do have openings, that the openings exist along half the length of one side.

The total opening then, would be

\[ \frac{36 \text{ in}^2}{\text{opening}} \times 4 \text{ hatches} \times 10.5 \text{ battens} \]

Total Area open to water \(1512 \text{ in}^2\)

Rate of Flood

A one inch hole of a 50 foot lead will allow 85 gpm to enter by the general formula.
\[ Q = K \text{ (Area) Head} \]

by proportion, 1512 m² at 1 ft head would called 23,150 gal/min
or at 269 gal/min of fresh water
rate of inflow of 1' head
86 tons/minute

6. Frequency of Waves

The following table is taken from
Mr. Weatherly’s notes given by Fitzgerald &
other vessels in the area.

<table>
<thead>
<tr>
<th>Time (date)</th>
<th>Significant Wave Height ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>1400 1°/09</td>
<td>5</td>
</tr>
<tr>
<td>2100</td>
<td>7</td>
</tr>
<tr>
<td>2300</td>
<td>9</td>
</tr>
<tr>
<td>0100 1°/0</td>
<td>10</td>
</tr>
<tr>
<td>0300</td>
<td>10</td>
</tr>
<tr>
<td>0500</td>
<td>10</td>
</tr>
<tr>
<td>0700</td>
<td>10+</td>
</tr>
<tr>
<td>0900</td>
<td>10+</td>
</tr>
<tr>
<td>1100</td>
<td>10+</td>
</tr>
<tr>
<td>1300</td>
<td>10+</td>
</tr>
<tr>
<td>1500</td>
<td>12+</td>
</tr>
<tr>
<td>1700</td>
<td>16</td>
</tr>
<tr>
<td>1900</td>
<td>16</td>
</tr>
</tbody>
</table>
② Designate the wave height necessary to put a crest one foot above the coaming as $H_1$.

Calc $H_1$:
- Original draft: 39.0' (mean)
- Freeboard: 11.8'
- Coaming: 2.0'
- 1 ft head: 1.0'

$H_1 = 14.8' = 14.67$ ft.

③ Assume Rayleigh distribution of wave

Significant wave: $H_{1/2} = 2.83 \sqrt{E} = 3.53$.

$H_{1/10} = 3.6 \sqrt{E} = 12.71$ (average of 1/10 highest waves).

As an aside, this shows that about 1 of each 20 waves could be about one foot over the deck.

To obtain a wave of 14.67 ft would require $4.16 \sqrt{E}$.

According to Table 1.6 of HO 603.
The average of the highest wave of a sequence of observations of 50 waves each would be 4.542 ft or 14.96 ft.

Average wave 50% higher than 60% lower, think a wave of 14.67 ft. Any wave or higher would be the highest of 50 in approximately 60% of the cases.

60% of each group of 50 waves over the long term is equivalent to one occurrence in each 63 waves.

The 10X reports indicate wave periods of 113 to 115 seconds, which seems short. Assuming a 6-second period would mean that the vessel would encounter 10 wave crests per minute.

With 10 waves per minute and an 14.67 per 83 waves, there would be an 14.67 each 83 min or 70.2 per hour.
d. **Flooded rate**

With a wave period of 6.5 sec (1.0 min) any given wave would have, on the average, 110 minute duration at the same time openings. Thus, if 8.5 tons/min flooding, the flooded rate would be 8.5 tons/min.

The vessel encountered 3.2 waves per hour or flooded at the rate of 61.9, say 62 tons per hour at the beginning of the incident at 0100.

2. **Flooding sequence**

There is an acceleration to this—the more flooding that occurs, the deeper up vessel gets the less freeboard there is, the more frequently it is encountered, the more flooding there is.

Thus, the flooding must either be anticipated or a continuously changing process, or at a series of
Stops at constant rate.

The latter is chosen because it is: (1) the easier analysis and (2) likely to yield a cross-checkable -let's focus on this answer.

a) 0100-1330 "hlo."
   \[ H_{13} = 10' \]
   12 hours at 62 tons/hr = 744T

\[
\text{TP}_1 = 113
\]

\[
\frac{760}{113} = 6.67^\circ = 0.5544
\]

b) 1330-1500
   \( H_{13}, 1300 \) 10T
   \( H_{13}, 1500 \) 12T
   Use \( H_{13} = 11 \)
   Then \( H_{10} = 13.99 \)

\[
H_{10} = 14.67 - 0.55 = 14.12
\]

14.12 is close enough to 13.99 that it can be reasonably said that \( H_1 = H_{10} \) or 14.6.

Later, part of the data and highest values did exceed \( H_1 \).
Thus in the average, 1/20 of the waves are greater than or equal to $H_1$, or $H_1$ occurs once each 20 waves.

Wave period of 6 sec (1/10 min) means one $H_1$ each 2 minutes or 30 per hour.

Using 8.6 tons/wave,
= 260 tons/hr
or a total of 520 tons
from 1300 - 1500

3) 1300 - 1700
$H_{1/3}$ 1500 12'
$H_{1/2}$ 1700 16'

Use $H_{1/3}$ 14'

578 T  TP14 = 113 T/lin
8d = 4.6 in = 0.41 ft
so $H_1$ = 13.72 ft

$H_{1/3} = 14$, the average of the highest 1/3 wave $\geq H_1$,
so at least 1/6th of the wave $\geq H_1$, and in the long
run, every 6th way = H1

10 waves/min = 600 waves/hr.

= 100 waves H1 per hour.

100 x 5.6 = 860 tons/hr.

1720 tons between between 1500 & 1700.

④ 1700 - 1900

1720 T 120 TPI = 15 miles

12 ft

H1 = 12.5 ft

H1/3 1700 = 16'

H1/3 1500 = 16'

H1/3 16'

\[ H_1' = \kappa \theta E \]

\[ \theta E = 16.28 \times 5.71 \]

\[ \kappa = \frac{12.5 \times 5.71}{2.2} \]

from Table 1.1 of 1.06.03
(taking 1/2 for amplitude)

30% of all waves will ≥ H1'

or roughly every 6th wave will never exceed H1'.
at 10 tons/minute
would have 3 hr of work.

\[ 8.6 \text{ tons/minute} \times 3 \text{ minutes/hr} = 26.8 \text{ tons/hr} \]
\[ = 3096 \text{ tons} \quad \text{from 1700-1400} \]

<table>
<thead>
<tr>
<th>Time</th>
<th>Reserve</th>
<th>Lead</th>
<th>Loss (T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1300</td>
<td>150T</td>
<td>750T</td>
<td>0.65 T</td>
</tr>
<tr>
<td>1300-1600</td>
<td>520T</td>
<td>520T</td>
<td>0.4 T</td>
</tr>
<tr>
<td>1600-1900</td>
<td>1720T</td>
<td>1720T</td>
<td>1.25 T</td>
</tr>
<tr>
<td>1700-1900</td>
<td>3290T</td>
<td>3290T</td>
<td>2.18 T</td>
</tr>
</tbody>
</table>

Total: 6080T 4.68 T
3. Error Analysis

1. Waves less than $H/2$. None of this analysis includes flooding from waves with a head (height above crease) of less than one foot. Clearly, considerable flooding would be caused by small waves. For example, a wave of $H/2$, minimum 0.5 feet, that is, one which creates 6 inches above the top of the coaming would result in 70% of the rate of flow of $H/2$ ($10.5 = 0.701$)

2. Motion of vessel. No consideration is taken of the motion of the vessel. Older calculations show that the maximum roll & pitch does not change appreciably with increased draft. Hence the vessel motion would affect the quantity of water on deck is not determined.

3. Wave profile. It has been assumed that the waves are fully created “ocean” waves and that the vessel does not
Respond to the individual wave, thus the wave height is assumed to be important upon the mean draft of the vessel. Of all the attempting only this one would tend to indicate more water—and thus greater flooding—than actually existed.

4. The weather reports from around indicate that the wind had died down & then shifted to NW at about 1300 11/10. If true, then there must have been some effect on the waves, but no reduction in waves & indicated & none has been considered.

5. Assuming the duration of the wave & the opening to be equal to the period might be open to question. By lumping all the small openings into one unit of area—when in fact the opening was a series of many larger small openings & thus causing that the head of the wave is on the larger opening for one wave period is first to combat the force of these effects.
6. The step by step integration of various effects of flooding and warmings from weather data clearly result in a calculation of less flooding than really happened.

Both O become unit build up
but not step but gradual
(Shaded area above).

F 0 unresolved in deep or, cut
9 feedback on also
continued
Openings

Use 1572 in² total.

Have 21 batches.

Each cover is 11'7" x 54'

11.5 ft

x 2 = 23.0 ft²

Total = 131 ft²

x 21 = 2751 ft²

Net total

2751 ft² = 33000 in². Calculate way around all the covers.

1572 / 2751 x 12 = 0.0455 in²

or 1572 in² = 0.0455 in² is equivalent to

45 thousandths in one.

way around every cover.

45 thousands open.
11/6/76.

Rough sales of "model" by test if flow rate & grainig
<table>
<thead>
<tr>
<th>Measured Specs</th>
<th>Observed Inches</th>
<th>Time</th>
<th>actual $(\text{cond-in}) \frac{1}{h}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>1(\frac{1}{2})</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>1.0</td>
<td>2</td>
<td>19</td>
<td>1.81</td>
</tr>
<tr>
<td>1.5</td>
<td>2(\frac{3}{4})</td>
<td>26</td>
<td>2.49</td>
</tr>
<tr>
<td>2.0</td>
<td>4</td>
<td>33</td>
<td>3.62</td>
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<tr>
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<td>5</td>
<td>36</td>
<td>4.53</td>
</tr>
<tr>
<td>1.5</td>
<td>3</td>
<td>25</td>
<td>2.72</td>
</tr>
<tr>
<td>1.25</td>
<td>2(\frac{1}{2})</td>
<td>25</td>
<td>2.24</td>
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<tr>
<td>0.5</td>
<td>1</td>
<td>18</td>
<td>0.905</td>
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<tr>
<td>0.75</td>
<td>1(\frac{1}{2})</td>
<td>22</td>
<td>1.36</td>
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<tr>
<td>1.0</td>
<td>2</td>
<td>23</td>
<td>1.81</td>
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<td>2(\frac{1}{2})</td>
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<td>2.26</td>
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<td>1.5</td>
<td>3</td>
<td>27</td>
<td>2.72</td>
</tr>
<tr>
<td>1.75</td>
<td>3(\frac{1}{2})</td>
<td>28</td>
<td>3.17</td>
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<tr>
<td>2</td>
<td>35</td>
<td></td>
<td>3.62</td>
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<td>0.5</td>
<td>17</td>
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<tr>
<td>0.5</td>
<td>20</td>
<td></td>
<td>0.905</td>
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</table>
\[ W = f(x) + \]

\[ \frac{d}{dx} \frac{dW}{dx} = \frac{d}{dt} \frac{d}{dQ} \]

\[ Q \frac{dV}{dt} = kA \frac{dH}{dx} \]

\[ \text{take slope at } V = 0 \text{ to } V = a \]

\[ Q = \text{vessel} \]

\[ k = \frac{Q}{A \delta} \]
Area = (15.0 x 4.125) - 4(1) - 3.1575

\[ \frac{115.625}{3.1575} = 36.435 \]

\[ \frac{231 \text{ in}^2}{36.435 \text{ in}^2} = 6.3010 \text{ in}^2/\text{gal} \]

After dawn is 0.014 in

\[ \text{Area added} = (13.0 \times 0.75) = 9.75 + (11.575 \times 0.75) = 8.91 \]

\[ 12.68 \text{ in}^2 \]

\[ \text{Area} = 127.60 \text{ in}^2 \]

\[ 231.0 / 27.4 = 8.410 \text{ in}^2/\text{gal} \]

\[ \frac{1.7054}{2.815021} = 0.5746 \]

\[ \frac{11C \text{ killed}}{G = \frac{dV}{dh} = KA \frac{d}{dh} h} \]

\[ dV = KA \frac{d}{dh} h \]

where \( h = 4 \text{ ft} \)

\[ V = KA \frac{1}{2} h^{3/2} + C \]
from plot-
when scale head = 1 H.
actual a = 1.5 in

V =

\[
\frac{1.0 \text{ gals}}{1.81 \text{ in}} = \frac{x \text{ gals}}{1.5 \text{ in}}
\]

\[x = 0.83 \text{ gals.}\]

at 0.83 gals.

\[+ \frac{55}{27} \text{ sec} \quad 1.41 \text{ gals} \]

\[- \frac{E}{5} = \frac{17 \text{ sec}}{10 \text{ sec}} \quad 1.03 \text{ gals.}\]

\[1.03 \text{ gals/10 sec} \times 60 \text{ sec/min}\]

= 6.18 gals/\text{min}
at scale head of 1 H.

W/ scale opening \( \frac{1}{36} \text{ in}^2 \)

\[Q = KAD + \frac{K}{H2} \]

\[= \frac{6.18 \text{ gals/min}}{36 \text{ in}^2} \]
The ideal value \( K = \frac{a}{A^{1/2}} \)

\[ \text{K model} = K \text{ actual} \]

\[ \text{K model} = 6.18 \text{ gpm} \]

\[ \frac{9.94 \times 9.94 \times 2}{9.94 \times 9.94 \times 2} = \frac{9.94 \times 9.94 \times 2}{9.94 \times 9.94 \times 2} = \frac{9.94 \times 9.94 \times 2}{9.94 \times 9.94 \times 2} = 0.3624 \times 1225 \text{ in}^3 \text{ in}^2 = 0.354 \text{ in}^3 \]

\[ \frac{6.18}{0.3624} = 17.025 \text{ gpm} \]

\[ \text{All} \quad \frac{A = \sqrt{KA}}{A = \frac{15.72}{2}} \]

\[ a = 1 \times 1 = 1 \]

\[ A = 34.75 \times 1217 = 51,760 \text{ gpm} \]

**Required**

\[ Re = V D e \frac{\mu}{\nu} \]

\[ V = \frac{a}{A} - D e = 4A \frac{\mu}{P} \]

\[ V D e = 4A \frac{\mu}{P} \]
\[ A_{\text{model}} \quad G = \frac{6.16 \cdot 920}{P} = 2.99 \quad \text{so} \quad P = 2.05 \]

\[ W_{\text{eff}} \quad (U) = \text{eff} \quad \frac{62.4}{1.35} \quad \text{so} \quad \text{eff} = \frac{4.14}{1.35} \quad P = 1.6 \]

\[ R = \frac{4.5}{P} \quad \eta = \frac{4.615}{1.5} \quad \frac{2.24}{1.33} \quad \text{so} \quad \eta = 1.4 \quad \frac{7}{6} \]

\[ \eta \div 1.4 \quad \frac{7}{6} \quad \text{so} \quad R = 1965 \quad \text{annual} \]

Actual:
\[ A = \text{ann} \quad 15 \quad 500 \]
\[ P = 15 \times 9 \times 9.5 \]

\[ R_{\text{eff}} = \frac{4 \times 12.5}{4 \times 12.5 \times 1.33 \times 7.45} \]

\[ 0.76 = 6 \quad \text{and} \quad 0.76 = 7.106 \]

\[ \text{So} \quad 16 \times 2 \quad 10.27 \quad 6 \quad 120 \quad \text{and} \quad 7.106 \]

\[ \text{Check} \quad G = 34.76 \times 36.77 = 14.6 \quad \text{so} \quad R = \frac{62.4}{1.33} \quad \frac{6.3}{7.45} \quad L \text{of 4.746} \]

\[ \text{so} \quad 10 \quad 4.74 \quad \text{and} \quad 4.74 \quad \text{and} \quad 7.45 \]
Radio Logs, Coast Guard Station Marquette
From: Commander, Coast Guard Group, Sault Ste. Marie, MI. 
To: Chairman, Marine Board of Investigation, SS EDMUND FITZGERALD Sinking of 10 November 1975 

Subj: Additional Information Concerning Sinking of the SS EDMUND FITZGERALD; forwarding of 

Ref: (a) Marine Board, CCGD9(m) ltr of 16 December 1975 
(b) Annex K to CCGDNINE OPLAN No. 1-FY 

1. The radio logs for CG Station Marquette for 9, 10, and 11 November 1975 are attached (enclosure (1)). In accordance with reference (b), the Whitefish Point radiobeacon is monitored by Station Marquette every four (4) hours and any discrepancies noted are recorded in the unit's rough log (also attached). However, there is no indication in the log that the radiobeacon was, in fact, monitored on the dates in question. 

2. The SANDS form for Whitefish Point radiobeacon has been previously forwarded by ANT Sault Ste. Marie to CCGD9(oan) on 11 December 1975. A copy of the SANDS form is attached (enclosure (2)). 

3. Attached are photocopies of the documents showing the items received from the various units during the search (enclosure (3)). Upon receiving the material, it was placed in a locked room in the buoy shed at Base Sault Ste. Marie until delivery to Cleveland. 

4. The photographs of the lifeboats and liferafts were taken by MSGT K. D. ROCHALEAU, Kincheloe Air Force Base Photo Lab, Kincheloe, Michigan on 19 November 1975. 

5. The lifeboats, previously stored at Base Sault Ste. Marie, have been turned over to the Sault Ste. Marie Historical Society by the Oglebay-Norton Company and are presently on board the Museum Ship SS VALLEY CAMP at Sault Ste. Marie. The liferafts have been returned to Oglebay-Norton and the receipt is attached (enclosure (4)). 

C. A. MILLRADT 

Encl: (1) Station Marquette Radio Log and Rough Log 
(2) Aids to Navigation Work Report (SANDS form) 
(3) Photocopies of documents showing the items received from various units during search. 
(4) Columbia Transportation (Oglebay-Norton Co.) ltr of 9 February 1976
<table>
<thead>
<tr>
<th>Entry</th>
<th>Frequency</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEGIND NEW RADIO DAY</td>
<td></td>
<td>0000Z</td>
</tr>
<tr>
<td>SN DAVID BERGER ON WATCH</td>
<td></td>
<td>0000Z</td>
</tr>
<tr>
<td>NEG TRAFF PENDING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R/C WITH R.C. NORTON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PASS INFO FORM DOCK SUPERVISER MR MARTIN</td>
<td>16,22 FM</td>
<td>0045Z</td>
</tr>
<tr>
<td>R LIEVED OF WATCH BY SA BOB KUMPULA</td>
<td></td>
<td>0100Z</td>
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<tr>
<td>SA ROBERT KUMPULA ON WATCH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEG TRAFFIC PENDING</td>
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<tr>
<td>NO SIGNALS TRANSMITTED</td>
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<tr>
<td>WATCH RELIEVED BY SA CRAINE</td>
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<td>SA ROBERT KUMPULA</td>
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<td>0430Z</td>
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<td>rienent ESOM 40552 R/O 2552 L/C U/N</td>
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</tr>
<tr>
<td>WATCH RELIEVED BY SA R CRAINE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>END OF RADIO DAY</td>
<td></td>
<td>2400Z</td>
</tr>
</tbody>
</table>
STA MARQUETTE

BEGIN NEW RADIO DAY
SA RONALD CRAINE ON WATCH
NEG TRAFFIC PENDING
NO SIGNALS TRANSMITTED
RELIED BY MK3 BARTHOLOMEW

MK3 RONALD E BARTHOLOMEW ON WATCH
EQUIPMENT IS NORMAL...NEGATIVE TRAFFIC IS PENDING
EQUIPMENT NORMAL...NEGATIVE TRAFFIC PENDS...
RELIED BY SA ROBERT KUMPULA:

SA ROBERT KUMPULA ON WATCH
NEG TRAFFIC PENDING
NO SIGNALS TRANSMITTED
WATCH RELIEVED BY SA CRAINE

SA RONALD CRAINE ON WATCH
NEG TRAFFIC PENDING
NO SIGNALS TRANSMITTED
RELIED BY BM2 HAUGHEY

BM2 GORDON J. HAUGHEY ON WATCH
NEG. TFC. PENDING
COMMS WITH TUG CATHY MAJOR
COMMS E.M. FORD WK INFO
COMMS GRO SCO info on radio guard
WATCH RELIEVED BY SN DAVID MATHOIT

SN DAVE MATHOIT ON WATCH
NEG RADIO TRAFFIC
END OF THE RADIO DAY.
<table>
<thead>
<tr>
<th>ENTRIES</th>
<th>FREQUENCY</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEGIN NEW RADIO DAY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SN DAVE MATHIOT ON THE WATCH</td>
<td>0001Z</td>
<td>0001Z</td>
</tr>
<tr>
<td>NEG RADIO TRANSMSSION</td>
<td>0100Z</td>
<td></td>
</tr>
<tr>
<td>RELIEVED OF THE WATCH BY EM2 WIEDERICH</td>
<td>0500Z</td>
<td></td>
</tr>
<tr>
<td>LARRY D WIEDERICH ON WATCH</td>
<td>0500Z</td>
<td></td>
</tr>
<tr>
<td>NEG TRAFF PENDING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO SIGNAL TRANSMITTED</td>
<td>0500Z</td>
<td></td>
</tr>
<tr>
<td>RELIEVED OF WATCH BY SN DAVID MATHIOT</td>
<td>0900Z</td>
<td></td>
</tr>
<tr>
<td>SN DAVE MATHIOT ON THE WATCH</td>
<td>1300Z</td>
<td></td>
</tr>
<tr>
<td>NEG RADIO TRANSMSSION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RELIEVED OF THE WATCH BY EM2 WIEDERICH</td>
<td>1300Z</td>
<td></td>
</tr>
<tr>
<td>LARRY D WIEDERICH ON WATCH</td>
<td>1300Z</td>
<td></td>
</tr>
<tr>
<td>NEG TRAFF PENDING</td>
<td>1500Z</td>
<td></td>
</tr>
<tr>
<td>COMMS WITH GRU DULUTH</td>
<td>1500Z</td>
<td></td>
</tr>
<tr>
<td>COMMS WITH STA GRAND MARIAS</td>
<td>1500Z</td>
<td></td>
</tr>
<tr>
<td>COMMS WITH GRU DULUTH</td>
<td>1500Z</td>
<td></td>
</tr>
<tr>
<td>COMMS WITH SMR EM FORD</td>
<td>1622PM</td>
<td>1622Z</td>
</tr>
<tr>
<td>COMMS WITH SMR EM FORD INFORAL</td>
<td>1830Z</td>
<td></td>
</tr>
<tr>
<td>COMMS WITH SMR POLARIS INFORAL</td>
<td>1925Z</td>
<td></td>
</tr>
<tr>
<td>COMMS GRAND MARIS R/C L/C</td>
<td>2030Z</td>
<td></td>
</tr>
<tr>
<td>RELIEVED BY SN BERGER</td>
<td>2100Z</td>
<td></td>
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<tr>
<td>SN DAVID BERGER ON WATCH</td>
<td>2100Z</td>
<td></td>
</tr>
<tr>
<td>NEG TRAFF PENDING</td>
<td>2351Z</td>
<td></td>
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<tr>
<td>R/C WITH TANKER POLARIS PASSING MAJOR</td>
<td>1622PM</td>
<td>1622Z</td>
</tr>
<tr>
<td>EQUIP NORM.</td>
<td>2000Z</td>
<td></td>
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</table>

END OF RADIO DAY

SN DAVID BERGER
<table>
<thead>
<tr>
<th>DATE: NOV 12 1975</th>
<th>FREQUENCY: GARDING 16 FM 2182 AM</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTRIES</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>BEGIN NEW RADIO DAY</td>
<td></td>
</tr>
<tr>
<td>SN DAVID BERGER ON WATCH</td>
<td></td>
</tr>
<tr>
<td>NEG TRAFF PENDING</td>
<td></td>
</tr>
<tr>
<td>NO SIGNAL TRANSMITTED</td>
<td></td>
</tr>
<tr>
<td>RELIEVED OF WATCH BY EM2 HAUGHLEY</td>
<td></td>
</tr>
<tr>
<td><strong>EM2 GORDON J. HAUGHLEY ON WATCH</strong></td>
<td></td>
</tr>
<tr>
<td>NEG TFC. PENDING</td>
<td></td>
</tr>
<tr>
<td>NEG SIGNALS TRANSMITTED</td>
<td></td>
</tr>
<tr>
<td>WATCH RELIEVED BY SN MATHEOT</td>
<td></td>
</tr>
<tr>
<td><strong>SN DAVE MATHEOT ON WATCH</strong></td>
<td></td>
</tr>
<tr>
<td>NEG RADIO TRNMS</td>
<td></td>
</tr>
<tr>
<td>RELIEVED OF THE WATCH BY SN DAVE BERGER</td>
<td></td>
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<tr>
<td><strong>SN DAVID BERGER ON WATCH</strong></td>
<td></td>
</tr>
<tr>
<td>NEG TRAFF PENDING</td>
<td></td>
</tr>
<tr>
<td>R/C WITH TANKER POLARIS PASSED MAJOR</td>
<td></td>
</tr>
<tr>
<td>R/C WITH TUG KATHRYN PASSED WEATHER</td>
<td></td>
</tr>
<tr>
<td><strong>EQUIP MORN.</strong></td>
<td></td>
</tr>
<tr>
<td>RELIEVED OF WATCH BY EM1 BOB LAPEN</td>
<td></td>
</tr>
<tr>
<td><strong>EM1 ROBERT C. LAPEAN ON WATCH</strong></td>
<td></td>
</tr>
<tr>
<td>NEG TRAFFIC PENDING</td>
<td></td>
</tr>
<tr>
<td>COMM UTB 40552 R/C L/C</td>
<td></td>
</tr>
<tr>
<td>COMM T/V POLARIS RB: POSITION RELAY</td>
<td></td>
</tr>
<tr>
<td>COMM T/V POLARIS</td>
<td></td>
</tr>
<tr>
<td>COMM M/V E M FORD RELAY INFO TO STA MUNISING</td>
<td>16,12FM</td>
</tr>
<tr>
<td><strong>EQUIPMENT NML</strong></td>
<td></td>
</tr>
<tr>
<td>RELIEVED OF WATCH BY MK3 BARTHOLOMEW</td>
<td></td>
</tr>
<tr>
<td><strong>MK3 RONALD E BARTHOLOMEW ON WATCH</strong></td>
<td></td>
</tr>
<tr>
<td>EQUIPMENT NORMAL: NEGATIVE TRAFFIC PENDS</td>
<td></td>
</tr>
<tr>
<td>NEGATIVE TRANSMISSIONS ON THE WATCH</td>
<td></td>
</tr>
<tr>
<td>RELIEVED BY SA ROBERT KUMPULA</td>
<td></td>
</tr>
<tr>
<td><strong>SA ROBERT KUMPULA ON WATCH</strong></td>
<td></td>
</tr>
<tr>
<td>NEG TRAFFIC PENDING</td>
<td></td>
</tr>
<tr>
<td>COMM M/V ROUSCH GENERAL INFO.........</td>
<td></td>
</tr>
<tr>
<td>END RADIO DAY</td>
<td></td>
</tr>
</tbody>
</table>

*Signatures:*
- David Berger
- Gordon J. Haughley
- D. Mathiot
- Robert C. Lapean
- Robert Kumpula
BEGINNIN:G RADIO DAY
SA ROBERT KUMPULA ON WATCH
NEG TRAFFIC PENDING
EQUIP NML
WATCH RELIEVED BY SA R CRAINE

SA RONALD CRAINE ON WATCH
NEG TRAFFIC PENDING
NO SIGNALS TRANSMITTED
RELIEVED BY MK3 BARTHOLOMEW

MK3 RONALD E BARTHOLOMEW ON WATCH
EQUIPMENT IS NORMAL:::NEGATIVE TRAFFIC PENDS::: 0500Z
EQUIPMENT IS NORMAL:::NEGATIVE TRAFFIC IS PENDING 0900Z
RELIEVED BY SA ROBERT KUMPULA 0900Z

SA ROBERT KUMPULA ON WATCH
EQUIPMENT NORMAL...NEGATIVE TRAFFIC PENDING 16.22PM 1125Z
COMM S M/V ROUSCH WX
EQUIP NML
WATCH RELIEVED BY BM1 LAFEAN 1320Z

BM1 ROBERT C. LAFEAN ON WATCH
NEG TRAFFIC PENDING
COMM S W R ROESCH RELAY MSG FROM 500 16.22 PM 1440Z
COMM S W R ROESCH INFO ON U/W LAST NIGHT 22 FM 1647Z
COMM S W R ROESCH INFO ON LINES LEFT AT Dock 16.22 FM 1502Z
COMM S W R ROESCH WX
EQUIP NML
RELIEVED OF WATCH BY SA CRAINE 1640Z

SA RONALD CRAINE ON WATCH
NEG TRAFFIC PENDING
NO SIGNALS TRANSMITTED
RELIEVED BY MK3 BARTHOLOMEW 2100Z

MK3 RONALD E BARTHOLOMEW ON WATCH:::
EQUIPMENT NORMAL:::NEGATIVE TRAFFIC PENDS:::
NEGATIVE TRANSMISSIONS ON THE WATCH:::
END OF RADIO DAY NOVEMBER 15, 1975

MK3 RONALD E BARTHOLOMEW
1200 - Released of watch by SA Crane

1100 - SA Crane on watch

1005 - Neg. Traffic pending

2100 - Released by U. Berger

2000 - On David Berger on watch

2000 - Neg. Traffic pending

0000 - End of radio day

0000 - On David Berger

Nov 09 - 1975

2000 - Beginning new radiogram

2000 - On David Berger on watch

Neg. Traffic pending

2000 - Equip normal

Reddened of watch by SA Kumpel

On David Berger

SA Kumpel on watch

Equip normal - Neg. traffic pending

Watch released by SA Crane

SA Kumpel
0930Z  SA Crane on watch

0900Z  Relieved by SN Berger
SA Crane

0900Z  SN David Berger on watch

1030Z  No signal transmitted

1100Z  Relieved of watch by BM Lefevre

1300Z  BM Lefevre on watch

1315Z  Equipment worked

1445Z  Checked equipment, ops and

1700Z  Relieved of watch by SA Kumpula

1 BM Lefevre

1700Z  SA Kumpula on watch

1840Z  Equipment, No traffic

1840Z  Comm 552 returning to station along

1920Z  Called city police about 2 bikes on rocks
behind ship, possibly stolen

2100Z  Watch relieved by SA Crane.  Off watch
SA Kumpula
2100 2A Crane on watch
Neg Traffic pending
Eqpt 76' Mid

2400 End of radio day
2A Crane

10 NOV

0002 2A Crane on watch
Neg Traffic pending
Eqpt Non

0102 Relieved by MK^3 Bartholomew
2A Crane

0102 MK^3 Bartholomew on watch
Neg Traffic pending... equip moved
Equipment moved
Relieved by 2A Robert Lamboy
MK^3 on the bridge

0335 2A Lamboy on watch
Eqpt fwd/ Neg Traffic pending

0355 2A Lamboy off
Watch Relieved by 2A Crane
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>0700Z</td>
<td>SA Crane on watch</td>
</tr>
<tr>
<td>1500Z</td>
<td>Rig traffic pending, Power failure switched to aux power</td>
</tr>
<tr>
<td>1335Z</td>
<td>Power back</td>
</tr>
<tr>
<td>1400Z</td>
<td>Equipment mark</td>
</tr>
<tr>
<td>1400Z</td>
<td>relieved by Dm. Haughery</td>
</tr>
<tr>
<td></td>
<td>S.A. Crane</td>
</tr>
<tr>
<td>1400Z</td>
<td>BM. Gordon Haughery on watch</td>
</tr>
<tr>
<td></td>
<td>NEG TEK pending</td>
</tr>
<tr>
<td>0045Z</td>
<td>Watch relieved by SW without</td>
</tr>
<tr>
<td>2045Z</td>
<td>SW Dave Mathiot on watch</td>
</tr>
<tr>
<td></td>
<td>EQUIP norm</td>
</tr>
<tr>
<td>2400Z</td>
<td>END OF DAY</td>
</tr>
<tr>
<td></td>
<td>S.H. Joe Peltt</td>
</tr>
</tbody>
</table>

**November 11, 1975**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001Z</td>
<td>SW Dave Mathiot on watch, EQUIP norm</td>
</tr>
<tr>
<td>0100Z</td>
<td>Relived of the watch by BM. Wiedrich</td>
</tr>
<tr>
<td></td>
<td>S.H. Joe Peltt</td>
</tr>
<tr>
<td>0100Z</td>
<td>BM. Wiedrich on watch</td>
</tr>
<tr>
<td></td>
<td>NEG TRAFF PENDING</td>
</tr>
<tr>
<td></td>
<td>no signal transmitted</td>
</tr>
<tr>
<td>0600Z</td>
<td>Relieved by SW Berger</td>
</tr>
<tr>
<td></td>
<td>BM.2 Wiedrich</td>
</tr>
</tbody>
</table>

0900 - Sn. Dave drafted on watch equit noam week.

1300 - Relived of watch by Mr. Weidlich.

1300 - Mr. Weidlich on watch neg traffic pending.

1755 - S.T.M.R. EM. Ford Major 16+22 FM

1930 - S.T.M.R. EM. Ford Informal 16+22 FM

1925 - S.T.M.R. Polaris Informal 16+22 FM

2100 - Relived by Sn Berger.

2100 - In. David Berger on watch. Neg traffic pending.

2300 - R/C with tanker Polaris passed Major. Equip Norm.

Nov 12 1925

6:00 A.M.  Beginning New Radio Day
6:00 A.M.  En David Berger on watch

Neg. Transmitted

6:15 A.M.  Relieved by En Haughey

En David Berger

6:10 A.M.  En² Gordon Haughey on watch

Neg. Transmitted

6:00 A.M.  Watch relieved by 82nd boat

Capt. Harold Haughey

0500 A.M.  SN Dave Mathiot on watch

EQUIP NORM NEG. TRANS. PENDING

0900 A.M.  Relieved of the watch by En Berger

En Tom Field

0900 A.M.  En David Berger on watch

Neg. Staff PENDING

1148 A.M.  Board well under radio. Passed major

1152 A.M.  RC with fog. Kathy passed weather

En Fog Warned

1400 A.M.  Relieved of watch by En Zafen

En David Berger
1400: BU1 Robert C. Leaman on watch.

1700: BU1 Robert C. Leaman.

1710: Comms 1476 Ford - relay info to MK3 Bartholomew.


2045: MK3 Bartholomew on watch. Pends.

2045: 1478 Radio [unreadable].

2145: 1475 Left aft morning line. Watch relieved by SA Canoe - all normal.

0100: SA Canoe on watch. Pends.

NOV 13


0700: SA Canoe. Pends.

BU1 Robert C. Leaman.

MK3 Bartholomew.

SA Canoe.
Nov. 13 (cont.)

0500 Z
MK-3 Bartholomew on watch
 equip, etc. norm meg life-raft
 equipment normal, neg life-raft
 relieved by SA McHugh

0900 Z
0902 Z
SA Robert Trumpea on watch
 received call from A/C. Postcard via 44
clocks were off by 5 seconds

1100 Z
Made report secure

1155 Z
Bit called in sick - fall if we need him

1200 Z
Found AM radio on channel 26-78 instead of
26-62

1320 Z
Eqpt Mk - Watch relieved by 1st Lt. yen
SA Foyntza

1320 Z
Bldr. Robert C. Reifman on watch
Eqpt. received

1326 Z
Read 1212002 hours from A/C. Escanaba
Relieved of watch by SA Cramer

1640 Z
Bldr. Reifman
1640
S/L Crain 0 in watch
Neg traffic ends

200 T
Relieved by MK3 Bartholomew
S/L Crain

2130
Ronald Bartholomew MK3 in watch
Neg traffic ends, 1 group mom

2135
Received call from State Police
(Doug Blue) concerning C6
commss on police freq. 4258
megacycles, checking with 500
(Call normal with above

2145
End of Radio Day 11/3/75

NOV 14, 1975

0220
Begin New Radio Day
MK3 Bartholomew off watch

0222
Relieved of watch by S/L Robert Kumpula
MK3 Bartholomew

0222
SA Robert Kumpula on watch

0235
Received call for machinery state police

0315
Neg machinery state police

0315
Neg machinery state police
WHITEFISH POINT LIGHT

46463N 084574W - 6101

999 W0 90 H423 C19D 99 9999

313 31 178

\[4159\]
\[5315 \ 4734 \ 0\]
\[5315 \ 1100 \ 91\]

GENERATOR TRIP SWITCH FAILED TO OPERATE PROPERLY AFTER POWER FAILURE. THIS CAUSED A LOSS OF ALL POWER.
1. (1) LIFEraft (Self Inflatable) **mm/1.3**
   WITH CO2 TANK & CANAPE
   ECUo FROM ROOSTER 1300CH

2. (7) LIFE RINGS WITH LOCATION MARKING

3. (4) LIFE PRESERVERS (CIRCULAR) ✓
   (2) SPECTRUM (CIRC)

4. (5) OAKS

5. (1) SECTIO OF STRONG BACK

6. (1) THWART ✓

7. (1) Suite: wooden LADD ER ✓

8. (1) DRUM MID TANK 6.4 cu. ft. ✓

/ Witness
Received from COC NAUGATUCK 12-30-12 November 1975

3 ea. Air Tanks - Defibot
3. 130 Duplex Steth, w/line
1 ea. Propane Cylinder
3 ea. Defibot Carts

Tested by

Capt. Lasie Car USCG
Picked from Knowler
11/12/75

TO LIFE JACKETS (CORK)
1) ONE
2) UNLIMITED BOOK FOR RENTS
3) DIVING BOARD

KB Baker
Rec'd from 405KB
11/12/75

2 Life Rings
1 Oak Blade
2 Pieces Line 6 ft 8 ft
Best 7 ft life wood
Found at Cappe Core Point

1. monkey line (man rope)
2. 1/2 ft step ladder
3. inflatable life raft
4. broken car
5. boat cover
6. small boat flotation tanks
7. suitcase from small boat
8. life jacket
9. empty boat box
10. inflation cylinder for rubber rafts
11. bag of garbage
12. piece of life ring

11/13/75
H. Hutchinson

17 Nov 8:36 AM CCQ picked up a shoe - possibly from C. T. Steel
Road from Knavesmire (W.L.)
11/10/75

10 Life Jackets (Cork)
1 ONC
2 Inflatable Deck For Rafts
1 Soundings Board

[Signature]
February 9, 1976

Lt. William Holt  
Coast Guard Group  
Sault Ste. Marie, Michigan  49783

Dear Lt. Holt:

This is to acknowledge receipt of two inflatable life rafts from the S/S Edmund Fitzgerald which were picked up at Soo base by our representative on February 3, 1976.

Very truly yours,

[Signature]

EMJacobsen  
Marine Superintendent

em
# 7

Water Pollution Violation Report, 10 November 1975
**WATER POLLUTION VIOLATION REPORT**

**INSTRUCTIONS:** Prepare in triplicate. Retain one copy for case file. Submit original and one copy to District Commanding Officer.

**REPORTING UNIT:**
Captain of the Port, Sault Ste. Marie, MI.

**DATE OF VIOLATION:**
10 Nov 1975

**CASE NUMBER:**
8D-55-75

<table>
<thead>
<tr>
<th>PART I - DISCHARGE DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SOURCE</strong></td>
</tr>
<tr>
<td>STMR EDMUND FITZGERALD</td>
</tr>
<tr>
<td>4. CAUSE</td>
</tr>
<tr>
<td>Sinking</td>
</tr>
<tr>
<td>5. CAUSE</td>
</tr>
<tr>
<td>NOV 26 1975</td>
</tr>
<tr>
<td>6. MATERIAL</td>
</tr>
<tr>
<td>Bunker C &amp; Diesel Unknown</td>
</tr>
<tr>
<td>7. QUANTITY</td>
</tr>
<tr>
<td>EDMUND FITZGERALD MEP</td>
</tr>
<tr>
<td>8. DISCHARGER</td>
</tr>
<tr>
<td>BRANCH</td>
</tr>
<tr>
<td>9. REMARKS</td>
</tr>
<tr>
<td>Position of initial sighting 46.56N, 85.09.0W in U.S. waters, U.S. Navy MAD aircraft located what is believed to be FITZGERALD with oil on surface in position 47.00.5N, 85.06.0W in Canadian waters.</td>
</tr>
</tbody>
</table>

**PART II - REPORTING DATA**

1. NAME OF PERSON REPORTING DISCHARGE (First, middle, last)
   - CG A/C 1016, 1349, A/F 50982
2. ADDRESS OF PERSON REPORTING DISCHARGE
   - CG AIRST RA Traverse City, MI., CG AIRST RA
3. GOVERNMENT AGENCY RECEIVING REPORT
   - COT G Sault Ste. Marie
4. TIME/DATE OF REPORT
   - 1545Z/11 November 1975
5. WAS THE PERSON REPORTING THE INCIDENT EMPLOYED BY OR ACTING IN BEHALF OF THE SUSPECTED VIOLATOR? YES |
6. REMARKS #4. Time of initial sighting of oil. Subsequent to initial sighting, several small slicks of a light oil were sighted by CG A/C and merchant vessels in the area of the sinking.

**PART III - FACILITY DATA**

1. NAME OF ONSHORE/OFFSHORE FACILITY
2. ADDRESS OF ONSHORE/OFFSHORE FACILITY
3. TYPE OF FACILITY
4. PERSON-IN-CHARGE
5. NAME OF OWNER(S)/OPERATOR(S)
6. ADDRESS OF OWNER(S)/OPERATOR(S)
7. REMARKS

**PART IV - VESSEL DATA**

1. NAME OF VESSEL
   - STMR EDMUND FITZGERALD
2. NATIONALITY
   - U.S.
3. CALL SIGN/OFFICIAL NO.
   - MJ9721/277437
4. HOMEPORT
   - Milwaukee, WI.
5. TYPE OF VESSEL
   - Ore Carrier
6. NAME OF OWNER(S)/OPERATOR(S)
   - Oglebay Norton Company
7. ADDRESS OF OWNER(S)/OPERATOR(S)
   - 1200 Hanna Building
   - Cleveland, OH. 44115
8. NAME OF LOCAL AGENT
9. ADDRESS OF LOCAL AGENT
10. NAME OF INSURANCE UNDERWRITER
11. ADDRESS OF INSURANCE UNDERWRITER
12. NAME OF MASTER
   - Ernest M McSorley
13. LICENSE/DOCUMENT NO.
   - 398598
14. NAME OF PERSON-IN-CHARGE
15. LICENSE/DOCUMENT NO.
16. CERTIFICATE OF FINANCIAL RESPONSIBILITY DATED
   - April 1971
17. CERTIFICATE NUMBER
   - 01069
18. REMARKS

**CERTIFIED TO BE A TRUE COPY**

[Signature]

PREVIOUS EDITIONS ARE OBSOLETE
PART V - PHOTOGRAPHS

1. WERE PHOTOGRAPHS TAKEN? [ ] YES [ ] NO
2. DIRECTION FROM WHICH TAKEN
3. NUMBER TAKEN
4. NAME OF PHOTOGRAPHER
5. DATE/TIME TAKEN

6. REMARKS

ARS A/C TM TVC A/S made several passes over area of reported slicks. Photos will be forwarded upon development.

PART VI - SAMPLES

1. WERE SAMPLES TAKEN? [ ] YES [ ] NO
2. LOCATION TAKEN (Attach evidence sheet)
3. NUMBER TAKEN
4. NAME OF PERSON WHO TOOK SAMPLES
5. DATE/TIME TAKEN

6. REMARKS

PART VII - STATEMENTS

1. WERE STATEMENTS TAKEN? [ ] YES [ ] NO
2. NUMBER TAKEN
3. STATEMENTS TAKEN FROM
   [ ] WITNESSES [ ] SUSPECTED VIOLATOR
4. REMARKS

PART VIII - WITNESSES

1. NAME OF WITNESS(ES)
2. ADDRESS OF WITNESS(ES)

3. REMARKS

PART IX - SUMMARY OF EVENTS (Include list of enclosures)

A. 110125Z Nov 75 STMR FITZGERALD reported missing by STMR ANDERSON
   111545Z CG A/C searching for FITZGERALD rptd sighting dark oil
   bubbling up near last reported position of FITZGERALD.
   131533Z light slicks sighted by M/V AYERS
   131610Z
   131855Z light slick sighted by M/V EIDHART
   131921Z light slick sighted by M/V BOYER
   132112Z MAD aircraft located contact believed to be FITZGERALD;
   observed light slick present.
   150010Z OSC, JRT, AST feel threat of major pollution incident non
   existent.
   150310Z CANUSLAK Contingency plan revoked.
   111930Z CANUSLAK Contingency plan invoked.

B. Attachments: TOXIN SITREPS

REPORTED IMPACT OF INCIDENT

Negligible

NAME AND RANK OF INVESTIGATING OFFICER

W. H. HOLT, LT, USCG

SIGNATURE OF SIGNED OFFICER

C.A. MILLRADT, CAPT, USCG

DATE

20 NOV 75

PART X - CIVIL PENALTY ACTION TAKEN

CERTIFIED TO BE A TRUE COPY
ACTION COPY

ACTION OFFICE INSURE CORRECT
ROUTING ASSIGNED

PAGE 2 RUCIAB3260 UCCAS
3. FUTURE PLANS AND RECOMMENDATIONS
   A. CANADIAN COAST GUARD PERRY IS ABOUT TO ISSUE NOTICE TO
      MARINERS ON HOARD OIL.
   B. COCP SCO WILL CONTINUE TO ADVISE LOCAL SHIPPIING TO KEEP
      LOOKOUT FOR OIL AND DEBRIS.
   C. RECOMMEND COCP CONTACT SERVICO AS DIRECTED BY COCP.
      SUGGEST CONTACT IDENTIFY ADDRESSES FOR FUTURE SHIPPERS. ANY AND ALL
      HAVE REQUESTED adjURS.
   D. RECOMMEND CANADA ARIZONA TRAVERSE CITY CHEMICAL PLANT CONTACT AS
      YOUR ASSESSMENT DICTATES.
   E. RECOMMEND AKEELE CHICAGO COE EMERGENCY PLAN. JRT RSET CORR.
      RECOMMEND ACTIVE POLLUTION CASE BE DISCONTINUED FURTHER
      DEVELOPMENTS.
   F. CASE RENDS.

( ZEX = ABOVE MESSAGE IS A BOOK MESSAGE AND
   WAS DELIVERED AS A SINGLE-ADDRESS MESSAGE
   TO ADDRESSES FOR WHICH WE ARE RESPONSIBLE)

CERRIFIED TO: ACTION COPY

MEP

DCP
DPA
OSR
O

MEP
SITUATION

A. AT 1532Z MAD ASIFT LOCATED SURFACE UNDERWATER CONTACT IN POSITION 47-06.5N 05-06.5W WITH LIGHT OIL SURFACING OVER CONTACT MOVING 200 FT X 12 FT AND THEN DISAPPEARING. IN VIEW OF LAST REPORTED POSITION STRONGLY SUSPECT CONTACT TO BE FITZGERALD. NO OTHER WEIRD BELIEVED TO BE IN THIS VICINITY WITH SURFACING OIL STRONGLY INFLUENCING ASSUMPTION LIGHT NATURE OF OIL MAY INDICATE DIESEL FROM DUMMY TANK. NO OTHER SUSPICIOUS CONTACTS NOTED.

B. POSITION FINDING BY MAD ASIFT RE LACKING GOOF. PHOTOS OF LUCK TAKEN AND ATTEMPTS TO ACCESS TODAY UNDERWAY.

C. LOCATION OF CONTACT IN CANADIAN WATERS.

D. SHORELINE SEARCH CONTINUES WITH REGULAR SIGHTINGS, NO

(ZEX - ABOVE MESSAGE IS A BOOK MESSAGE AND WAS DELIVERED AS A SINGLE-ADDRESS MESSAGE TO ADDRESSEES FOR WHOM WE ARE RESPONSIBLE)

CF

CERTIFIED TO BE A TRUE COPY
CERTIFIED TO BE A TRUE COPY

We Certify

[Signature]

[Date]
ACTION COPY
ACTION COPY INSURED
ROUTING ASSIGNED

FAC. 1:45 PM
EPT. 907, WED. 18 SEP 75
EPT.

ACTION COPY
ACTION COPY INSURED
ROUTING ASSIGNED

FAC. 1:45 PM
EPT. 907, WED. 18 SEP 75
EPT.

ACTION COPY
ACTION COPY INSURED
ROUTING ASSIGNED

FAC. 1:45 PM
EPT. 907, WED. 18 SEP 75
EPT.

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ACTION COPY INSURED
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EPT. 907, WED. 18 SEP 75
EPT.

ACTION COPY
ACTION COPY INSURED
ROUTING ASSIGNED

FAC. 1:45 PM
EPT. 907, WED. 18 SEP 75
EPT.

ACTION COPY
ACTION COPY INSURED
ROUTING ASSIGNED

FAC. 1:45 PM
EPT. 907, WED. 18 SEP 75
EPT.

ACTION COPY
ACTION COPY INSURED
ROUTING ASSIGNED

FAC. 1:45 PM
EPT. 907, WED. 18 SEP 75
EPT.

ACTION COPY
ACTION COPY INSURED
ROUTING ASSIGNED

FAC. 1:45 PM
EPT. 907, WED. 18 SEP 75
EPT.
PAGE FOUR: RECONNAISSANCE WHEELS

D. Established liaison with KUCHEL 504 for heavy wrench.
VENUE if necessary.
E. Carefully removed oil samples from debris.
F. Continuing examination of marker counts.

3. FUTURE PLANS AND RECOMMENDATIONS

A. Chart RAD MAP for field location, obtaining OMEGA SE-1 SNARE.

B. Asst and canadian army clear personnel debris, access accessory material.

C. Asst prepare to analyze samples as necessary.

D. Deploy marker posts and secure equipment as situation dictates.

E. Deploy navy diving gear as situation dictates.

F. Continue search for debris area.

G. Request police to encircle debris area immediately.

AREA SUSPENDED BY DEPOT for 15 MINUTES. 100 FEET NORTH AND SOUTH.

CARE wires.

7/5201

CERTIFIED TO BE A TRUE COPY
ACTION COPY

ACTION OFFICE: INSURE CORRECT

ROUTING ASSIGNED

CERTIFIED TO A TRUE COPY

[Handwritten text:]

Corpo and traffic -

called direct to 0521380 -

Here, the 0521380 -

[More handwritten text:]
UNCLASSIFIED

TOKYO SITREP NUMBER TEN

MAJOR OIL SPILL WHITFISH BAY ONE CARARRIER EDMOND FITZGERALD

1. SITUATION
   A. NO OIL SIGHTED ALONG ONTARIO SHORELINE MICHIGAN SHORELINE
   ON WHITFISH BAY TODAY, ONE SUSPICIOUS AREA NOTED BETWEEN VERMILLION PT.
   AND CHIEF POINT MICHIGAN AND WILL BE RE-EXAMINATED. SEARCH
   CONDITIONS HOWEVER VERY POOR DURING THE ENTIRE DAY.
   B. ACT PERSONNEL RETURNED AT 1600.
   C. OWNERS STILL CONSIDER MUSTER OF FINANCIAL RESPONSIBILITY
   D. WEATHER FORECAST WINDS EAST TO NORTHWEST UP TO 45 KNOTS
   INCREASING 40 TO 50 KNOTS BY EVENING. BOREALLY INCREASING 50 TO 45 KNOTS
   TONIGHT GRADUALLY DECREASING 25 TO 35 KNOTS THURSDAY....SNOW SHOWERS...
   E. WAVES 9 TO 12 SEET INCREASING 3 TO 16 FEET TONIGHT.... TURNS
   COLDER LOW TEMPERATURES BY THURSDAY WORKING IN THE UPPER 30s.

2. ACTION TAKEN
   A. CONDUCTED EXTENSIVE DISCUSSIONS WITH OWNERS NETS AND JET
   B. CONDUCTED VISUAL SEARCHES AS WIND PERMITTED.
   C. ENVIRONMENTALLY SENSITIVE AREAS IDENTIFIED.
   D. ALERTED CUSTOMERS AND LOCAL POLICE.
   E. SELECTED CONTRACTORS AND CANADIAN CO. OFFICER PLACED ON NOTICE
   BUT NOT MOBILIZED.

3. FUTURE PLANS AND RECOMMENDATIONS
   A. CANADIAN CS TO CONDUCT SHORELINE SEARCH OF ONTARIO ONG CAY
   B. HIGH DRA BDU OR JET TO CONDUCT SHORELINE SEARCH TOWARDS
   C. GROV COUP AND AS COUP FOR CAL LOOKOUT PURPOSES AND
   STRENGTHEN CO OR COUP TO ASSIST IN RECEIVING OIL SPILLAGE
   D. ACT PERSONNEL WILL COORDINATE WITH CO NO DRAFT UNDERWATER SAFETY
   E. FULL MOBILIZATION OF EQUIPMENT PENDING RECON.
   F. SUGGEST CSO OR CSO MAKE INQUIRY AS TO AVAILABILITY OF AIR
   AIRCRAFT FOR USE IN LOCATION OF SIGHT OR PARTS OF SIGHT AREA
   G. REQUEST CSO OR CSO TO PATROLLER PATROL FIRST SUITABLE LIGHT 13 NOV
   AREA SURROUNDED BY WHITFISH CAY SHORELINE AND 47-10N 85-28N INCLUDING
   LOSS OF AVAILABLE.

4. CASE FEES
   13/11/67 70 NOV OAS

ACT: MCF

IN/F/DPA/009/0/DAM

CERTIFIED TO BE A TRUE COPY
PAGE 700 GRL 900 UNCLAS
ZEN/DEPARTMENT OF TRANSPORT ABERDEEN
ZEN/DEPARTMENT OF TRANSPORT TORONTO
ZEN/NAVY LEHIGH NAVY ZERO NAVY
ZEN/COMPAGNY COGAND SAN FRANCISCO CA
UT
UNCLAS
TCXXT GENTREP NUMBER CRV
MAJOR OIL SPILL WHITEFISH BAY CRV CARRIER EDMUND FITZGERALD
I. SITUATION
A. OWNERS CONFIRM AMOUNT OF BUNKER O ABOARD SUNKEN VESSEL
EDMUND FITZGERALD APPROXIMATELY 75,530 GALLONS PLUS LIMITED AMOUNT
DIESEL OIL.
B. SAR UNITS HAVE IDENTIFIED SEVERAL SLICKS INCLUDING ONE WHICH
IS SUSPECTED TO BE FROM VESSEL IN POSITION 45°36′N, 89°56′W. OTHER
SMALL SLICKS HAVE BEEN NOTICED NEAR CANADIAN SHORELINE.
C. DEBRIS FROM VESSEL COACHED IN PART WITH BUNKER O.
D. PRINCIPAL GOVERNMENT UNITS REMAIN SAR INVOLVED.
E. JOINT RESPONSE TEAM ON SCENE AND FUNCTIONING.
F. OWNERS PRESENTLY IN NO POSITION TO ASSUME FINANCIAL
RESPONSIBILITY.

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PAGE THREE GRU 585 UNCLASS

G. ATLANTIC STRIKE TEAM ADVISORY PERSONNEL EMERGENCY AIR 121836Z.

H. PRESS RELATIONS GOOD.

I. ON SCENE WITH SEARCH AND RESCUE COM ZE 4 2 FEET, WIND 60K 10-15 KTS.

OVERCAST, VIS 15 M 20 MILLION 300 MILLION, FORECAST EXHAUSTION INCREASING
IN WINDS BACKING TO SOUTHWEST THIS EVENING. SMOKE EQUALLY AND
SMOKE INCREASING TO 15-10 FEET CONTINUOUSLY.

ACTION TAKEN

A. CONDUCTED RECON THROUGH SAR UNITS AND ONTARIO PROVINCIAL

CLOKE.

B. CONDUCTED MEETINGS WITH JRT.

C. ARRANGED RECON FLIGHTS OVER ONTARIO AND MICHIGAN

AREAS TO DETERMINE PROBABILITY OF PERMIT VIEWING.

D. DISCUSSED OVERALL RECON SITUATION WITH JRT AND OFFICERS.

E. JRT HANDLING PRESS.

F. ESTABLISHED LIASION WITH U.S. ON DEVICES REP CROSSMARK.

G. 50,000 DOLLARS CEILING ESTABLISHED AND CONSIDERED ADEQUATE

VITAL POINTS

H. FULL UNDERSTANDING REACHED AMONG JRT RELATIVE TO

EMERGENCY.

I. FUTURE PLANS AND RECOMMENDATIONS

PAGE FOUR GRU 585 UNCLASS

A. CONTINUE RECON ACCOMPANYING RECALL OF SAR UNITS OCCUR.

B. CONDUCT FREQUENT MEETINGS WITH JRT TO DETERMINE COUNTERMEASURES

S RECON DICTION.

C. JRT IDENTIFYING ENVIRONMENTALLY SENSITIVE AREAS.

D. ASSEMBLE NECESSARY EQUIPMENT TO CONDUCT FULL CLEANUP AS

SITUATION DICTION.

E. ATTEMPT Direct SICHERHOUT OF RECOG OCCURRE.

F. ALERT COURTS AND POLICE RELATING TO TRANSFERENCE MOVEMENTS.

CASE PEND.

ACT: REP

219442 55V JP

M
F
DP
DCS
C
C

CERTIFIED TO BE A TRUE COPY
# 8

Soo Control Daily Traffic Summaries and Radio Logs from
Coast Guard Station Grand Marais
From: Commander, Group Sault Ste. Marie
To: Chairman, Marine Board of Investigation, SS Edmund Fitzgerald

Subj: Additional information requested

1. Forwarded as enclosures are the additional items requested during my testimony on 26 November 1975:
   b. WX data for 102200Z.
   c. Statements and radio logs from Station Grand Marais.
   d. Two WX reports from SS Arthur M. Anderson.

2. The statement previously submitted from RM2 BRANCH should be dated 18 November 1975.

   (Signature)
   C. A. MILLRADT

Encl: (1) Soo Control Traffic Summaries (para 1a above).
      (2) WX Data (para 1b above).
      (3) Statements/Logs from Grand Marais (para 1c above).
      (4) WX Reports (para 1d above).
Commander
U.S. Coast Guard Group
Sault Ste. Marie, MI
49783

5000
2 December 1975

From: Commander, Group Sault Ste. Marie
To: Chairman, Marine Board of Investigation, SS Edmund Fitzgerald

Subj: Additional information requested

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      (2) WX Data (para 1b above).
      (3) Statements/Logs from Grand Marais (para 1c above).
      (4) WX Reports (para 1d above).
# SOO Control Daily Traffic Summary

**Date:** 12 November, 1975

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<th>Vessel</th>
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<th>Month</th>
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<td>180</td>
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<tr>
<td>Downbound</td>
<td>08</td>
<td>166</td>
</tr>
<tr>
<td>American</td>
<td>11</td>
<td>5245</td>
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<td>Canadian</td>
<td>08</td>
<td>2504</td>
</tr>
<tr>
<td>Foreign</td>
<td>02</td>
<td>572</td>
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**Following Totals for Year:**

- **Collisions:** 03 Year
- **Grounding:** 05 Year
- **Locks Closed:** 85.44 Hours This Year
- **River Closed:** 130.02 Hours This Year

**Remarks:**

- (Grounding, SAR, Violations, Locks Closed, Open, ECT)

**0140R—** J. Burton Ayers A/A due to weather in Goulias Bay, will get U/W in the morning and return to search area.

**0548R—** Rcvd call from Stewart J. Cirt westbound out of detour reporting that Martins Reef light is extinguished.

**0616R—** Contacted St. Ignace and informed them of Martins Reef light reported ext. They replied that their monitor did show fail and that he was pretty sure their ET's knew about it.

**1141R—** CCGS Verendrye U/W to assist in search area.

**1352R—** Rcvd call from RCC stating to call off search of surface vessels.

**1355R—** Advised CGC Woodrush and CGC Naugatuck RCC secured search by surface vessels, Woodrush and Naugatuck returning to base SOO.

**1358R—** Advised CCGS Verendrye search of surface vessels called off due to weather conditions, Verendrye returning to SOO.

**Submitted:**

- Controller

**Forwarded:**

- TCWO

**Approved:**

- Commanding Officer
SOG CONTROL
DAILY TRAFFIC SUMMARY

DATE __________________________

VEssel .................. DAY .............. MONTH ..............

UPBOUND ..............

DOWNBOUND ..............

AMERICAN .............. DAY .............. YEAR ..............

CANADIAN .............. DAY .............. YEAR ..............

FOREIGN .............. DAY .............. YEAR ..............

FOLLOWING TOTALS FOR YEAR........

COLLISIONS _____ YEAR .............. GROUNDING _____ YEAR ..............

LOCKS CLOSED ______ HOURS THIS YEAR

REMARKS: (GROUNDING, SAR, VIOLATIONS, LOCKS CLOSED, OPEN, ECT)

1515R- TUG JOE VAN REPT DRAGING BUOY 102 OFF STATION TO THE WEST 150 FT., ANCHOR IS TANGLED IN BUOY CHANE.

1543R- RCVD CALL FROM TUG JOE VAN STATING THAT HE HAS DRAGGED BUOY 102 BACK ON STATION.

1644R- RCVD CALL FROM CG 7236 THAT ONE OF THE CG HELOS SPOTTED A RED NUN BUOY 10 MILES SOUTH OF WHITEFISH PT ON THE BEACH.

1830R- CGC KAAUGATUCK MOORED BASE SOO.

1955R- CGC WOODRUSH MOORED BASE SOO.

SUBMITTED: S. D. CARROLL, RD2 CONTROLLER

FORWARDED: I. J. TREADWAY, CWO-3 TCEO

APPROVED: C. A. MILLRADT, CAPT. COMMANDING OFFICER
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<td>LT. HOLT RELIEVED LTJG STOUT ALG</td>
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<td>CSS A 6977 MOORED ADJ TO VILLAGE</td>
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<td>HAPPY L. ALLEN A/A GOUAUS PAY DUE TO WAX</td>
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<td>MANITOUIN U/W D/R</td>
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<td>CSS VERPENDYE U/W XP ENP. TO ASSIST FCP SEARCH</td>
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<td>CSS A 6977 ENP. DETOUR LT. WITH ET EST. 1/2 HOUR AT LIGHT</td>
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<td>ADV. CSS VERPENDYE SEARCH OF SURFACE VESSELS CALLED OFD DUE TO WEATHER CONDITIONS, VERPENDYE RETURNING TO SOO</td>
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<td>LATE ENTRY, PCVD CALL FM PCC STATION TO CALL OFF SEARCH OF SURFACE VESSELS</td>
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<td>LATE ENTRY, ADV. CSS WOODPUSH AND CSS NAUGATUCK PCC SECUPED SEARCH OF SURFACE VESSELS, WOODPUSH AND NAUGATUCK RET. RETURNING TO PACE 500</td>
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<td>CSS A 6977 MOORED DETOUR VILLAGE</td>
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<td>CSS RUCKTHORN U/W ENP. DRUMMOND IS. 21 PASSENGER</td>
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TOL
GCG Ruckthorn U/W Ent. Detour Village
CHANNEL
DIRECTED SCOTT MISENER TO CHECK SPEED TIL JOE VAN CLEARS

DATE
A LATE ENTRY, CWO-3 DREADWAY RELIEVED LT HOLT AS OOD
PERGA TO SCOTT MISENER TO PROCEED U/R WITH EXTREME
CAUTION VIC. RUOY 1/2
WATCH TO HUNYADY PD3

S. D. CARROLL, PD3

1600-2400
PD3 HUNYADY ON WATCH
GCG 30436 U/W SOO HRR TO PICK UP TREE BM1 HAWKEY COX
GCG Ruckthorn Moored Detour Village
-REC CALL FM TUG JOE VAN STATING THAT HE HAD
DRAGGED RUOY 1/2 RACK ON STATION
GCG 30436 Moored Base SOO
-REC CALL FM MRS. ROGERS ON SUGAR IS. STATING THAT
SHE WAS MISSING A 14 FT MIRBE CRAYF PROWBOAT NO.
MC 3619CR, ALUMINUM TOP PART COLORED, SHE SAID THAT
IT HAD BLOWN OFF THE TOP OF BOATS STACKED ON REACH
BUCKTHORN U/W ENR DRUMMOND IS. 55 POR
BUCKTHORN MOORED DRUMMOND IS.
BUCKTHORN AND GCG 40527 MOORED DETOUR VILLAGE
-REC CALL FM GCG 7236 THAT ONE OF THE GC HELOS
SPOTTED A PED NUN RUOY 1/2 M.T. S. OF WHITEFISH PT.
ON THE REACH
-NAUGATUCK MOORED BASE SOO
-WOODRUSH MOORED BASE SOO
WATCH TO PD2 CAPRILL

F.J. HUNYADY PD3
<table>
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<tr>
<th>VESSEL NAME</th>
<th>DRAFT</th>
<th>DETOUR</th>
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SOO CONTROL
DAILY TRAFFIC SUMMARY

DATE  3 NOV 1975

VESSEL    DAY    MONTH
UPBOUND  5th  48       188
DOWNBOUND  11      177
AMERICAN  5th  5552    YEAR
CANADIAN  5th  2513   YEAR
FOREIGN  5th  575   YEAR

FOLLOWING TOTALS FOR YEAR......

COLLISIONS  03   YEAR  GROUNDING  05   YEAR

LOCKS CLOSED  85.44 HOURS THIS YEAR  DIVE CLOSED 13d. 92 HOURS

REMARKS: (GROUNDING, SAR, VIOLATIONS, LOCKS CLOSED, OPEN, ETC)

1st NO-OCT PUCKTHORN DEPT HAVING RUPTURED THEIR HYDRAULIC LINE. GETTING U/W
DUE TO WEATHER CONDITIONS.

2nd NO-OCT PUCKTHORN U/W FOUND OUT DEP. BASE SOO.

5th NO-NAUGATUCK DEPT PADA DO DEP. ET ASSIST.

7th NO-J RUPON AYERS PPTD LT OIL 258 T 4.8 MI FM COPPERMINE PT.

11th NO-J RUPON AYERS PPTD LT OIL 27d T 9.1 MI FM COPPERMINE PT.

13th NO-J RUPON AYERS PPTD LT OIL 1 MI DIA READING 275 T 1d.9 MI COPPER
PT 348 T 16.8 MI WHITEFISH PT.

13th NO-WOODPUSH PPTD THAT WILLIS ROYER PPTD LT OIL SLICK 336 T 16.8 MI
WHITEFISH PT.

182rd-OCVD CALL FROM MO ROONK STATING THAT MAR. AIRCRAFT HAS LOCATED
WEAPON OF FITZGERALD.

22rd-ADV GLEN PARK OF SPD CHK FABICHETTE PT DOING 1d.2 MPH CAVE OFFICIAL

SUBMITTED:  CONTROLLER  FORWARD:  TCWO
APPROVED:  COMMANDING OFFICER
SOO CONTROL
DAILY TRAFFIC SUMMARY

VEssel   DAY      MONTH
UPBOUND
DOWNBOUND
AMERICAN    DAY      YEAR
CANADIAN     DAY      YEAR
FOREIGN     DAY      YEAR

FOLLOWING TOTALS FOR YEAR......

COLLISIONS____YEAR      GROUNDING____YEAR

LOCKS CLOSED______HOURS THIS YEAR

REMARKS: (GROUNDING, SAR, VIOLATIONS, LOCKS CLOSED, OPEN, ECT)

22ND CONT WARNING AND DIRECTED VESSEL TO CHK DOWN.

______________________________
SUBMITTED:  E.C. HADIS WM?
CONTROLLER

______________________________
FORWARDED:   K.A. BAKER  ENS

______________________________
APPROVED:    C.A. MILLS ADJ CPT
COMMANDING OFFICER
# Radio Log

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## Entries

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<td>BUCKTHORN PEPT HAVING RUPTURED THEIR HYDRAULIC LINE, BUCKTHORN SECURED &amp; ELECTRICAL POWER AFT DUE TO HYDRAULIC FLUID SPILLING RHEX OUT ON THE MESC DECK AND WAPROOM, POWER IS SECURED AFT DUE TO FIRE HAZARD. BUCKTHORN PEPT DUE TO WEATHER CONDITIONS, THEY WILL HAVE TO GET U/W SUP. COMMANDER PEPT IT IS UP TO THE DISCRETION OF BUCKTHORN CO. ON MAXIMAL WETHER THEY RETURN BASE. BUCKTHORN U/W ENR. BASE SOO WHITEFISH PT. MOOR GEAR OPS NWL P/C WITH CGG NAUGATUCK L/C ROTH ENDS $23 12 233 16 21</td>
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**E. C. HARRIS QM2**
1600-2400
PD2 CARROLL ON WATCH
ENS. RAKER RELIEVED QMCS GALLAGHER AS OOD
MIDDLETOWN REPT FLARE SIGHTING HALF WAY BETWEEN
CRISP PT. AND WHITEFISH PT., THEY ARE PROCEEDING
TO INVESTIGATE. FLARE X HAS GONE OUT IN WATER.
MIDDLETOWN REPT FLARE 3.2 MILES FROM SHORE 5 ML.
ABOVE WHITEFISH PT. ON THE 280° COURSE
MIDDLETOWN REPT JUST BEFORE SIGHTING FLARE A HELO
FLEW OVERHEAD
CG 1016 REPT DROPPING SMOKE FLARE TO MARK OIL
SLICK XXX IN THE POSITION OF MIDDLETOWNS FLARE
SIGHTING
CG 40573 U/W FM BROWNS FISHERY ENR. RASE SOO
CG 40573 OPS NML
RCVD CALL FROM MR. RRONK XXXXXX STATING THAT MAD
AIRCRAFT HAS LOCATED WRECK OF FITZGERALD
STADACONA DEPARTED ALGOMA D/B
CG 40573 OPS NML GROS CAP LT.
CG 40573 MOORED RASE SOO
AMOCO WISCONSIN DEPARTED CAPRIDE D/C D/B
ADV. GLEN PARK OF SPD CHK PEGHETTE PT. DOING 10-2
MPH GAVE OFFICIAL WARNING AND DIRECTED VESSEL TO
CHECK DOWN
CG NAUGATUCK MOORED RASE SOO
CGS VERENDYNE MOORED RASE SOO
CGS VERENDYNE DEPARTED RASE SOO, HAVING DROPPED OFF
FITZGERALD'S LIFEROAT
WATCH TO HAPPIS QM2

S. D. CARROLL, PD2
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SOO CONTROL
DAILY TRAFFIC SUMMARY

DATE 14 NOV 75

VESSEL  DAY  MONTH
UPBOUND  16  24
DOWNBOUND  22  199
AMERICAN  19  DAY  5571  YEAR
CANADIAN  15  DAY  2528  YEAR
FOREIGN  04  DAY  579  YEAR

FOLLOWING TOTALS FOR YEAR.......

COLLISIONS 03  YEAR  GROUNDING 05  YEAR
LOCKS CLOSED 85.44  HOURS THIS YEAR  RIVER CLOSED 139.42  HOURS

REMARKS: (GROUNDING, SAR, VIOLATIONS, LOCKS CLOSED, OPEN, ECT)

0510- WHITEFISH RADIORECEON SHOWING FAIL AND ON SECONDARY.

1310- JOSEPH H FRANTZ A/A OFF SWEETS PT IN ORDER TO MAKE REPAIRS TO THEIR ENGINE HEADS.

1320- NOTIFIED MIO OF ANCHORAGE

1950- ALCOPAIL SPD CKD APEAM BUOY 92 SPD LIMIT IN THAT AREA 10.6 MPH HIS SPD 11.6 MPH IN VIOLATION. MASTER'S NAME MCDONALD. LAST PORT SOO CANADA.

2006- WOODPUSH U/W U/R END TO SEARCH AREA.

2352- WHITEFISH MONITOR ALARM WILL NOT STAY OFF. CHK WITH TELEPHONE CO. SAID IT WAS IN OUR MONITOR NOTIFIED CWO-3 MAGILL PROBLEMS STARTED AROUND 1700.

__________________________
D.A. Wills GM3

__________________________
Controller

__________________________
A. J. Gallagher GMCS

__________________________
TCHO

__________________________
C. A. MILLARD Capt.

__________________________
Commanding Officer
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**Entries**

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QM2 Harris on watch in SOO traffic control. Ensign Raked as OOD, Comms and Vis good.

Woodpush moored base SOO.

Whitefish radio beacon showing fail and on secondary Vis.

C.G. Vespynntie causing excessive wake and spd notified him to check down.

Watch QM3 watch. E.C. Harris QM2

QM3 Wiapd on watch.

QMCS Gallacher relieved Ensign Raked as OOD.

Algomaio moored Algoma Steel.

Joseph H. Frankz A/A off sweets pt. Vive to do some repair work to their engines.

Notified MIO of anchorage.

Algosoq moored Algoma Steel.

Watch QM2 Harris.

P. A. Wiapd QM3

1600-2400

QM2 Harris on watch.

Algomaio Dptd Algoma W/R.

Joseph H. Frankz U/W D/R.

Algomaio spd chk FUCY 92 spd in area 1st. 6 M1 His spd 1st. 6 M1 gave official violation warning Master's name.

McDonald last port Soo Canada.

Algosoq Dptd Algoma.

Woodpush Dptd base SOO U/R to search area.

Whitefish monitor whistle will not stay off check.

With telephone Go said it was in our monitor. Notified CWO-3 Macill problems started with around 1700.

Watch QM3 Wiapd. E.C. Harris QM2
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<th>DETOUR</th>
<th>FUEL DOCK</th>
<th>EVERNS</th>
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**DATE** 14 Nov 75

**REMARKS**

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**REMARKS**

- NA 6-C 3-B 16
# Downbound Vessel Log

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Date: 14 Nov 75

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**DATE:** 14 Nov 75

**REMARKS:**
WX NET DE DS

BT
UNCLAS
5XUS8 KCLE 102200Z
ID WXVSS /WIND/WAVE/SEA/AIR/PRES REMARKS STATION NAME
38Y CY10 /W22 /05 /M /43 /2998 ST IGNACE
28Y CY10 /W20 /22 /M /50 /3029 NORTH MANITOU
32G CY20 /NW12 /C1 /54 /54 /M LANSING SHOALS
27Y CY12 /WNW35/16 /N /41 /2976 GRAND MARAIS
44Y CY10 /NNE06/CALM/54 /50 /M SAULT STE MARIE
34Y CY/R10 /NW12 /C7 /S /42 /2962 MARQUETTE
P46 3056//G66 STANARD ROCK
42Y WHITEFISH PT MISSING
BT

NNNN
Coast Guard Station Grand Marais, Michigan

STATEMENT CONCERNING THE SINKING OF THE MERRIYND FITZGERALD

To whom it may concern:
At 1530-R I was told to make a boat check, and secure more mooring lines on the stations vessel. SN Wigen said he would stand by while I was at the boat dock. In the mean time the CO of this unit decided to moor stations vessel at public dock to insure the vessel's safety. I returned to station at 1645 and assumed my watch till 1800-R. On date in question 10 November 75 and heard nothing from the MERRIYND FITZGERALD while on watch.

[Signature]
SN Michael R. McFarland
WX MSGS SENT FROM ANDERSON TO GRAND MARAIS

DS DE MA
P 110545Z NOV 75
FM STA GRAND MARAIS TO METEO CLEVELAND METEO DETROIT METEO CHICAGO
BT UNCLAS
ARTHUR M. ANDERSON/WE 4865
11469 84906 92840 97707 1031 1 31309 S 7 NNE 10
BT
TOD: 11/10547Z NOV 75 GE KKK
DE DS R RDT AR

DS DE MA
P 102354Z NOV 75
FM STA GRAND MARAIS TO METEO CLEVELAND METEO DETROIT METEO CHICAGO
BT UNCLAS
ARTHUR M. ANDERSON/WE 4865
11471 85300 83050 98687 10106 31410 S 30 NW 10
BT
TOD: 11/00042Z NOV 75 GE KKK
DE DS R PB AR
Coast Guard Station Grand Marais Michigan

STATEMENT CONCERNING THE STARTING OF THE STORM ON EDWARD FITZGERALD

To whom it may concern:

At 101530 I assumed the watch so that the boat crew could move the boat due to weather conditions. During this time, (between the time the boat crew left and when they returned) the Edward Fitzgerald called this unit at 101530 on channel 16 FM and I asked him to go to channel 22 FM. When he called back on 22 he asked if we knew if Whitefish Point radio beacon was operating because they could not monitor it. I told him to standby, because we had no equipment here to monitor it and I would have to go through the Soo, I talked to the Soo via teletype and asked them if they could monitor it for me and tell me if it was working or not. The man at the Soo said that they were having a power failure, but that as far as their equipment showed it was not working at all. I said thank you and got back on the radio and told the Fitzgerald that so far as the Soo knew it was not working. The man on the Fitzgerald said "OK, thanks. We were just wondering because we haven't been able to get it for a while." Then he said his call sign and went off. The Soo also told me that they would call me back when the power came back on to give me some more information on the beacon. I also told the Fitzgerald that when I told them that it wasn't working.

I would say that this whole process took about 90 seconds to do.

/s/ E. Wills

Chief Enginner
Mate's Logs, EDMUND FITZGERALD, 1970, and Guidance Manual for Loading, EDMUND FITZGERALD
MARINE BOARD OF INQUIRY
% COMMANDER (mmt)
Ninth Coast Guard District
Room 455
Investment Insurance Building
601 Rockwell
Cleveland, Ohio 44114

Subj:  Job #1593-1 - EDMUND FITZGERALD
       Board of Inquiry Requests

Encl:  (1) One copy STR. EDMUND FITZGERALD, Mate's Logs 1970 (partial)
       (2) One copy "Guidance Manual for Loading EDMUND FITZGERALD"
          dated Feb. 28, 1972, Revised Dec. 5, 1975

Gentlemen:

In accordance with the request to furnish certain data during the
hearing on November 22, I am responding as follows:

1. 1970 Mate's Loading Sheets. The sheets which we received and which were
    used to assist in the preparation of the loading manual for the EDMUND
    FITZGERALD are enclosed. These are Xerox copies, and you will note that
    there have been pencil notations and calculations added to the sheets by
    this office.

2. Angle of Repose of Pellets. We have determined the angle of repose by
   observation on board ship and by measurement of repose angles from
   photographs. These angles have varied 2 or 3 degrees above and below 30
   degrees and we have used 30 degrees as a good mean in our calculations.

3. Feedback from Mates on FITZGERALD Loading. We have received no feedback
   from the mates on loading of the FITZGERALD after issuance of the loading
   manual.

4. Up to Date Copy of Loading Manual. One copy is enclosed. The only changes
   from the copy of which was placed on board are the insertion on the cover
   page of the approval dates by USCG and ABS and the correction of typo-
   graphical errors on sheets 8, 9, and 12.
The notes which I took at the hearing stated there were five items requested. However, I do not have a record of what the fifth item was. If you will so inform me I will be pleased to furnish the additional information.

Very truly yours,

R. A. STEARN, INC.

R. A. Stearn, President

RAS/rjm

cc: File (1)
    Thomas O. Murphy (1)
Steamer Edmund Fitzgerald

Dates Applicable to Seasons

GROSS TONS = 13,632
NET TONS = 8,686
DEADWEIGHT =
BALE CUBIC = 805,000
LENGTH = 220' (67.1 m)
BEAM = 75' (22.9 m)
DEPTH = 38'
NO. OF HATCHES = 21
HATCHES = 137.6 ft.
SIZE OF WATER BOTTOM =
NO. OF TANKS = 8
HOLDING HATCHES = 9 1/2 16

1970
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<td>157.18</td>
</tr>
<tr>
<td>220.00</td>
<td>220.00</td>
<td>220.00</td>
</tr>
<tr>
<td>223.67</td>
<td>223.67</td>
<td>223.67</td>
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</tbody>
</table>

**DATE:** April 11, 1970

**GRADE ONE:** 12

**ACCOUNT:**

**DOCK LOADED:** S.

**AVERAGE CAP:**

**WEIGHT:**

**START LOAD:**

**STOP:**

**RESUME:**

**STOP:**

**RESUME:**

**FINISH:**

**DRAFT:** 24.12'

**FORD:** 24.3'

**MID:** 24.

**AFT:** 25.3'

**22,616 LBS**

**571 PLS**

**22,616 LBS**

**22,616 LBS**

**22,616 LBS**

**22,616 LBS**

**22,616 LBS**
<table>
<thead>
<tr>
<th>TIME</th>
<th>1ST</th>
<th>2ND</th>
<th>3RD</th>
<th>4TH</th>
</tr>
</thead>
<tbody>
<tr>
<td>14750</td>
<td>14750</td>
<td>15188</td>
<td>21.25</td>
<td>1.0184</td>
</tr>
<tr>
<td>142</td>
<td>142</td>
<td>15188</td>
<td>21.25</td>
<td>1.0184</td>
</tr>
<tr>
<td>14750</td>
<td>14750</td>
<td>15188</td>
<td>21.25</td>
<td>1.0184</td>
</tr>
<tr>
<td>142</td>
<td>142</td>
<td>15188</td>
<td>21.25</td>
<td>1.0184</td>
</tr>
<tr>
<td>14750</td>
<td>14750</td>
<td>15188</td>
<td>21.25</td>
<td>1.0184</td>
</tr>
<tr>
<td>142</td>
<td>142</td>
<td>15188</td>
<td>21.25</td>
<td>1.0184</td>
</tr>
</tbody>
</table>

**DATE**: 5-17-70

**GRADE CRE**: 1/26.5%

**ACCOUNT**: ____________

**DOCK LOADED**: ____________

**AVERAGE CAR WEIGHT**: ____________

**TONS**: ____________

**START LOAD**: ____________

**STOP**: ____________

**RESUME**: ____________

**STOP**: ____________

**RESUME**: ____________

**FINISH**: ____________

**DRAFT**: FORD 26 10 1/2, MID 26 11 1/2, AFT 26 11 1/2

**Diff**: 1.1% = 25817

25817 = 1 467 DIF
<table>
<thead>
<tr>
<th>Date 6-18-70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Ore: 106</td>
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<tr>
<td>Account:</td>
</tr>
<tr>
<td>Dock Loaded:</td>
</tr>
<tr>
<td>Average Car Weight:</td>
</tr>
<tr>
<td>Tons:</td>
</tr>
<tr>
<td>Start Load:</td>
</tr>
<tr>
<td>Stop:</td>
</tr>
<tr>
<td>Resume:</td>
</tr>
<tr>
<td>Stop:</td>
</tr>
<tr>
<td>Resume:</td>
</tr>
<tr>
<td>Finish:</td>
</tr>
<tr>
<td>Draft:</td>
</tr>
<tr>
<td>Ford: 27&quot;</td>
</tr>
<tr>
<td>Mid: 27 1/2&quot;</td>
</tr>
<tr>
<td>Aft: 27 1/4&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Runs</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10925</td>
<td>11122</td>
<td>1157</td>
<td>1373</td>
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</table>

150, 150, 150, 150, 150, 150

26,608 Delivered

768 Diff

Let 1.1% = 26315
25850

765 Diff

1.1% 106
<table>
<thead>
<tr>
<th>NUMBER OF RUNS</th>
<th>1ST</th>
<th>2ND</th>
<th>3RD</th>
<th>4TH</th>
<th>5TH</th>
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<tbody>
<tr>
<td>15100</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>X1.0122</td>
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<td>15284</td>
<td></td>
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<tr>
<td>21.46' AFT HCH #5</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>154.54' FWD</td>
<td></td>
<td></td>
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<tr>
<td>11180</td>
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<td>X1.0122</td>
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<td>11235</td>
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<td></td>
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<td>1.73' AFT HCH #18</td>
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<tr>
<td>131.73' AFT</td>
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<td>26260</td>
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<td>26519</td>
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**DATE**: 7-21-70

**GRADE ORP**: [signature]

**ACCOUNT**: [blank]

**DOCK LOADED**: [blank]

**AVERAGE CAR WT**: [blank]

**TONS**: [blank]

**START LOAD**: [blank]

**STOP**: [blank]

**RESUME**: [blank]

**STOP**: [blank]

**RESUME**: [blank]

**FINISH**: [blank]

**DRAFT**: [blank]

**FORD**: 27.5''

**MID**: 27.5''

**AFT**: 27.6''

26.519 - 1.1% = 26.519

26.519 - 1.1% = 26.519
<table>
<thead>
<tr>
<th></th>
<th>1ST</th>
<th>2ND</th>
<th>3RD</th>
<th>4TH</th>
<th>5TH</th>
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<tbody>
<tr>
<td>15680</td>
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<td>5.0</td>
<td>1</td>
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<tr>
<td>X.99335</td>
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<td>15576</td>
<td></td>
<td></td>
<td>15.1</td>
<td>2</td>
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<tr>
<td>22.58' AFT HCII #15</td>
<td></td>
<td></td>
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<tr>
<td>153.42' FWD X</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>11100</td>
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<td>3</td>
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<tr>
<td>X.99335</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>11026</td>
<td></td>
<td></td>
<td>15.1</td>
<td>4</td>
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<tr>
<td>147.3' AFT HCII #18</td>
<td></td>
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<tr>
<td>136.75' AFT #3</td>
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<td></td>
<td></td>
<td></td>
<td>19</td>
<td>5</td>
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<tr>
<td>26602</td>
<td></td>
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</table>

**DATE** 7-27-70

**GRADE ORE** [Handwritten]

**ACCOUNT**

**DOCK LOADED**

**AVERAGE CAR WEIGHT**

**TONS**

**START LOAD**

**STOP**

**RESUME**

**FINISH**

**DRAFT**

**FORD 37.5''**

**MID 37.5''**

**AFT 37.5''**

26,878 less 11.75 x 26602 = 26780

26780

118 -178
<table>
<thead>
<tr>
<th>#1</th>
<th>15200</th>
<th>15200</th>
<th>15643</th>
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<tbody>
<tr>
<td>#2</td>
<td>@149.87' fwd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#3</td>
<td>@137' aft</td>
<td></td>
<td></td>
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</tbody>
</table>

### TONs

<table>
<thead>
<tr>
<th>START LOAD</th>
<th>STOP</th>
<th>RESUME</th>
<th>STOP</th>
<th>RESUME</th>
<th>FINISH</th>
<th>DRAFT</th>
<th>FORD 5' 4&quot;</th>
<th>MID 9' 4 1/2&quot;</th>
<th>AFT 9' 5&quot;</th>
</tr>
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<tbody>
<tr>
<td>10750</td>
<td>x1094</td>
<td>10750</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5' 4&quot;</td>
<td>9' 4 1/2&quot;</td>
<td>9' 5&quot;</td>
</tr>
<tr>
<td>10941</td>
<td></td>
<td></td>
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</table>

### Date

- 7-11-70

### Account

- Official

### Grade

- Ore

### Dock Loaded

- N/A

### Average Car Weight

- N/A

### Notes

- 26,706 less 1.1% = 25950
<table>
<thead>
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<th>9-29-70</th>
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<td>ACCOUNT</td>
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<td>DOCK LOADED</td>
<td>58</td>
</tr>
<tr>
<td>AVERAGE CAR WEIGHT</td>
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<td>TONS</td>
<td></td>
</tr>
<tr>
<td>START LOAD</td>
<td></td>
</tr>
<tr>
<td>STOP</td>
<td></td>
</tr>
<tr>
<td>RESUME</td>
<td></td>
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<tr>
<td>STOP</td>
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<tr>
<td>RESUME</td>
<td></td>
</tr>
<tr>
<td>FINISH</td>
<td></td>
</tr>
<tr>
<td>DRAFT</td>
<td></td>
</tr>
<tr>
<td>FORD</td>
<td>27 8</td>
</tr>
<tr>
<td>MID</td>
<td>27 8 1/2</td>
</tr>
<tr>
<td>AFT 27 9</td>
<td></td>
</tr>
<tr>
<td>Final 27 8</td>
<td></td>
</tr>
<tr>
<td>27 8 1/2 ( \times 2.12 = 57 04)</td>
<td></td>
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<tr>
<td>26 9 05 ( \div 2.48 = 26 9 05)</td>
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</table>

<table>
<thead>
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<th>NUMBER OF RUNS</th>
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<td>15355</td>
<td>15417</td>
</tr>
<tr>
<td>16575</td>
<td>2512</td>
</tr>
<tr>
<td>211.92' FWD YK</td>
<td></td>
</tr>
<tr>
<td>157 48' FWD YK</td>
<td></td>
</tr>
<tr>
<td>17 150</td>
<td>15 97</td>
</tr>
<tr>
<td>211.92' AFT HK</td>
<td></td>
</tr>
<tr>
<td>138.70'</td>
<td></td>
</tr>
<tr>
<td>26 9 05</td>
<td>27 014</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td>----</td>
<td>-----</td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>600</td>
</tr>
<tr>
<td>4</td>
<td>600</td>
</tr>
<tr>
<td>3</td>
<td>700</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>600</td>
</tr>
<tr>
<td>8</td>
<td>500</td>
</tr>
<tr>
<td>9</td>
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<td>10</td>
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<tr>
<td>11</td>
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<td>12</td>
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</tr>
<tr>
<td>20</td>
<td>SKIP</td>
</tr>
<tr>
<td>21</td>
<td>6000</td>
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</table>

2731'f  #17  Finish  30.6''
Both Ships at 23:36 A.M.
GUIDANCE MANUAL
FOR LOADING

EDMUND FITZGERALD

FOR

COLUMBIA TRANSPORTATION DIVISION
OCLEBAY NORTON COMPANY
CLEVELAND, OHIO 44115

APPROVED BY:
OWNER (REV. 0) 5-9-72
USCG (REV. 1) 10-23-73
ABS (REV. 1) 10-17-73

PREPARED BY:
R. A. STEARN, INC.
NAVAL ARCHITECTS & MARINE ENGINEERS
STURGEON BAY, WISCONSIN 54235
FEBRUARY 28, 1972
REVISED OCTOBER 5, 1973
REVISED DECEMBER 5, 1975

FILE 1362-14
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<td>CONTENTS</td>
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</tr>
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<td>VESSEL CHARACTERISTICS</td>
<td>3</td>
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<td>GENERAL ARRANGEMENT</td>
<td>4</td>
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<td>HYDROSTATIC PROPERTIES</td>
<td>5</td>
</tr>
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<td>TANK CAPACITIES</td>
<td>6</td>
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<td>CARGO CAPACITIES</td>
<td>7</td>
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<tr>
<td>EQUIVALENTS &amp; SYMBOLS</td>
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<tr>
<td>PURPOSE OF MANUAL</td>
<td>9</td>
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<tr>
<td>HULL BENDING</td>
<td>9-10</td>
</tr>
<tr>
<td>BALLASTING INSTRUCTIONS</td>
<td>11</td>
</tr>
<tr>
<td>LOADING INSTRUCTIONS</td>
<td>12-13</td>
</tr>
<tr>
<td>INSTRUCTIONS FOR USE OF TRIM DIAGRAM</td>
<td>14</td>
</tr>
<tr>
<td>TRIM DIAGRAM</td>
<td>15</td>
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<tr>
<td>BALLAST CONDITIONS</td>
<td>16-18</td>
</tr>
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<td>LOADING CONDITIONS</td>
<td>19-21</td>
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**PRINCIPAL DIMENSIONS**

<table>
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<th>Description</th>
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<tr>
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<td>729'-0&quot;</td>
</tr>
<tr>
<td>Length for Classification</td>
<td>711'-0&quot;</td>
</tr>
<tr>
<td>Beam, Molded</td>
<td>75'-0&quot;</td>
</tr>
<tr>
<td>Depth at Side, Molded</td>
<td>39'-0&quot;</td>
</tr>
<tr>
<td>Sheer, Forward</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>Sheer, Aft</td>
<td>3'-6&quot;</td>
</tr>
<tr>
<td>Camber of Spar Deck</td>
<td>18&quot;</td>
</tr>
<tr>
<td>Deadrise</td>
<td>No Deadrise</td>
</tr>
<tr>
<td>Bilge Radius</td>
<td>3'-6&quot;</td>
</tr>
<tr>
<td>Tumblehome</td>
<td>9&quot;</td>
</tr>
<tr>
<td>Bilge Strake Below Molded Baseline</td>
<td>1-1/2&quot;</td>
</tr>
<tr>
<td>Midships Fwd of Fr. 112 (711/2 Ft. From FP)</td>
<td>1'-0&quot;</td>
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**ADMEASUREMENT DATA**

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
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<tbody>
<tr>
<td>Port of Registry</td>
<td>Milwaukee, Wisconsin</td>
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<tr>
<td>Registered Dimensions</td>
<td>711.2' x 75.1' x 33.4'</td>
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<tr>
<td>Builder</td>
<td>Great Lakes Engineering Works River Rouge, Michigan</td>
</tr>
<tr>
<td>Builder's Hull Number</td>
<td>301</td>
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<tr>
<td>Year Built</td>
<td>1958</td>
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<td>Official Number</td>
<td>277,437</td>
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<tr>
<td>Gross Tonnage</td>
<td>13,632</td>
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<td>Net Tonnage</td>
<td>8,713</td>
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**LOADLINE DATA**

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<tr>
<td>Top of Deck Line Above Molded Line</td>
<td>1-1/2&quot;</td>
</tr>
<tr>
<td>Assigned Freeboard</td>
<td>11'-2&quot;</td>
</tr>
<tr>
<td>Molded Summer Draft</td>
<td>27'-11 1/2&quot;</td>
</tr>
<tr>
<td>Midsummer Keel Draft</td>
<td>28'-9 1/2&quot;</td>
</tr>
<tr>
<td>Summer Keel Draft</td>
<td>28'-1&quot;</td>
</tr>
<tr>
<td>Intermediate Keel Draft</td>
<td>28'-1&quot;</td>
</tr>
<tr>
<td>Winter Keel Draft</td>
<td>27'-9&quot;</td>
</tr>
</tbody>
</table>

**LIGHTSHIP DATA**

Ship complete in every respect, with water in boilers at steaming level and liquids in machinery and piping but with all tanks and bunkers empty and no cargo, fuel, fresh water, stores, or crew and effects on board. Lightship weight is 7678 long tons with center 38.74 feet aft of midships based on deadweight survey on April 4, 1971, and adjusted for conversion to oil firing.
<table>
<thead>
<tr>
<th>KEEL DRAFT FEET</th>
<th>TOTAL DEADW. TONS F.W.</th>
<th>TOTAL DISPL'MT TONS F.W.</th>
<th>TONS PER INCH TO TRIM</th>
<th>MOMENT FEET</th>
<th>LCG FWD FEET</th>
<th>LCF AFT FEET</th>
<th>KEEL DRAFT FEET</th>
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<td>6</td>
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<td>0</td>
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<td>0</td>
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</tr>
<tr>
<td>7</td>
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<td>120</td>
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<tr>
<td>9</td>
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NOTE: TONS ARE 2240 LBS.
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<td>F.O. BUNKER S</td>
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<td>DIESEL OIL TANK S</td>
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%5 EDWARD FITZGERALD  TANK CAPACITIES  1562-10-14 考核
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STOWAGE FACTORS:

1 LONG TON TACONITE PELLETS 17 CUBIC FEET (NOTE #2)
1 LONG TON IRON ORE (RED ORE) 12 CUBIC FEET
1 LONG TON LIMESTONE 25 CUBIC FEET
1 SHORT TON COAL 40 CUBIC FEET

NOTES:

1. CUBIC CAPACITY OF TACONITE PELLETS AND RED IRON ORE IS GREATER THAN DEADWEIGHT CAPACITY OF VESSEL, HENCE, THE CUBIC CAPACITY IS NOT SIGNIFICANT.

2. NORMAL REPOSE ANGLE OF TACONITE PELLETS IS APPROXIMATELY 30 DEGREES.

3. MULTIPLY NET CAPACITY IN CUBIC FEET BY 0.8035 TO OBTAIN GRAIN CAPACITY IN BUSHELS.
### ABBREVIATIONS & SYMBOLS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
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<tr>
<td>M</td>
<td>Midships</td>
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<td>%</td>
<td>Percent</td>
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<td>A.P.</td>
<td>Aft Perpendicular or Aft Peak</td>
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<tr>
<td>B.R.</td>
<td>Boiler Room</td>
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<tr>
<td>C.L.</td>
<td>Chain Locker</td>
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<td>CLG.</td>
<td>Cooling</td>
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<td>COFF.</td>
<td>Cofferdam</td>
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<td>CU. FT.</td>
<td>Cubic Feet</td>
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<td>D.B.</td>
<td>Double Bottom</td>
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<td>Diesel Oil</td>
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<td>DWT.</td>
<td>Deadweight</td>
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<td>E.R.</td>
<td>Engine Room</td>
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<td>F.O.</td>
<td>Fuel Oil</td>
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<td>F.P.</td>
<td>Fwd. Perpendicular or Fore Peak</td>
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<td>Forward</td>
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<td>L.C.B.</td>
<td>Longitudinal Center of Buoyancy</td>
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<tr>
<td>L.C.F.</td>
<td>Longitudinal Center of Flotation</td>
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<tr>
<td>L.T.</td>
<td>Long Tons</td>
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<td>LKR.</td>
<td>Locker</td>
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<tr>
<td>MACH'Y</td>
<td>Machinery</td>
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<tr>
<td>P.</td>
<td>Port</td>
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<td>Potable</td>
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<tr>
<td>PROP.</td>
<td>Propeller</td>
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<td>RES.</td>
<td>Reserve</td>
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<td>S.</td>
<td>Starboard</td>
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<tr>
<td>SNDG.</td>
<td>Sounding</td>
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<tr>
<td>S.T.</td>
<td>Short Tons</td>
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<td>WTR.</td>
<td>Water</td>
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### EQUIVALENTS

1 Long Ton = 2240 Pounds = 1.12 Short Tons  
1 Short Ton = 2000 Pounds = .893 Long Tons

1 L.T. of Fresh Water = 268.5 Gallons = 35.9 Cubic Feet  
1 L.T. of Bunker C Oil = 284.2 Gallons = 38.0 Cubic Feet  
1 L.T. of Diesel Oil = 322.0 Gallons = 43.0 Cubic Feet
PURPOSE OF MANUAL

The purpose of this manual is to provide the ship's officers with sufficient information to safely load the ship with ballast or cargo, with respect to the ship's longitudinal bending strength. Stability is not considered or included in this manual.

HULL BENDING

An understanding of the effects of internal loading and external forces on the ship's structure is helpful to the operator in understanding the reasons for distribution of cargo and ballast.

The hull may be compared to a long girder which is loaded by the weight of the hull structure, machinery, cargo, ballast, fuel, stores, etc. The support for this girder is provided by buoyancy of the displaced water. The uneven distribution of weight, with respect to buoyancy, along the hull results in hull bending.

The bending of the hull girder varies with sea state, vessel speed, and heading. When operating in waves, the support for the vessel varies from the still water condition according to size of wave and location of wave trough and crests relative to the ship. When the trough of a long wave is amidships, and wave crests near the ship's ends, the weight of the ship and cargo generally exceeds buoyancy throughout the middle of the ship's length and sagging occurs (compression in deck plating and tension in bottom plating). The stresses are reversed when the wave crest is amidships, and hogging occurs.

For cubic cargos, such as coal, which plug the holds full or nearly full, there is little option left for variations in distribution. The same is true for heavy ballast condition. For deadweight cargos, such as taconite pellets or stone, and for less than full ballast, there exists a wide range of possible load distribution for a given displacement and trim. Favorable distribution of the cargo or ballast along the length of the hold will assure that satisfactory stress levels will not be exceeded, in the hogging and sagging conditions, when operating in waves.

Experience has shown that there is a "safe still water bending stress" which will allow sufficient strength margin to handle the additional stresses caused by wave action, springing, local loads, machinery vibration, etc. The "safe level" is determined from the size, shape, and strength of the hull. The strength of the hull is fixed by the structure according to rules of the American Bureau of Shipping and the U. S. Coast Guard.

For this vessel, the "safe still water bending stress" is 4.0 long tons per square inch. In general, the still water bending stress will be well within the safe level if the vessel's keel has little or no deflection, that is no hog or sag. Where possible, hogging deflection should be eliminated or minimized.

(Cont'd)
HULL BENDING (Cont'd)

This manual shows the recommended load distribution for cargo and ballast so as to restrict the still water hull stresses to optimum (low) or satisfactory levels. The following table lists the still water bending levels for loading conditions typical of those shown in this manual.

<table>
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<tr>
<th>Condition</th>
<th>Stress Long Tons Per Sq. In.</th>
<th>% of Safe Still Water Bending Stress</th>
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<td>Light Ballast</td>
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<td>Medium Ballast</td>
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<td>Ball. for Prop. Out*</td>
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<td>Ship Ready for Sea*</td>
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<tr>
<td>(No cargo or ballast)</td>
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<tr>
<td>Midsummer DWT Load</td>
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<td>Winter DWT Load</td>
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<tr>
<td>Partial DWT Load (24' -0' Draft)</td>
<td>1.39</td>
<td>35</td>
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</table>

*Not an at-sea condition.

When loaded to seasonal draft, a decrease in consumables, without adding ballast to compensate for change in draft and trim, will cause the maximum bending stress to decrease by .09 long tons per square inch for every 100 long tons decrease in consumables. Conversely, an increase in cooling or feed water without a corresponding decrease in other consumables will cause the maximum bending stress to increase by .10 long tons per square inch for every 100 long tons increase in cooling or feed water.
BALLASTING INSTRUCTIONS

The recommended ballasting conditions are shown on sheet 18. The weights shown are the combined totals for both sides of the ship in long tons. The soundings are in feet and inches and are corrected for vessel trim and height of striking plate above baseline.

The condition on the right side of sheet 18 is intended for use when work is required on the propeller. This ballast condition should be used in protected waters only. The drafts shown at the bottom of each column are based on average shipboard conditions. They will be affected by the weight of variable items of load onboard such as fuel, supplies, feed water, and cooling water.

In general, the "at sea" conditions concentrate ballast less at the ends and more near midships. The stress curves for these conditions are shown on sheet 16.
LOADING INSTRUCTIONS

The Loading Curves on sheet 20 indicate the recommended amount of cargo to be loaded through each hatch (in long tons per hatch) to arrive at a desired mean keel draft between 28'9 1/2" and 24'0" with approximately 1" trim at drafts of 27'9" and deeper to 15" trim at 24'0" draft. Sheet 19 indicates the resulting still water bending stress along the length for this range of drafts showing that the safe still water bending stress will not be exceeded if the recommended loading is followed.

Also shown with the Stress Curves are typical cargo profiles which illustrate the relationship between loading sequence, cargo per hatch, and cargo spread. The amount of cargo to be loaded through any one hatch is dependent upon the following factors:

1. Density of the cargo.
2. Type of loading equipment.
3. Sequence of loading.
4. Amount of cargo spread, which is affected by:
   a. The cargo's natural angle of repose.
   b. Location of bulkheads relative to the hatch.
   c. Amount of cargo already loaded in an adjacent hatch.

Therefore, the values in the Loading Curves will be valid only for the cargo, loading equipment, and sequence of loading shown.

Since practical considerations will make it nearly impossible to load exactly to the values of the curves, they should be considered as target values, from which variations will have little effect on the bending stress if reasonable compensation is made in nearby hatches.

On sheet 21 are tabulations at the seasonal drafts of the sequence and long tons per hatch indicated by the Loading Curves. To create a tabulation for other drafts first determine the midship keel draft. Second, on the Loading Curves draw a line parallel to the even foot draft lines. Third, where this draft line intersects each "long tons per hatch" curve, project a line parallel to the scale. Blank forms are provided (at the back of the manual) for entering these values read.

The Loading Officer must use his judgment, based on his experience with and confidence in the loading equipment and procedure, to estimate the amount of cargo to be reserved for final adjustment of draft and trim. The amount so reserved must be deducted from the values indicated.

The Loading Curves are based on the assumption that there is approximately 200 long tons of mud and residual ballast in the tanks; 66 long tons of miscellaneous deadweight consisting of crew, stores, small tanks, etc., and the following amounts of consumables on board:

Bunker Fuel 215 L. Tons (53% Full)
Reserve Feed Water 53 L. Tons (67% Full)
Cooling Water (#9 Tk) 60 L. Tons (24% Full)
Potable Water, Fwd 47 L. Tons (75% Full)
Potable Water, Aft 60 L. Tons (75% Full)

for a total of 701 long tons.

(Cont'd)
LOADING INSTRUCTIONS (Cont'd)

For each 100 long tons increase in consumables on board, increase the cargo in the after part of hold #3 by 50 tons and decrease the cargo in the forward part of hold #3 by 150 tons. For each 100 long tons increase in mud, decrease the cargo in each hold by 33 long tons. Reverse the process for a decrease in consumables or a decrease in mud.

As a check on the values read off the Loading Curves, add the 701 long tons of consumables, etc., to the total cargo. This value should equal the total deadweight on sheet 5 for the mean keel draft selected.

Dual Belt Loaders (sheets 19, 20, and 21)

On the first pass, the sequence of loading within each hold must be followed as shown on sheet 19 (or reading sheet 21 from the top) for the values indicated by the Loading Curves to be valid. For example, hatch #17 must be loaded before #15, #11 before #9, etc.; however, hatch #9 could be loaded before #17 because they are in different holds. Using the given values with a different sequence within a hold may result in improper loading.

The sequence of loading on the second pass can vary since the first pass restricts the cargo spread of the second pass.
INSTRUCTIONS FOR USE OF TRIM DIAGRAM

The trim diagram, sheet 15, can be used to determine changes to the forward and aft drafts for loading or unloading a known weight at a given location along the length of the hull.

The use is best illustrated by an example: With an existing draft of 23 feet aft and 17 feet forward (mean draft is 20 ft.) what will be the new draft if 150 Tons is added in hatch No. 2?

1. Draw vertical line from center of hatch No. 2 to CHANGE IN FWD DRAFT line for 20' mean draft.

2. Project horizontally from this intersection to CHANGE IN FWD DRAFT scale to read +3.1".

3. Continue vertical line to CHANGE IN AFT DRAFT line for 20' mean draft.

4. Project horizontally from this intersection to CHANGE IN AFT DRAFT scale to read -1.44".

5. Since these changes are for loading 100 tons and our example is for 150 tons, modify draft changes by the ratio 150 ÷ 100.

\[
\text{Fwd draft change is } \frac{150}{100} \times (+3.1") = 4.65"
\]

NEW FWD DRAFT is 17'-0" + 4 3/4" = 17' - 4 3/4"

Aft draft change is \( \frac{150}{100} \times (-1.44") = -2.16" \)

NEW AFT DRAFT is 23'-0" - 2 1/4" = 22' - 9 3/4"

As the hull sinkage and trim characteristics vary with draft, five values of mean draft (average of forward and aft drafts) are shown for determining the change in draft. After loading or unloading a given amount, the new mean draft should be used for the next calculation. The position for mean drafts other than those shown may be estimated (interpolated).

Note that the sign (plus or minus) shows if the change in draft is to be added to or subtracted from the present draft, depending upon if the weight is being loaded or unloaded and the location along the hull.

Note that weight loaded or unloaded at approximately hatch No. 8 will not change the aft draft. Likewise, weight loaded or unloaded at approximately hatch No. 16 will not change the forward draft. These points are the "holding hatches". Weight loaded or unloaded at approximately hatch No. 12 will cause equal changes in forward and aft drafts.

The trim diagram can be used for determining changes in draft for adding or subtracting cargo, fuel, ballast, stores, etc. The accuracy will depend upon the estimated location, along the hull length, of the center of gravity of the item being considered.
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VALUES ON THIS PAGE ARE FROM CURVES ON SHEET 20. FOR CARGO PROFILE AND STRESS CURVES SEE SHEET 19.

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LOADER: DUAL BELT

CARGO: PELLETS

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Lorain Electronics Corporation Work Reports, EDMUND FITZGERALD
Clear wel operation

I certify that the above work has been carried out to my satisfaction.

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COMMENTS:

E. AC
E. DC

SERIAL NO. 38446
**TRouble REPORTED**

**ACTION TAKEN**
- [ ] See rec & Trans
- [ ] Set Fig & Dec

**FURTHER WORK NEEDED**
- [ ] Operation Satisfactory

**TECHNICIAN**
- John D. Flood

I certify that the above work has been carried out to my satisfaction.

**TIME - HOURS**

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**Parts & File**

**Serial No.** 38447
Edmond Fitzgerald  

**LOCATION**  
Toldeo  
**LINE**  
2330  
**DATE**  
1970

**ACTION TAKEN**  
605, 5763, ok for re

**TIME - HOURS**

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**EXPENSES**

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<th>MISC.</th>
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**SERIAL NO.**  
38863
ACTION TAKEN
ch 501 - Trans Bt low - 2.5 - 3w suspect Bt 190.6 in circuit
Replace with spare

I certify that the above work has been carried out to my satisfaction.

TECHNICIAN
John D. Flood

EXPIRES

TIME - HOURS

WORK
QUAN.
PART NO.
PARTS USED
DESCRIPTION
REPLACE
YES
NO
UNIT COST
AMOUNT

WAIT FOR SHIP

WAIT ON SHIP

TRAVEL

TOTAL

TRAVEL - MILES

LOCAL

FROM

TO

TOTAL

EXPENSES

MEALS

MOTEL

TOLLS

TAXI

PHONE

MISC.

TOTAL

LINE

E.

AC

DC

EQUIP.

E.

AC

DC

HOUR COUNT

COMMENTS:
ch 127T 928 R x1 500 x2 in spare set
Defective - used ones in Fitzgerald set to replace.
Fitzgerald set missing 27T

PART 8/1-74
**LORAIN ELECTRONICS CORP.**

**Ship/Base**: 2307 Leavitt Rd, Lorain, Ohio 44052 • (216) 282-6116

**Owner/Agent**: Edmund Fitzgerald

**Type/Equipment**: FM

**Model**: 361

**Location**: Toledo

**Date**: 25-Jul

---

**Trouble Reported**

Hum & Distortion in Audio

---

**Action Taken**

Bed fit. Hi Gain Modi 425 Rec. add 30/20 @ 500 to 0.8 Rec. Main and 1'st stage of 20/50 db as spec. added to Audio Output C. B. & C. bypass. Now good. Distortion cleared up.

---

**Technician**: John D. Flood

---

I certify that the above work has been carried out to my satisfaction.

---

**Time - Hours**

| Work | Quant. | Part No. | Parts Used
|------|--------|----------|------------|
| Wait for ship | 1 | 20/20 | @ 750V
| Wait on ship | 1 | | |
| Travel | 2 | | |
| **Total** | **2** | | |

---

**Travel - Miles**

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**Parts & File**

**Serial No.**: 38865
**ACTION TAKEN**

Drive to Toledo. Wait for vessel. Install new radio. Instruct crew on operation. Return to Lorain. Assisted by Roger.

---

**LICENSE NO.**

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<th>QUAN.</th>
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<th>PARTS USED</th>
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**COMMENTS:** ALL EQUIPMENT LOADED ABOARD VESSEL AND CARRIED TO FORWARD END. LEFT ANTENNA AND TOOLS SETTING ON DECK WHILE TAKING RADIO AND OTHER EQUIPMENT TO PILOT HOUSE. RETURNED TO DECK AND FOUND ANTENNA MISSING. UNABLE TO LOCATE MISSING ANTENNA ANYWHERE...
ACTION TAKEN
INSTALLED NEW RADIO, SOME HOW AN ANTENNA WAS MISPLACED BY ONE OF THE CREW OR DOCK MEN AND HAD TO BE REPLACED.

FURTHER WORK NEEDED

OPERATION SATISFACTORY
CU #145
SMU #100

I certify that the above work has been carried out to my satisfaction.

| LICENSE NO. | EXPIRES | TIME - HOURS | QUAN. | PART NO. | PARTS USED | REPLACE | LOCAL PURCHASE | SERVICE | SHIP SPARES | SHIP PARTS | COMMISSION | UNIT COST | AMOUNT |
|-------------|---------|--------------|-------|----------|------------|---------|----------------|---------|-------------|-----------|------------|-----------|---------|--------|
|             |         | WORK         | 6     |          |            |         |                |         |             |           |            |           |         |        |
|             |         | WAIT FOR SHIP| 1.5   |          |            |         |                |         |             |           |            |           |         |        |
|             |         | WAIT ON SHIP | 1.5   |          |            |         |                |         |             |           |            |           |         |        |
|             |         | TRAVEL       | 4.5   |          |            |         |                |         |             |           |            |           |         |        |
|             |         | TOTAL        | 12    |          |            |         |                |         |             |           |            |           |         |        |

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Phone dead.

Chile Power supply, check for grounds, found smoke in control unit, take control unit to repair shop.

I certify that the above work has been carried out to my satisfaction.

<table>
<thead>
<tr>
<th>TIME - HOURS</th>
<th>QUAN.</th>
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REPAIR CONTROL UNIT, return to ship.
**LORAIN ELECTRONICS CORP.**  2307 LEAVITT RD.  44052  (216) 282-6116

**Ed. Fitzgerald**  **FM**  **RF**  **15C D.**

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**OWNER/AGENT**

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**TIME REPORTED**

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**TROUBLE REPORTED**

**TROUBLE FOUND**

**ACTION TAKEN**

Return control unit and check operation.

**FURTHER WORK NEEDED**

**OPERATION SATISFACTORY**

**TECHNICIAN**

 dispro

**LICENSE NO.**

<table>
<thead>
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**TIME - HOURS**

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**TRAVEL - MILES**

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<tr>
<td>TO 150</td>
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**COMMENTS:**

**LINE**

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**EQUIP.**

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**HOUR COUNT.**

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<tr>
<td></td>
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</table>
AM. SERVICE - WEAK

TRouble found
4022 \% 83 RX DEAD. ANTENNA LOOSE AND RUBBING

ACTION TAKEN
REPLACE RF HF 4022
W01 - 1000 OHM, 1000 OHM 53 RX
TIGHTEN BOTH ANTENNAS

I certify that the above work has been carried out to my satisfaction.

TECHNICIAN
SCOTT
LICENSE NO. 81-11.77441 EXPIRES 10-30-75

TIME - HOURS

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<th>REPLACE</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
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TRAVEL - MILES

| LOCAL FROM | 10,000 |
| TOTAL     | 130    |

EXPENSES

COMMENTS:

1/12/75

LINE

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EQUIP.

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<th>AC DC</th>
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<tbody>
<tr>
<td>115</td>
<td>AC DC</td>
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</table>
COLUMBIA TRANSPORTATION DIVISION, CLEVELAND MOTON COMPANY

TRoubled FITZGERALD

LOCATION TIME DATE
CLEVELAND, OH 1000 1-10-75

TRouBLE REPORTED

All: WEAK.

TRouBLE FOUND

Weak tube in modulator chassis. Low modulation.

ACTION TAKEN

Replaced weak tube in modulator. Went through all receivers and replaced weak tubes as needed. Brought up receivers somewhat. Tested with I.C. WLC, and TUG Taboga.

I certify that the above work has been carried out to my satisfaction.

CHARLES C. RAYMONDS

LICENSE NO. F1-10-23394 EXPIRES 3-4-76

<table>
<thead>
<tr>
<th>QUAN.</th>
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<td>TUBE</td>
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<tr>
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<td>737</td>
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<td>6476</td>
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TIME - HOURS

WORK 2.5
WAIT FOR SHIP 1.5
TRAVEL 2.0
TOTAL 5.0

TRAVEL - MILES

LOCAL 66
FROM TO
TOTAL 66

EXPENSES

COMMENTS:

PARTS & FILE

SERIAL NO. 24055
**Trouble Reported:**

Fitout 501 still combined w/ old VHF set

**Trouble Found:**

**Action Taken:**

Check and align receiver's AOR 2, then turn up, and also reconcile terminating AC subject cable into AM cabinet.

**Further Work Needed:**

- 

**Operation Satisfactory:**

- 

**Licensed No.**

**Expires**

**Time - Hours**

<table>
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<tr>
<th>Work</th>
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<th>Replace</th>
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**Travel - Miles**

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**Expenses**

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<tr>
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<th>Motel</th>
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<tr>
<td>Hour Count</td>
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</tbody>
</table>

**Comments:**

I certify that the above work has been carried out to my satisfaction.

**Title**

Daniel C. Clay

**Parts & File**

**Serial No.**

38102
Edmond Fitzgerald

AM

CLC

100 MSL

Owner/Agent

Location

Toledo

Time

10:30

Date

10/01

Trouble Reported

Fitout — set still combined with old VHF set

Trouble Found

Action Taken

Remove subset cable from 261 cabinet & terminate in AM Cabinet

Check connection — ok

Further Work Needed

Operation

Satisfactory

Technician

John D. Flood

I certify that the above work has been carried out to my satisfaction.

Title

License No.

Time / hours

0:5

Parts Used

Description

Replace

Yes

No

Local

Purchase

Service

Parts

Spare

Parts

Spares

Total

Cost

Amount

Travel - Miles

Local

From

To

To

Total

Expenses

Meals

Motel

Tolls

Taxi

Phone

Misc.

Total

Line

AC

DC

QTR COUNT

Comments:

Parts & File

Serial No.

30355
**Time-Hours**

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<thead>
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<th>WORK</th>
<th>QUAN.</th>
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<th>PARTS USED DESCRIPTION</th>
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<th>PURCH.</th>
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**Travel - Miles**

<table>
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<th>COMMENTS:</th>
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**Total**

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<th>HOUR COUNT</th>
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</table>

**Action Taken**

- 507

**Technician**

John D. Flood

I certify that the above work has been carried out to my satisfaction.

**License No.**

[Signature]

**Expires**

[Date]

**Serial No.**

30353
ACTION TAKEN

After checking operation of unit

I certify that the above work has been carried out to my satisfaction.

TIME - HOURS

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LOCAL PURCHASE

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SHIP SPARES

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UNIT COST

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EXPENSES

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COMMENTS:

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HOUR COUNT

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SERIAL NO. 38100
# 11

Casualty Reports and Surveys, EDMUND FITZGERALD, 1973-1974
ON FEBRUARY 25, 1974, IT WAS UNDERSTOOD AND AGREED WITH MR. R.A. FELDTZ, OWNER'S REPRESENTATIVE, THAT THE PRICE TO EFFECT THE REPAIRS AS ENUMERATED IN ITEM NO. 1-A OF THE CAPTIONED REPORT WILL BE IN THE AMOUNT OF $795.00, EXCLUSIVE OF PREMIUM OVERTIME. THIS PRICE IS CONSIDERED FAIR AND REASONABLE.

SUBMITTED WITHOUT PREJUDICE AND SUBJECT TO ADJUSTMENT.

P.S. ODIN
PRINCIPAL SURVEYOR
GREAT LAKES DISTRICT
CONDITIONS

The employment of this Association and all services rendered in connection therewith are made, offered and rendered without recourse and on the following conditions and this and all other reports, including any oral reports and certificates, are made and issued without recourse and subject to said conditions:

1. While the officers and the Board of Directors of United States Salvage Association, Inc. have used their best endeavors to select competent surveyors, employees, representatives and agents and to ensure that the functions of the Association are properly executed, neither the Association nor its officers, directors, surveyors, employees, representatives or agents are responsible for or liable for any errors, omissions, misrepresentations or misstatements in any report or certificate.

2. That the information contained in this and all other reports and certificates is true only so far as the information of the Association as of the signed herein, that the report or report and certificate shall not be used or called to the name, nor in connection with the purchase, lease, mortgage, pledge, farming, letting, hiring or charter of any vessel, cargo or property, and if so used shall be null, void and of no effect and shall not be binding on anyone.

3. Reports subject to these conditions are the only reports authorized by the Association.

4. The terms of these conditions can be varied only by specific resolution of the Board of Directors of the Association and the acceptance or use of this report or of the employment or services of this Association or of its surveyors, employees, representatives or agents or the use of any other report or certificate shall be construed to be an acceptance of these conditions.

5. This report and all services in connection with this employment are for the account of the persons requesting the same, but with the understanding that they are to be used only for the purposes for which the Association was employed as stated herein.


DESCRIPTION

S.S. "EDMUND FITZGERALD" IS AN ALL WELDED STEEL CONSTRUCTED SINGLE SCREW BULK CARRIERS, HAVING THREE HINDS WITH TWENTY-ONE HATCHES AND MACHINERY AFT, BUILT BY GREAT LAKES ENGINEERING WORKS AT RIVER ROUGE, MICHIGAN IN 1958 AND IS POWERED BY A 7,500 SHAFT HORSEPOWER WESTINGHOUSE STEAM TURBINE.

DIMENSIONS

LENGTH ------------------------ 711'-0"
BREADTH ------------------------ 75'-0"
DEPTH ------------------------ 39'-0"

ATTENDING

Mr. R.A. Feldtz, REPRESENTING COLUMBIA TRANSPORTATION DIVISION, ONGEBAY NORTON COMPANY

FOR FURTHER PARTICULARS, PLEASE REFER TO THE ORIGINAL SURVEY REPORT, CASE NO. 56-19379, ISSUED AT CLEVELAND, OHIO, DATED SEPTEMBER 18, 1972.
Case No. 56-19379(S)


FOUND

PROPELLER - FOUR BLADE, SECTIONAL, BRONZE, 19'08" DIAMETER

1. ONE BLADE REPORTEDLY DISTORTED ALONG UPPER TRAILING EDGE WITH A SECTION OF BLADE APPROXIMATELY 10 INCHES DEEP BY 32 INCHES LONG BROKEN OFF AND MISSING WAS REPORTEDLY REMOVED AND REPLACED WITH OWNER FURNISHED BLADE PRIOR TO SUBJECT SURVEY.


2. SECOND BLADE REPORTEDLY DISTORTED ALONG UPPER TRAILING EDGE OVER AN AREA APPROXIMATELY 2 INCHES DEEP BY 24 INCHES LONG PREVIOUSLY REPAIRED AND A SECTION OF BLADE APPROXIMATELY 2 INCHES DEEP BY 6 INCHES LONG BROKEN OFF AND MISSING. ROOT OF BLADE FRAGMENTED OVER APPROXIMATELY 36 1/2 LINEAR INCHES AT A POINT APPROXIMATELY 9 INCHES ABOVE BLADE HUB EXTENDING PARALLEL TO THE HUB AND TO A DEPTH IN EXCESS OF 5 INCHES.


RECOMMENDED

1. DAMAGED BLADE HAD REPORTEDLY BEEN DELIVERED TO THE SHOP OF THE AMERICAN PROPELLER COMPANY IN TOLEDO, OHIO PRIOR TO SURVEY. THE BLADE REPORTEDLY WAS FAIRED, BUILT-UP AS NECESSARY, WELDED, REPLITCHED, REFINISHED, BALANCED AND STRESS RELIEVED. UPON COMPLETION OF REPAIRS THE BLADE WAS REPORTEDLY RETURNED TO THE OWNERS AS A SPARE BLADE.

2. A-BLADE MARKED Ht. 1711 TO BE RENEWED WITH OWNER FURNISHED SPARE BLADE.

B-TWO BLADES, MARKED Ht. 1718 AND Ht. 1678, TO BE REMOVED TO SHOP AND UPON COMPLETION OF REPAIRS RETURNED TO VESSEL AND REINSTALLED IN GOOD ORDER. (SEPARATE INVOICE.)

C-TWO BLADES, MARKED Ht. 1718 AND Ht. 1678, TO BE BUILT-UP AS NECESSARY IN WAY OF MISSING SEGMENT OF EACH BLADE, BLADE TO BE WELDED, REPLITCHED, BALANCED, STRESS RELIEVED BY HEAT TREATMENT AND RETURNED TO OWNERS AS SPARE BLADE. (SEPARATE INVOICE.)
RUDDER

3. Rudder reportedly vibrating excessively and subsequently examined by diver.
   Pintle bushing and eight pintle bushing bolts missing, with pintle pin battered and distorted in way of missing bushing.

3. Pintle bushing and eight pintle bushing bolts to be renewed.
   Pintle pin to be removed to shop and machined true. Steel sleeve to be fitted to pin in way of pintle pin bushing and machined to required diameter for proper fit to the pintle pin bushing. Upon completion pintle pin to be returned to vessel and reinstalled in good order.

NOTES

A. Necessary services of diver and attendent furnished for underwater examination of vessel's rudder.

B. Necessary floating equipment and labor furnished to assist in underwater examination of vessel's rudder.

C. Necessary tug assistance to be furnished on and off dry dock.

D. Necessary drydocking to be carried out to effect foregoing repairs as enumerated in item No. 3.

E. The following dry dock services to be supplied, including hook-up and disconnection as applicable:
   - Electricity for illumination and ship's service.
   - Circulating water for ship's service.

F. Necessary staging to be erected to effect foregoing repairs as enumerated in item No. 3 and upon completion of repairs to be dismantled.

G. Necessary removals to effect foregoing repairs as enumerated in item No. 3 to be replaced in good order.

H. Necessary testing to be carried out to the satisfaction of all interested parties.

I. Necessary labor and equipment furnished to blade marked Ht. 1711 to determine full depth of fracture.

J. Necessary replacement of owner furnished blade as enumerated in item No. 2-A to be effected at owner's convenience. (Separate invoice.)

K. Necessary transportation and handling of propeller blades to be furnished. (Separate invoice.)

L. Scrap credit allowance to be considered.

American Propeller Company, Toledo, Ohio submitted a price in the amount of $1,233.00 to effect the foregoing repairs, exclusive of item Nos. 2 through note M, inclusive. This price is considered fair and reasonable.
Frasier Shipyards, Inc., Superior, Wisconsin submitted a price in the amount of $15,834.48 to effect the foregoing repairs as enumerated in Item Nos. 2-A, 2-B, 2-C, 2-D, 2-E, 2-H, 2-M and 2-N but exclusive of premium overtime in the amount of $2,560.00. This price is considered fair and reasonable. Refund

It was reported that the foregoing repairs as enumerated in Item Nos. 2-A, 2-B, 2-C, 2-D, 2-E, 2-H, 2-M and 2-N would be effected at a later date at the convenience of the owners when a further survey will be held and price agreed upon.

Malcolm Marine, St. Clair, Michigan submitted a price in the amount of $275.00 to effect the foregoing service as enumerated in Note "A". This price is considered fair and reasonable.

Merce Boiler & Welding Company, Inc., Toledo, Ohio submitted a price in the amount of $286.00 to effect the foregoing service as enumerated in Note "B". This price is considered fair and reasonable.

The Great Lakes Towing Company, Duluth, Minnesota submitted a price in the amount of $994.16 to effect the foregoing services as enumerated in Note "C". This price is considered fair and reasonable.

The foregoing service as enumerated in Note "F" was effected by the American Propeller Company, Toledo, Ohio on a "time and material" basis. The costs for the time and material expended in carrying out this service will be submitted to the undersigned for review.

It was agreed that the foregoing repairs would require:

Drydocking - Note "D":

One haul day --------------------------- $ 5,022.24
One lay day --------------------------- $ 4,362.24

Total --------------------------------- $ 9,384.48

Tug assistance - Note "C" -------------- $ 994.16

Dry dock services - Note "E" ----------- $ 150.00

Premium overtime in the amount of $2,560.00 was authorized to expedite the foregoing repairs as enumerated in Item No. 3 and saved one day on dry dock.

Surveyor's Notes

Vessel was drydocked solely to effect the foregoing damage repairs as enumerated in item No. 3 and no owner's work was carried out during this drydocking period.

Vessel on dry dock ------------ 1215 hours, November 14, 1973.
Vessel off dry dock ------------ 0405 hours, November 18, 1973.

Recapitulation

American Propeller Company --------- $ 1,233.00

Frasier Shipyards, Inc. -------------- $15,834.48

Malcolm Marine ---------------------- $ 275.00

Merce Boiler & Welding Company, Inc. $ 286.00

The Great Lakes Towing Company ----- $ 994.16
Case No. 56-19379(S)

The various contractors, Fraser Shipyards, Inc. et al., indicated that all of the above-noted repair work was carried out by the respective organizations, as specified.

Survey made without prejudice and subject to adjustment.

[Signature]
Norman H. Robertson
Surveyor
This is to certify that the undersigned Surveyor to this Bureau did, at the request of the Owner's representative, attend the S.S. "EDMUND FITZGERALD" of Milwaukee, Wisconsin, Official Number 277,437, while the vessel lay on dry dock at Superior, Wisconsin on the 14th day of November 1973, and subsequent dates, relative to damage alleged to have been sustained on 9 June 1972 as a result of the stern anchor chain cable fouling the propeller blades while maneuvering at Toledo, Ohio. For further particulars see vessel's log book and report as follows:

Reference is made to Detroit Report D7351 dated 10 June 1972 relative to previous examination of this damage and the outstanding recommendation contained therein which was partially satisfied at this time.

UPON EXAMINATION FOUND

1. The stem, stern frame and all outside shell plating examined and no apparent damage noted.

2. The pintle bearing bushing and bushing retainer plate missing.

3. The four-bladed CSHEB propeller was examined and the following condition noted:
   (a) Blade No. 1 - torn, scored and gouged at the trailing tip and fractured at the root of the blade, approximate length of fracture 24".
   (b) Blades Nos. 2 and 3 - torn, scored and gouged at the trailing tip.

4. The propeller fairwater cap had been previously renewed, fairwater cap examined and all found satisfactory.

RECOMMENDED

5. Pintle bearing bushing and bushing retainer plate to be replaced.

6. The fractured propeller blade to be renewed.

7. The above recommendations were carried out, upon completion examined, steering gear observed in operation and all found satisfactory.
8. It is further recommended that the propeller blades noted in Item 3(b) of this report, together with the propeller shaft, inboard shafting and bearings be further examined and repairs as considered necessary be carried out prior to completion of the vessel's next Special Survey of Hull.

The undersigned recommends that this vessel be retained as classed with this Bureau.

H. W. Taylor  Surveyor
On November 11, 1973, upon arrival at Toledo, Ohio, it was reported by the Chief Engineer of subject vessel that a pounding noise from vessel's rudder had become more pronounced during a period of heavy weather on its last outbound voyage from Silver Bay, Minnesota.

The employment of a diver for underwater examination of rudder and shoe revealed that the pintle bushing was missing, thereby leaving the pintle free to move from side to side within the shoe. It was established at this time that dry-docking had been necessitated.

At 2000 hours on November 11, 1973, the subject vessel departed Toledo, Ohio, for the nearest available dry dock - Superior, Wisconsin.

Survey was held on November 14, 1973, while vessel lay on dry dock at Fraser Shipyards, Inc., Superior, Wisconsin, in order to ascertain the full extent and required repair of damage.

Attending
Mr. D. Crede Representing United States Coast Guard
Mr. H. Taylor Representing American Bureau of Shipping
Mr. N. Robertson Representing United States Salvage Association, Inc.
Mr. W Meldrum Representing Fraser Shipyards, Inc.
Mr. R. A. Feldtz Representing the Owners

The following was disclosed.

Pintle and Bushing

1. Pintle bushing, together with keeper and securing bolts, missing.
2. Pintle worn and out of round.

1. New brass pintle bushing to be provided, machined and installed in good order.
2. To be removed, sleeve fitted on, machined to fit new bushing and installed in good order.
R. A. Feldtz

S/S Edmund Fitzgerald
Casualty of June 9, 1972
(Vessel Backed Over
Stern Anchor and Chain)

Found
Propeller: Four Blade, Sectional, Bronze, 19' 08" Diameter

3. One blade distorted along upper trailing edge with a 9" crack at mid-width in way of hub fillet.
   (Blade markings: Heat No. 1711, Wt. 8045, Date: 3-25-58).

Recommended
3. To be removed and owner's spare installed. New blade to be provided.
   (Spare blade markings: Heat No. 1677, Wt. 8039, Date: 3-25-58).

Notes
A. Necessary diver's service at Toledo, Ohio.
B. Necessary dry-docking to effect the foregoing repairs (one haul day and one lay day).
C. Necessary assistance into and out of dry dock.
D. Necessary dry-dock services to be provided.
E. Necessary staging to be erected to effect the foregoing repairs and afterwards dismantled.
F. Necessary testing to the satisfaction of all concerned parties.

It is the opinion of the undersigned that the damage, as set forth herein, is a direct consequence of casualty of June 9, 1972, whereby the vessel backed over its stern anchor and chain, causing disturbance to pintle bushing securements followed by the loss of bushing at a later date, and was not detected until this time.

The foregoing repairs were effected by Fraser Shipyards, Inc., Superior, Wisconsin, on a time and material basis for Underwriters' account.
Total cost breakdown of casualty is as follows.

**Fraser Shipyards, Inc.**

**Dry-Docking**

- 1 Haul Day $5,022.24
- 1 Lay Day $4,362.24
- Dry-Dock Services $150.00

- Renew Pintle Bushing and Repair Pintle $5,000.00
- Change One Propeller Blade $1,300.00
- Overtime to Effect Repairs $2,560.00

**Great Lakes Towing**

Malcolm Salvage

- Diver's Fee at Toledo, Ohio $275.00

**Estimated Cost of New Propeller Blade** $15,000.00

It was agreed by all concerned that the overtime worked to effect these repairs saved one day on dry dock ($4,362.24).

R. A. Feldtz
UNITED STATES SALVAGE ASSOCIATION, INC.
99 JOHN STREET
NEW YORK, N. Y. 10038

CASE NO. 56-19379
PROPPELLER DAMAGE
JUNE 9, 1972

Cleveland, Ohio
September 18, 1972

S.S. "EDMUND FITZGERALD"

CONDITIONS

The employment of this Association and all services rendered in connection therewith are made, offered and rendered without reserve and on the following conditions and that all other reports, including any oral reports and certificates, are made and issued without reserve and subject to said conditions:

1. While the officers and the Board of Directors of United States Salvage Association, Inc. have used their best endeavors to select competent surveyors, employees, representatives or agents and to assure that the functions of the Association are properly executed, neither the Association nor its officers, directors, surveyors, employees, representatives or agents are under any circumstances whatever to be held responsible for any error of judgment, default or negligence of the Association’s surveyors, employees, representatives or agents nor shall the Association or its officers or directors under any circumstances whatever be held responsible for any inaccuracies, omissions, misrepresentation or misstatement in any report or certificate.

2. That the information contained in this and all other reports and certificates is only that coming to the attention of or under the observation of such surveyors, employees, representatives or agents and deemed pertinent for the purpose for which the Association was employed as stated herein; that the report or certificate is not a Certificate of Seaworthiness that under no circumstances shall this report or certificate be used in connection with the issuance, purchase, sale or pledge of any security or assurance, or in connection with the purchase, sale, mortgage, pledge, leasing, letting, hiring or charter of any vessel, range or other property, and if so used shall be null, void and of no effect and shall not be binding on anyone.

3. Reports subject to these conditions are the only reports authorized by the Association.

4. The terms of these conditions can be varied only by specific notification of the Board of Directors of the Association and the acceptance or use of this report or of the employment or services of this Association or of its surveyors, employees, representatives or agents or the use of any other report or certificate shall be construed to be an acceptance of these conditions.

5. This report and all services in connection with this employment are for the account of the person requesting the same, but with the understanding that they are to be used only for the purpose for which the Association was employed as stated herein.


DESCRIPTION

S.S. "EDMUND FITZGERALD" IS A SINGLE SCREW BULK CARRIER OF WELDED STEEL CONSTRUCTION, HAVING THREE HOLS WITH TWENTY-ONE HATCHES AND MACHINERY AFT, BUILT BY GREAT LAKES ENGINEERING WORKS AT RIVER ROUGE, MICHIGAN DURING 1958 AND IS POWERED BY A 7,500 SHAFT HORSEPOWER WESTINGHOUSE STEAM TURBINE.

DIMENSIONS

LENGTH _____________________________ 711'-00"
BREADTH _____________________________ 75'-00"
DEPTH _______________________________ 39'-00"

ATTENDING

Mr. S.L. SPINNER,
Representing Columbia Transportation Division,
Oglebay Norton Company

Mr. K. ERMEN,
Representing United States Coast Guard

Mr. W. JEANQUART,
Representing American Bureau of Shipping
Case No. 56-19379

NARRATIVE

It was reported that upon arrival of the S.S. "EDMUND FITZGERALD" at the Chesapeake and Ohio Railway Company docks in Toledo, Ohio the crew failed to secure the stern anchor and while shifting ship to the one dock on June 9, 1972, the chain of the stern anchor fouled in the propeller as the vessel maneuvered astern.

FOUND

Propeller: Four blade, sectional, bronze, 19'-08" diameter

1. One blade distorted along upper trailing edge with a section of blade approximately 10 inches deep by 32 inches long broken off and missing.
   (Blade markings: Ht. 1717, Wt. 8045, AB-JSG-62, 3-25-58)

2. Second blade distorted along upper trailing edge over an area approximately 2 inches deep by 24 inches long with a section of blade approximately 2 inches deep by 6 inches long broken off and missing.
   (Blade markings: Ht. 1711, Wt. 8045, AB-JSG-62, 3-25-58)

Third blade distorted along upper trailing edge with a section of blade approximately 2 inches deep by 10 inches long broken off and missing.
   (Blade markings: Ht. 1718, Wt. 8046, AB-JSG-62, 3-25-58)

Fourth blade distorted along upper trailing edge over an area approximately 2 inches deep by 21 inches long with a section of blade approximately 2 inches deep by 10 inches long broken off and missing.
   (Blade markings: Ht. 1628, Wt. 8027, AB-JSG-62, 3-25-58)

3. Propeller hub fairwater cap missing.

RECOMMENDED

1. A-To be removed and replaced with owner furnished spare blade.
   B-Damaged blade to be delivered to shop, faired, built-up as necessary, welded, refinished, balanced and stress relieved by heat treatment. (Separate invoice.)
   C-Upon completion of repairs blade to be returned to owner as a spare blade. (Separate invoice.)

2. A-Three blades to be removed to shop and upon completion of repairs returned to vessel and reinstalled in good order. (Separate invoice.)
   B-Three damaged blades to be faired, built-up as necessary, welded, refinished, balanced and stress relieved by heat treatment. (Separate invoice.)

3. To be renewed.
   Approximate size: 3'06"-3'4" maximum diameter by 2106-1'4" over-all length.

Total: $81,181

Install Fairwater Cone $49.45
FOUND (CONTINUED)

4. Eight propeller hub fairwater cap studs sheared and part missing.

RECOMMENDED (CONTINUED)

4. Stud fragments to be extracted, stud holes re-tapped and studs renewed. Approximate sizes: Eight 7/8" studs.

NOTES

A. Drydocking not required to effect foregoing repairs.

B. Vessel's underwater area to be inspected at next regular drydocking and if any damage found in consequence of the subject alleged casualty a supplementary survey is to be held and the damage dealt with as found necessary.

C. Necessary floating equipment to be furnished to assist survey party in submersible survey.

D. Necessary floating equipment, men and material to be furnished to effect foregoing repairs as enumerated in Item Nos. 1-A, 3 and 4.

E. Necessary floating equipment, men and material to be furnished to effect foregoing repairs as enumerated in Item No. 2-A. (Separate invoice.)

F. Necessary testing to be carried out to the satisfaction of all interested parties.

G. No scrap material involved in foregoing repairs.

The foregoing repairs, exclusive of Item Nos. 1-B, 1-C, 2-A, 2-B, Notes "C" and "E", were effected by the American Ship Building Company, Toledo, Ohio, on a "time and material" basis. The costs expended in making the repairs will be submitted to the undersigned for review.

It was reported that the foregoing repairs as enumerated in Item Nos. 1-B, 1-C, 2-A, 2-B and Note "E" would be effected at a later date at the convenience of the owners when a further survey will be held and price agreed upon.

The foregoing repairs as enumerated in Note "C" were effected by Herc Boilers and Welding Company, Inc., Toledo, Ohio, on a "time and material" basis. The costs expended in making the repairs will be submitted to the undersigned for review.

Temporary repairs, consisting of heating and fairing the three propeller blades referred to in the foregoing Item No. 2, were effected afloat at this time by the American Ship Building Company. $20,000 included changing one blade.

The foregoing temporary repairs were effected by the American Ship Building Company, Toledo, Ohio, on a "time and material" basis. The costs for the time and material expended in making these temporary repairs will be submitted to the undersigned for review.

Repairs commenced ------------------------ June 9, 1972.
Repairs completed ------------------------ June 10, 1972.

Survey made without prejudice, and subject to adjustment.

/8/ W. JEMOQUART
Attending Surveyor

P. J. Coli
Principal Surveyor
Great Lakes District
THIS IS TO CERTIFY that the undersigned surveyor to this Bureau did, at the request of the owner's representative, attend the single screw, steel, steamer EDMUND FITZGERALD of Milwaukee, Wisconsin, Official No. 277,437, while the vessel lay afloat at Toledo, Ohio on the 9th day of June, 1972, and subsequent date, relative to damage alleged to have been sustained in consequence of the stern anchor chain becoming fouled in the propeller blades while maneuvering astern at the C & O docks at Toledo, Ohio on June 9, 1972. For further particulars, see vessel's log book and report as follows:

UPON EXAMINATION FOUND:

Four-bladed, Sectional, Bronze Propeller.

1. Blade No. 1, upper trailing edge distorted and broken off over an area 2" deep x 10" long. (Ht. 1718, Wt. 8046, AB-JSG-62, 3-25-58)

2. Blade No. 2, upper trailing edge distorted over an area 2" deep x 21" long; piece broken off 2" deep x 10" long. (Ht. 1678, Wt. 8027, AB-JSG-62, 3-25-58)

3. Blade No. 3, upper trailing edge distorted; piece broken off 10" deep x 32" long. (Ht. 1717, Wt. 8045, AB-JSG-62, 3-25-58)

4. Blade No. 4, upper trailing edge distorted 2" deep x 24" long; piece broken off 2" deep x 6" long. (Ht. 1711, Wt. 8045, AB-JSG-62, 3-25-58)

5. Propeller hub fairwater cap missing (42-3/4" max. diameter x 2'-61/4" overall length) and eight 7/8" studs sheared off.

RECOMMENDED:

To be temporarily faired in place and dressed to a smooth finish.

To be temporarily faired in place and dressed to a smooth finish.

To be replaced with ship's spare blade. (Ht. 414, AB-200-BBN, 3-23-71)

To be temporarily faired in place and dressed to a smooth finish.

New fairwater cap to be fabricated and installed when available.

6. The foregoing recommended repairs mentioned in Items Nos. 1 through 4 were carried out, examined and found satisfactory for continued operation.

7. It is recommended that Items Nos. 1, 2, 4 and 5, together with the underwater portion of the vessel, be further examined and dealt with as found necessary at the vessel's next drydocking.

8. The inboard shafting, coupling bolts and bearings were examined and found satisfactory as far as could be determined.

This Certificate is granted subject to the condition that it is understood and agreed that neither the Bureau nor any of its Committees nor any of its Officers, Surveyors, Agents or Employees is under any circumstances whatever to be held responsible for any inaccuracy in any report or certificate issued by this Bureau or its Surveyors or in any entry in Record or other publication of the Bureau or for any of its or their errors of judgment, default or negligence.

Form A.B. 141 Rev. (1/71)
9. The reduction gear, bull gear was inspected through the inspection cover and found satisfactory as far as could be determined.

10. The stern bearing weardown was measured with the ship's tram and found to be down 7/32".

11. A dock trial was conducted at one-third speed and found operating in a normal condition.

It is recommended that this vessel be retained in her present classification with this Bureau.

W. J. Nauwast
Surveyor
Field Survey Report

S.S. Edmund Fitzgerald  
June 9, 1972

We the undersigned, have on this date held survey on the
S.S. Edmund Fitzgerald, Oglebay Norton Co., Columbia Transporta-
tion Division, owners and operators, while lying afloat
at Toledo, Ohio in order to ascertain and agree upon or as-
serted otherwise the cause, the nature and extent and the
recommended repair of damage alleged to have been sustaine-
in consequence of the stock anchor chain becoming fouled
in the propeller blades while maneuvering astern at the
C&O Locks at Toledo, Ohio on June 9, 1972.

Freed

Your Bladed Sectional

George Personius

1. Blade No. 1, upper trailing edge.  To be temporarily fairied in
   distorted and broken off at area
   2" x 10" long (HT: 1718, WT: 8046,
   AB-JSG-62, 3-25-57.)

2. Blade No. 2, upper trailing edge.  To be temporarily fairied in
   distorted over an area 2" x 21" long, piece broken off 2" x 10" long.
   (HT: 1678, WT: 8027, AB-JSG-63, 3-25-57.)

(Continued)
Page Two Field Survey Report  S.S. Edmund Fitzgerald  

June 9, 1972

3. Blade No. 3, upper trailing edge distorted, piece broken off 10" deep x 32" long.

3. To be replaced with owner furnished spar. Damaged blade to be removed to shop for repair and returned to vessel as a spar.

4. Blade No. 4, upper trailing edge distorted 2" deep x 24" long, piece broken off 2" deep x 6" long.

4. To be temporarily fastened in place and dressed to a smooth finish. Blade to be removed, repaired and replaced at a later date.

5. Propeller hub–fairwater (423/4" max. diameter x 24 1/2" overall length) missing, eight 7/8" studs sheared off.

5. New fairwater cap to be fabricated and installed when available.

Note:  (A) Necessary propeller screw and work boat.

(B) Necessary Crane service

The foregoing temporary repairs to be effected by American Ship Building Co., Toledo. This on time and material basic cost will be submitted for review.

Estimated cost of permanent repairs.

It is recommended that the vessel be further examined and repairs as found necessary be dealt with at vessel's next drydock.

Signed without prejudice,

[Signature]

L. J. Simmers  

[Signature]  

Mr. H. Ervin—present—did not sign rep U.S.C.G.
CASUALTY REPORT

Name of our Vessel: Edmund Fitzgerald

Accident Date: June 9, 1972

Name(s) of Vessel(s) Damaged: Edmund Fitzgerald

Name of Bridge, Dock, or Structure Damaged: None

NOTE: IF TWO VESSELS DAMAGED, OR IF VESSEL AND BRIDGE, DOCK, OR STRUCTURE BOTH DAMAGED, THIS REPORT IS TO BE SUBMITTED IN DUPLICATE

NATURE OF ACCIDENT (Indicate by Check Mark)

- Struck Dock
- Struck Unknown Obstruction
- Fire
- Struck Bridge
- Collision with Another Vessel
- Ice
- Struck Bottom
- Heavy Weather
- Wash
- Rubbed Bottom
- Sank
- Machinery
- Stranded
- Other Cause

Propeller Damage

More detail, if known, as to cause of accident:

Mate neglected to secure stern anchor after arriving dock.

In shifting to on deck vessel's engine was reversed and anchor became fouled in propeller.

City or Location Where Accident Occurred (If accident occurred at a dock or at a bridge, please name the dock or bridge)

Toledo, Ohio - C & O Coal Dock

BRIEF DESCRIPTION, AND POSITION, OF DAMAGE SUSTAINED

Our Vessel: Damage to four propeller blades.

Other Vessel: None

Bridge, Dock, or Structure: None

FOLLOWING INFORMATION TO BE FURNISHED IN CONNECTION WITH DAMAGES TO OTHER VESSELS AND DAMAGES TO BRIDGES, DOCKS, OR STRUCTURES

Name of other vessel: It was damaged

Claim has been made against our vessel for damage to other vessel: 

We suggest that survey be deferred until claim is made: 

We will then arrange to notify U.S. Salvage Assoc. if and when claim is made: 

Claim been made against our vessel for damage to bridge, dock, or structure: 

We suggest that survey be deferred until claim is made: 

We will then arrange to notify U.S. Salvage Assoc. if and when claim is made: 

NAME OF INSURANCE BROKER

Hull: Willcox, Peck & Hughes, Inc.

P. & I.

SURVEY INFORMATION

Damaged vessel may be surveyed at Toledo, Ohio (Port) A.M. P.M. (Date) June 9, 1972

Additional remarks

Date of report: June 13, 1972

Columbia Transportation Division

Signature of Assured, Managing Owner, or Master

The above form is for the convenience of vessels holding policies containing Notice-and-Tender clauses reading: "In the event of an accident whereby loss or damage may result in a claim under this policy, immediate notice with such details as are available, followed by full and accurate details (such details shall in no event be delayed beyond thirty days after the accident), shall be given in writing by the assured to the United States Salvage Assn., Inc., representing the underwriters."

UNITED STATES SALVAGE ASSOCIATION, INC.

802 PARK BUILDING

CLEVELAND, OHIO 44114

TELEPHONE CHERRY 1-6752, 1-6753

NIGHT NUMBER - TRINITY 1-1669

FORM NO. 10 10/61
**GREAT LAKES PROTECTIVE ASSOCIATION**

**DATE OF REPORT:** June 13, 1972

**VEssel:** Edmund Fitzgerald  
**Trip:** #8

**Owner or Manager:** Oglebay Norton Company - Columbia Transportation Division

**Bound From:** Silver Bay, Minnesota  
**To:** Toledo, Ohio

Place where accident occurred: C & O #1 Coal Dock, Toledo, Ohio

Date and hour it occurred: 12:30 P.M., June 9, 1972

Nature of accident: Note, neglected to secure stern anchor after arriving dock. In shifting to ore dock, vessel's engine was reversed and anchor became fouled in propeller.

Condition of weather: Clear

Direction of wind: East  
**Velocity:** 5 MPH

Draft of vessel, For'd: 27' 10"  
Amidship: 27' 10"  
Aft: 27' 11"

**Character of damage to hull of your vessel:**

| 1 | Damage to four propeller blades |

**Character of damage to other vessel’s hull or to other property:**

| 2 | None |

**REMARKS:** (Here outline a concise statement of any additional facts bearing on the accident.)

**SUGGESTIONS as to possible method to avoid a recurrence:**

The above is a full and complete statement of all facts concerning this accident.  
**Ernest McSorley**  
**Master**
Supplement survey was held on January 22, 1974, for permanent repairs on the subject vessel while lying afloat in her winter berth at The American Ship Building Company, Lorain, Ohio.

Attending

Mr. S. Borthwick  Representing United States Salvage Association, Inc.
Mr. W. White      Representing American Bureau of Shipping
Mr. E. Stadnicar  Representing United States Coast Guard
Mr. N. Schroeder  Representing The American Ship Building Company
Mr. R. A. Feldtz  Representing the Owners

Survey disclosed damage to be substantially the same as described in initial report of survey dated May 7, 1973; however, Plate L-9 (Item 2 of original report) to be cropped in lieu of complete renewal, thereby reducing its overall length.

Permanent repairs are being effected at this time for Underwriters' account by The American Ship Building Company, Lorain, Ohio, for an agreed price of $33,500.

R. A. Feldtz
THE AMERICAN SHIP BUILDING COMPANY
SHIPBUILDERS AND ENGINEERS

STR. EDMUND FITZGERALD & OWNERS
OGLEBAY NORTON COMPANY
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6508
CLEVELAND, OHIO 44101

INVOICE NO. 22613
YARD LORAIN
INVOICE DATE MARCH 13, 1974
YOUR ORDER 23 3761-22
OUR ORDER
TERMS NET 30 DAYS

PLEASE FORWARD REMITTANCE TO P. O. BOX 5448 U CLEVELAND, OHIO 44101
AND SHOW OUR INVOICE NUMBER ON REMITTANCE FOR PROPER CREDIT

INTEREST AT RATE OF 6% CHARGED AFTER MATURITY.

NECESSARY LABOR AND MATERIAL TO CROP, REMOVE AND
RENEW PORT SIDE SHELLS L-8 AND L-9, INCLUDING
RUBBING BARS. ALSO, K-10 WITH INTERNALS, STAGING,
TEST AND PAINT.
SCRAP CREDIT ALLOWANCE INCLUDED IN PRICE.

AGREED PRICE ........... $33,500.00

Chas. P. Bentley

Fitzgerald

United States Salvage Association, Inc.
Cleveland Office
Approved without prejudice to underwriters' liability and
subject to adjustment.
Date: March 13, 1974
Signature

Case No. 57-20153(3)
American Bureau of Shipping
45 BROAD STREET, NEW YORK, N.Y. 10004

Report No. C5544

Cleveland, Ohio - 12 March 1974

S/S EDMUND FITZGERALD

Contact Damage - Casualty of 4 May 1973
Repaired

This is to certify that the undersigned Surveyor to this Bureau did, at the request of the Owner’s representative, attend the single screw, steel, S/S EDMUND FITZGERALD of Milwaukee, Wisconsin, Official No. 277,437, while the vessel lay afloat at Lorain, Ohio on the 22nd day of January 1974 and subsequent dates, relative to survey and repairs to damage alleged to have been sustained in consequence of making contact with the corner of the lock wall at Sault Ste. Marie, Michigan on 4 May 1973 while downbound from Silver Bay, Minnesota to Toledo, Ohio in a laden condition. For further particulars, see vessel’s log book, Toledo Report No. TL7506 dated 5 May 1973 and reports as follows:

UPON EXAMINATION FOUND

Shell Plating - Port Side #2 and #3 Ballast Tanks

1. The aft third length of shell plate #8 in the first strake below sheer strake set in moderately.

2. The forward three quarter length of shell plate #9 in the first strake below sheer strake set in heavily.

3. The mid length of shell plate #10 in the second strake below sheer strake set in moderately over the top half.

4. Rub bars in way of #9 shell plate in first below sheer strake and #10 plate in second below sheer strake set in way of damaged plates.

Internals

#2 Ballast Tank

5. Watertight bulkhead between #2 and #3 ballast tanks severely distorted for about 10 feet from main deck across damage shell plating along with three shell frames and three main deck beams severely to moderately buckled.

#3 Ballast Tank

6. Three shell frames, along with five bulkhead stiffeners, bulkhead bracket and one main deck beam moderately to severely buckled.

This Certificate is granted subject to the condition that it is understood and agreed that neither the Bureau nor any of its Committees nor any of its Officers, Surveys, Agents or Employees is under any circumstances whatever to be held responsible for any inaccuracy in any report or certificate issued by this Bureau or its Surveyors or in any entry in Record or other publication of the Bureau or for any of its or their errors of judgment, default or negligence.

Form A.6.141 Rev. (1/71)
Main Deck

7. The main deck from the shell connection inboard for about 3 feet x about 20 feet along with one main deck shell web and one channel longitudinal stringer set in moderately to severely.

RECOMMENDED

1. Crop, remove and renew the aft portion of shell plate #8 in the first strake below sheer strake for about six (6) feet.

2. Crop, remove and renew the forward three quarters length of shell plate #9 in the first strake below sheer strake for about sixteen (16) feet.

3. Crop, remove and renew the mid length of shell plate #10 in the second strake below sheer strake for about fifteen (15) feet.

4. Remove and renew rub bar in way of damage shell plating.

Internals

#2 Ballast Tank

5. Crop, remove and renew watertight bulkhead at shell connection for about 10 feet x 2 feet along with the first three shell frames from bulkhead for about 15 feet each and adjacent deck beams for about 4 feet each.

#3 Ballast Tank

6. Crop, remove and renew the first three shell frames aft of watertight bulkhead for about 15 feet each. Also, five (5) bulkhead stiffeners, one bulkhead bracket and one (1) deck beam.

Main Deck

7. Crop, remove and renew a section of main deck from the shell connection inboard for about 18 feet x 2 feet. Also, crop and renew one deck frame for about 6 feet x 4 feet along with the first shell stringer channel for about 12 feet.

Note: Upper seam of plate renewal at #8 and #9 shell plates in first strake below sheer to be riveted, remaining seams, butts and internals to be welded.

The above recommended repairs were carried out, examined during and upon completion, hose tested and all found satisfactory.

The undersigned recommends that this vessel be retained as classed with this Bureau.

First visit: 22 Jan 1974
Last visit: 12 March 1974

WILLIAM J. WHITE SURVEYOR
CONDITIONS

The employment of this Association and all services rendered in connection therewith are made, offered and rendered without reserve and on the following conditions and that all other reports, including any and all reports and certificates, are made and issued without reserve and subject to such conditions:

1. While the officers and the Board of Directors of United States Salvage Association, Inc. have used their best endeavors to select competent surveyors, employees, representatives, and agents and to assure that the members of the Association are properly insured, neither the Association nor its officers, directors, employees, representatives, or agents are under any circumstances whatever to be held responsible for the results of such employment, report or engagement of the Association's surveyors, employees, representatives, or agents or any certificates whatever to be held responsible for any mistakes, omissions, misunderstandings, errors or mistakes or any reports or certificates.

2. That the information contained in this and all other reports and certificates is only that coming to the attention of or under the direction of such surveyors, employees, representatives, and agents and deemed pertinent for the purpose for which the Association was employed to state by them. That the report or certificate is not a comprehensive survey, but merely a statement of the facts, state of the vessel, its condition, repairs, salvage, value, etc., or the like, and is not a guarantee of any nature or kind and shall not be binding on anyone.

3. Expenses subject to these conditions are the only expenses incurred by the Association.

4. That the terms of these conditions can be waived only by special resolution of the Board of Directors of the Association and the acceptance as one of the terms or conditions of any engagement of the Association or its employees, surveyors, representatives, or agents in the use of any such report or certificate shall be considered to be an acceptance of all of the terms.

5. This report and all services in connection with this employment are for the amount of all the persons requiring the same, but with the understanding that they are to be used only for the purpose for which the Association was engaged as aforesaid above.


DESCRIPTION

S.S. "EDMUND FITZGERALD" IS A TYPICAL GREAT LAKES BULK CARRIER OF RIVETED AND WELDED STEEL CONSTRUCTION BUILT IN 1958. IT HAS THREE CARGO HOLDS SERVICED BY TWENTY-ONE HATCHES AND IS POWERED BY A CROSS-COMPUND STEAM TURBINE WHICH DELIVERS 7,500 SHAFT HORSEPOWER TO A SINGLE PROPPELLER THROUGH DOUBLE REDUCTION GEARS. A 1,000 BRAKE HORSEPOWER BOW THRUSTER IS ALSO PROVIDED.

DIMENSIONS

LENGTH, BETWEEN PERPENDICULARS .......................... 711'-00"
BREADTH, MOLDED ........................................... 75'-00"
DEPTH, MOLDED .............................................. 39'-00"

ATTENDING

CAPT. E.M. JACOBSEN, REPRESENTING COLUMBIA TRANSPORTATION DIVISION, OGLEBAY NORTON COMPANY
MR. R.A. FELDTZ, REPRESENTING COLUMBIA TRANSPORTATION DIVISION, OGLEBAY NORTON COMPANY
MR. W.J. WHITE, REPRESENTING AMERICAN BUREAU OF SHIPPING
LT. E. STADNIKAR, REPRESENTING UNITED STATES COAST GUARD
MR. N.E. SCHOEDER, REPRESENTING THE AMERICAN SHIP BUILDING COMPANY
CASE NO. 56-20153(S)

FOR FURTHER PARTICULARS, PLEASE REFER TO THE ORIGINAL REPORT OF SURVEY, CASE NO. 56-20153, ISSUED AT CLEVELAND, OHIO, DATED JUNE 1, 1973.

WHEN THE UNDERSIGNED ATTENDED THE VESSEL AT THE TIME AND PLACE STATED ABOVE, THE EXTENT OF DAMAGE WAS FOUND TO BE AS DESCRIBED IN THE ORIGINAL SURVEY REPORT WITH THE EXCEPTIONS AS OUTLINED IN ITEM NO's. 1, 2, 7 AND 8 OF THIS REPORT.

FOUND

SHELL PLATING - PORT SIDE
FIRST STRAKE BELOW SHEER STRAKE
(PLATES NUMBERED FROM BOW)

1. PLATE NO. 8 SET-IN 0-6 INCHES OVER AFTER SECTION TOGETHER WITH ATTACHED RUB BAR.

2. PLATE NO. 9 SET-IN 0-6 INCHES OVER FORWARD TWO-THIRDS LENGTH TOGETHER WITH ATTACHED RUB BAR.

SECOND STRAKE BELOW SHEER STRAKE

3. PLATE NO's. 9 AND 10 SET-IN 0-6 INCHES ACROSS COMMON BUTT.

INTERNALS - NO. 2 TANK

4. AFTER BULKHEAD DISTORTED ADJACENT TO SHELL DAMAGE.

5. THREE CHANNEL SHELL FRAMES DISTORTED TOGETHER WITH ATTACHED DECK BEAMS.

NO. 3 TANK

6. THREE CHANNEL SHELL FRAMES DISTORTED AND ONE DECK BEAM BUCKLED.

7. FIVE ANGLE STIFFENERS DISTORTED.

RECOMMENDED

1. TO BE CROPPED AND PARTLY RENEWED. APPROXIMATE SIZES:
   1 PC. 6'00" X 7'04" X 45.9 POUND PLATE.
   1 PC. 7'00" X 9" X 1/2" BEVELED BAR.

2. TO BE CROPPED AND PARTLY RENEWED. APPROXIMATE SIZES:
   1 PC. 16'00" X 7'04" X 45.9 POUND PLATE.
   1 PC. 17'00" X 9" X 1/2" BEVELED BAR.

3. TO BE CROPPED AND PARTLY RENEWED USING ONE PLATE. APPROXIMATE SIZE:
   15'00" X 7'04" X 28.05 POUND PLATE.

4. TO BE CROPPED AND PARTLY RENEWED. APPROXIMATE SIZE:
   2'00" X 10'00" X 15.3 POUND PLATE.

5. TO BE CROPPED AND PARTLY RENEWED. APPROXIMATE SIZES:
   3 PCS. 15'00" X 12" X 35 POUND CHANNEL.
   3 PCS. 4'00" X 2'00" X 15.3 POUND FLANGED PLATE.

6. TO BE CROPPED AND PARTLY RENEWED. APPROXIMATE SIZES:
   3 PCS. 15'00" X 12" X 35 POUND CHANNEL.
   1 PC. 4'00" X 2'00" X 15.3 POUND FLANGED PLATE.

7. TO BE CROPPED AND PARTLY RENEWED. APPROXIMATE SIZES:
   5 PCS. 3'00" X 8" X 4" X 19.6 POUND ANGLES.
8. One bracket buckled.

9. Main deck distorted at shell connection.

10. One web frame distorted at shell connection.

11. One longitudinal channel frame distorted between webs.

NOTES

A. The foregoing repairs do not require drydocking.

B. Necessary staging to be erected to effect repairs and upon completion dismantled and removed.

C. Necessary adjacent fairing to effect a fair landing for the new plates.

D. Necessary removals and replacements to effect repairs, including two ballast tank vent pipes and one sounding pipe.

E. All new and disturbed areas to be prime coated.

F. All new and disturbed areas to be tested and proven tight.

G. Scrap material to be considered.

The American Ship Building Company submitted a price in the amount of $33,500.00 to effect the foregoing repairs, including and reflecting a scrap allowance in the amount of $280.00. This price is considered fair and reasonable.

Reparis commenced --------------------- January 24, 1974.

Survey made without prejudice, and subject to adjustment.
You are directed to inform the above officer when the following requirements have been corrected.

D-1. Crop and Renew A.S....
Clear and Necessary by A.

MARINE INSPECTOR PORT
SIDE SHELL PLATES L-889
AND ASSOCIATED INTERNAL MEMBERS PRIOR TO THE START OF THE 1974 NAVIGATION SEASON.

[Signature]

[Signature]

2-2-74 A.S.E.

Superintendent

[Signature]

Marine Inspector.
Columbia Transportation Division  
Orlebay Norton Company  
1200 Hanna Building  
Cleveland, Ohio - 44115

Subject: "EDWARD FITZGERALD (O.N. 277437)"

Gentleman:

At a damage survey conducted on board subject vessel at this port on 5 May 1973, the following requirement was issued relative to damage sustained when vessel collided with the McArthur Lock, Sault Ste. Marie, Michigan on 4 May 1973:

D-1 Crop and renew as deemed necessary by a Marine Inspector, port side shell plates L-6 and 9 and associated internal members, prior to the commencement of the 1974 navigation season.

Please notify this office when the required corrective action has been taken, and the marine inspection zone in which it was checked.

Very truly yours,

A. W. GOVE
Commander, U. S. Coast Guard  
Officer in Charge  
Marine Inspection
On May 4, 1973, at 0755 hours while the subject vessel was on Trip No. 7 in laden condition downbound from Silver Bay, Minnesota, to Toledo, Ohio, it struck the northwest corner of the MacArthur Lock, Sault Ste. Marie, Michigan.

Survey was held at Toledo, Ohio, on May 5, 1973, in order to ascertain and agree upon the extent and repair of damage sustained.

Attending

Mr. W. Jeanquart Representing American Bureau of Shipping
Mr. T. Polgar Representing United States Coast Guard
Mr. P. O'Conner Representing United States Salvage Association, Inc.
Mr. R. A. Feldtz Representing the Owners

The following was disclosed.

<table>
<thead>
<tr>
<th>Found</th>
<th>Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shell Plating - Port Side</td>
<td><strong>(Plates numbered from stern)</strong></td>
</tr>
<tr>
<td><strong>First Strake Below Sheer</strong></td>
<td></td>
</tr>
<tr>
<td>1. Plate L-8 set in 0-8 inches at after end of plate in way of lower one-half width.</td>
<td>1. To be cropped and partly renewed. Size: 12'00&quot; x 7'04&quot; x 45.9 pound plate.</td>
</tr>
<tr>
<td>2. Plate L-9 set in 0-8 inches at forward end of plate in way of lower one-half width.</td>
<td>2. To be renewed. Size: 24'00&quot; x 7'04&quot; x 45.9 pound plate.</td>
</tr>
<tr>
<td>3. Rub bar in way of above shell plate damage effected.</td>
<td>3. To be renewed. Size: 37 lineal feet of 9&quot; x 1-1/2&quot; bevelled steel plate.</td>
</tr>
</tbody>
</table>
R. A. Feldtz

S/S Edmund Fitzgerald
Casualty of May 4, 1973
(Struck Lock Wall)

Found

Second Strake Below Sheer

4. Plates K-9 and 10 set in 0-6 inches in way of common butt over upper one-half width of plate.

Internals

Main Deck Tunnel - Port Side

5. Main deck plating, heavily buckled and fractured in way of common bulkhead between Nos. 2 and 3 side tanks.

6. One web frame heavily buckled and fractured at frame 45.

7. One section of longitudinal shell frame set in bodily and distorted in way of above shell plate damage.

No. 2 Port Side Tank

8. Three channel shell frames set in bodily and twisted in way of above shell plate damage.

9. Three flanged plate deck beams heavily buckled in way of above main deck damage.

Recommended

4. To be cropped and partly renewed. Size: 15'00'' x 7'04'' x 28.05 pound plate.

5. To be cropped and partly renewed. Size: 18'00'' x 3'06'' x 15.3 pound plate insert.

6. To be cropped and partly renewed. Size: 5'06'' x 3'06'' x 15.3 pound plate insert.

7. To be cropped and partly renewed. Size: 1 pc. 12'' x 30.9 pound ship channel 24'00'' long.

8. To be cropped and partly renewed. Size: 3 pcs. 12'' x 35 pound ship channel 12'00'' long, each.

9. To be cropped and partly renewed. Size: 3 pcs. 2'00'' x 15.3 pound flanged plate 4'00'' long, each.
S/S Edmund Fitzgerald
Casualty of May 4, 1973
(Struck Lock Wall)

R. A. Feldtz

10. Common bulkhead between Nos. 2 and 3 port side tanks heavily buckled and distorted in way of above shell plate damage.

Recommended

10. To be cropped and partly renewed.
Size: 1 pc. 4'00" x 3'00" x 15.3 pound plate insert.

No. 3 Port Side Tank

11. Three channel shell frames set in bodily in way of above shell plate damage.

11. To be cropped and partly renewed.
Size: 3 pcs. 12" x 35 pound ship channel 12'00" long, each.

12. One flanged plate deck beam heavily buckled in way of above main deck damage.

12. To be cropped and partly renewed.
Size: 1 pc. 2'00" x 15.3 pound flanged plate 4'00" long, each.

Notes

A. Dry-docking not required to effect the foregoing repairs.

B. Necessary staging to be erected both inside and outside and removed upon completion of repairs.

C. Necessary removals and replacements to effect the foregoing repairs, including two tank vent pipes in way of main deck plating.

D. Necessary fairing of adjacent shell plates.

E. Necessary painting of new and disturbed work as original.

F. Necessary testing to be carried out to the satisfaction of all interested parties.

The foregoing repairs have been deferred until winter lay-up 1973-1974, when they will have to be effected per United States Coast Guard requirement issued May 5, 1973.
Temporary repairs were effected at this time, which entailed installing a doubler plate over main deck damage.

Estimated cost of deferred, permanent repairs - $40,000.

Estimated cost of temporary repairs effected May 5, 1973 - $700. actual

R. A. Feldtz
United States Salvage Association, Inc.

59 JOHN STREET
NEW YORK, N. Y. 10038

CASE NO. 56-20153
CONTACT WITH LOCK WALL
MAY 4, 1973

Cleveland, Ohio
JUNE 1, 1973

S.S. "EDMUND FITZGERALD"

CONDITIONS

The employing of this Association and all services rendered in connection therewith are made, offered and rendered without recourse and on the following conditions and the said all other reports, including any said reports and certificates, are made and issued without recourse and subject to such conditions:

1. While the officers and the Board of Directors of United States Salvage Association, Inc. have used their best endeavors to select competent surveyors, employees, representatives and agents and to ensure that the functions of the Association are properly executed, neither the Association nor its officers, directors, surveyors, employees, representatives or agents nor shall the Association or its officers or directors under any circumstances whatever be held responsible for any error of judgment, delay or negligence of the Association's surveyors, employees, representatives or agents nor shall the Association or its officers or directors under any circumstances whatever be held responsible for any inaccuracy, omissions, misrepresentations or misstatements in any report or report certificate.

2. That the information contained in this and all other reports and certificates is only that coming to the attention of or under the observation of such surveyors, employees, representatives and agents and deemed pertinent for the purpose for which the Association was employed or stated herein; that this report or report certificate is not a contract, warrant or guaranty or a guarantee nor is made in connection with the issuance, purchase, sale or pledge of any security of any kind or nature and in no way is connected with the issuance, purchase, sale or pledge of any security of any kind or nature and in no way is connected with the issuance, purchase, sale or pledge of any security of any kind or nature.

3. Reports subject to these conditions are the only reports authorized by the Association.

4. The terms of these conditions can be varied only by specific resolution of the Board of Directors of the Association and the acceptance or use of this report or of the employment or services of the Association or of its surveyors, employees, representatives or agents or the use of any other report or certificate shall be construed to be an acceptance of these conditions.

5. This report and all services in connection with this employment are for the account of the person requesting the same, but with the understanding that they are to be used only for the purpose for which the Association was employed as stated herein.


DESCRIPTION

THIS VESSEL IS A TYPICAL GREAT LAKES BULK CARRIER BUILT OF WELDED AND RIVETED STEEL CONSTRUCTION IN 1958. IT HAS THREE CARGO HOLDS SERVICED BY 21 HATCHES AND IS POWERED BY A COMPOUND STEAM TURBINE WHICH DELIVERS 7,500 SHAFT HORSEPOWER TO A SINGLE PROPELLER THROUGH A DOUBLE REDUCTION GEAR. A 1,000 BRAKE HORSEPOWER BOW THRUSTER IS ALSO INSTALLED.

DIMENSIONS

| LENGTH, BETWEEN PERPENDICULARS | 711'10" |
| BREADTH, MOLDED | 75'10" |
| DEPTH, MOLDED | 39'10" |

ATTENDING

Mr. R. A. Feldtz,
Representing Columbia Transportation Division,
Oglebay Norton Company

Mr. W. Jeanquart,
Representing American Bureau of Shipping

Mr. T. Polgar,
Representing United States Coast Guard
ABSTRACT OF DECK LOG

"Trip No. 7. Silver Bay to Toledo

0534: Gros Cap
0715: Soo W. Piers

Remarks:
Soo draft: 27' FWD 27'1.5" MID 27'2" AFT
0755: Entering Mac Arthur Lock Vessel rubbed N W corner of lock portside.

C. Mc Sorley"

FOUND

SHELL PLATING - PORT SIDE

FIRST STRAKE BELOW SHEER STRAKE

1. Plate No. 8 set in 0-8" over after section together with attached rub bar.

2. Plate No. 9 set in 0-8" over full length together with attached rub bar.

SECOND STRAKE BELOW SHEER STRAKE

3. Plate No's. 9 and 10 set in 0-8" across common butt.

INTERNALS - NO. 2 TANK

4. After bulkhead buckled and distorted at shell connection.

5. Three channel shell frames buckled and distorted together with attached deck beams.

NO. 3 TANK

6. Three channel shell frames and one deck beam buckled and distorted.

TUNNEL - PORT SIDE

7. Main deck buckled and distorted at shell connection.

RECOMMENDED

1. To be cropped and partly renewed.
   Approximate sizes:
   1 pc. 12' x 88\(\frac{1}{4}\)" x 45.9 pound plate.
   1 pc. 13' x 9" x 1\(\frac{1}{4}\)" beveled rub bar.

2. To be renewed.
   Approximate sizes:
   1 pc. 24' x 88\(\frac{1}{4}\)" x 45.9 pound plate.
   1 pc. 25' x 9" x 1\(\frac{1}{4}\)" beveled rub bar.

3. To be cropped and partly renewed with one piece.
   Approximate size:
   1 pc. 15' x 88\(\frac{1}{4}\)" x 28.05 pound plate.

4. To be cropped and partly renewed.
   Approximate size:
   1 pc. 4' x 3' x 15.3 pound plate.

5. To be cropped and partly renewed.
   Approximate sizes:
   3 pcs. 15' x 12" x 3.767" x 35 pound channel.
   3 pcs. 4' x 2' x 15.3 pound flanged plate deck beams.

6. To be cropped and partly renewed.
   Approximate sizes:
   1 pc. 4' x 2' x 15.3 pound flanged plate deck beam.

7. To be cropped and partly renewed.
   Approximate size:
   1 pc. 18' x 3\(\frac{1}{4}\)" x 15.3 pound plate.
Case No. 56-20153

(Continued)

8. Web frame between No. 2 and No. 3 tanks buckled and distorted at shell connection.

9. Longitudinal channel stringer in way of plate damage buckled.

8. To be cropped and partly renewed.
   Approximate size:
   1 pc. 516" x 316" x 15.3 pound flanged plate.

9. To be cropped and partly renewed.
   Approximate sizes:
   1 pc. 12" x 3.45" x 30.9 pound channel.
   1 pc. 24" x 3.45" x 30.9 pound channel.

NOTES

A. Drydocking is not required to effect the foregoing repairs.

B. Necessary staging to be erected to effect the foregoing repairs and upon completion dismantled and removed.

C. Necessary adjacent fairing to effect a fair landing for new plating.

D. Necessary removals and replacements including two vent pipes in way of main deck.

E. Necessary painting of new and disturbed areas upon completion of repairs.

F. Necessary testing of repairs for tightness to be carried out to the satisfaction of all concerned.

G. Scrap credit allowance to be considered.

It was reported that the foregoing repairs would be effected at a later date at the convenience of the owner's when a further survey will be held and a price agreed upon.

Survey made without prejudice and subject to adjustment.

[Signature]
P. O'Connor
Surveyor
DAMAGE SURVEY
CASUALTY OF MAY 4, 1973

THIS IS TO CERTIFY that the undersigned surveyor to this Bureau did, at the request of the owner's representative, attend the single screw, steel, steamer EDMUND FITZGERALD of Milwaukee, Wisconsin, Official No. 277,437, while the vessel lay afloat at Toledo, Ohio, on the 5th day of May, 1973, relative to damage alleged to have been sustained in consequence of making contact with the corner of the lock wall on May 4, 1973, while downbound from Silver Bay, Minnesota, to Toledo, Ohio, in laden condition. For further particulars, see vessel's log book and report as follows:

UPON EXAMINATION FOUND
SHELL PLATING - PORT SIDE
ABREAST NOS. 4 AND 5 CARGO HATCHES
(1st below sheer strake)

1. Plate No. 8, set in 0-8 inches over the after section together with welded rub bar.
2. Plate No. 9, set in 0-8 inches over the full length together with welded rub bar.

INTERNALS NO. 2 BALLAST TANK

3. The after bulkhead was buckled and distorted in way of above plate damage.
4. Three (3) shell frames, together with attached main deck beams were buckled and distorted in way of above plate damage.

NO. 3 BALLAST TANK

5. Three (3) shell frames and one (1) main deck beam, buckled and distorted in way of above plate damage.

TUNNEL PORT SIDE

6. One (1) channel stringer, one (1) web frame and main deck plating in way of above shell damage was buckled and distorted.

TEMPORARY REPAIRS

7. A doubler plate was welded over the fractured and distorted portion of the main deck plating, examined, tested and found satisfactory.

This Certificate is granted subject to the condition that it is understood and agreed that neither the Bureau nor any of its Committees nor any of its Officers, Surveyors, Agents or Employees is under any circumstances whatever to be held responsible for any inaccuracy in any report or certificate issued by this Bureau or its Surveyors or in any entry in Record or other publication of the Bureau or for any of its or their errors of judgment, default or negligence.

Form A.B. 141 Rev. (1/71)
8. It is recommended that further examination and repairs as found necessary be dealt with before the completion of special survey of hull.

It is recommended that this vessel be retained in her present classification with this Bureau, subject to the above paragraph.

W. Jeanquart - Surveyor
GREAT LAKES PROTECTIVE ASSOCIATION

Date of Report: May 7, 1973

VESSLE: Edmund Fitzgerald
TRIP: 7

OWNER or MANAGER: Oglebay Norton Company - Columbia Transportation Division

BOUND FROM: Silver Bay, Minnesota
TO: Toledo, Ohio

Place where accident occurred: MacArthur Lock - Soo Canal - St. Marys River

Date and hour it occurred: May 4, 1973 - 2245 E.S.T.

Nature of accident: Entering lock vessel rubbed northwest corner of lock in way of Nos. 4 and 5 hatches.

Condition of weather: Clear

Direction of wind: Northwest
Velocity: 20

Draft of vessel, For'd: 27'
Amidship: 27' 1"
Aft: 27' 2"

Character of damage to hull of your vessel: In case of grounding, examination of water bottom should be made immediately, or as soon thereafter as possible, and description and extent of damage reported.

First plate below sheer pushed in, tunnel tank top buckled and frame bent.

Character of damage to other vessel's hull or to other property:

REMARKS: (Here outline a concise statement of any additional facts bearing on the accident.)

SUGGESTIONS as to possible method to avoid a recurrence:

The above is a full and complete statement of all facts concerning this accident.

Ernest McSorley
MASTER.

Make a diagram on the back of this report indicating the exact position of your vessel and showing physical characteristics of place where accident occurred, adding if necessary, detailed explanation of the diagram. If space allowed for explanation is not sufficient, continue on a separate sheet and attach to report. This blank to be filled out and sent as promptly as possible to Great Lakes Protective Association, 603 Park Building, Cleveland, Ohio 44113.
CASUALTY REPORT
Name of our Vessel Edmund Fitzgerald
Name(s) of Vessel(s) Damaged Edmund Fitzgerald
Name of Bridge, Dock, or Structure Damaged

NOTE: IF TWO VESSELS DAMAGED, OR IF VESSEL AND BRIDGE, DOCK, OR STRUCTURE BOTH DAMAGED, THIS REPORT IS TO BE SUBMITTED IN DUPLICATE

<table>
<thead>
<tr>
<th>Lock Wall</th>
<th>NATURE OF ACCIDENT (Indicate by Check Mark)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Struck Dock</td>
<td>X Struck Unknown Obstruction</td>
</tr>
<tr>
<td>Struck Bridge</td>
<td>Collision with Another Vessel</td>
</tr>
<tr>
<td>Struck Bottom</td>
<td>Heavy Weather</td>
</tr>
<tr>
<td>Rubbed Bottom</td>
<td>Sank</td>
</tr>
<tr>
<td>Stranded</td>
<td>Other Cause</td>
</tr>
<tr>
<td>More detail, if known, as to cause of accident</td>
<td>While entering lock, vessel rubbed northwest corner of lock wall.</td>
</tr>
</tbody>
</table>

City or Location Where Accident Occurred (If accident occurred at a dock or at a bridge, please name the dock or bridge) MacArthur Lock - Eeo Canal

BRIEF DESCRIPTION, AND POSITION, OF DAMAGE SUSTAINED
Our Vessel Plate damage port side Nos. 4 and 5 hatches, tank top in tunnel buckled and frame bent in same area.

Other Vessel

Bridge, Dock, or Structure

FOLLOWING INFORMATION TO BE FURNISHED IN CONNECTION WITH DAMAGES TO OTHER VESSELS AND DAMAGES TO BRIDGES, DOCKS, OR STRUCTURES
Name of other vessel ___________________________ It was damaged □ Yes □ No
Claim has been made against our vessel for damage to other vessel ___________________________ □ Yes □ No
We suggest that survey be deferred until claim is made ___________________________ □ Yes □ No
We will then arrange to notify U.S. Salvage Assoc. if and when claim is made ___________________________ □ Yes □ No
Claim been made against our vessel for damage to bridge, dock, or structure ___________________________ □ Yes □ No
We suggest that survey be deferred until claim is made ___________________________ □ Yes □ No
We will then arrange to notify U.S. Salvage Assoc. if and when claim is made ___________________________ □ Yes □ No

NAME OF INSURANCE BROKER
Hull W.P. H. P. & I.

SURVEY INFORMATION

□ Damaged vessel may be surveyed at Toledo, Ohio (Port) A.M. P.M. (Date) May 4, 1973
Additional remarks
Date of report May 7, 1973

The above form is for the convenience of vessels holding policies containing Notice-of-Tender clauses reading: "In the event of accident whereby loss or damage may result in a claim under this policy, immediate notice with such details as are available, followed by full and accurate details (such details shall in no event be delayed beyond thirty days after the accident), shall be given in writing by the assured to the United States Salvage Assn., Inc., representing the underwriters."

UNITED STATES SALVAGE ASSOCIATION, INC.

FORM NO. 10 10/61
# 12

**Samuel Kope & Marine Supply Co.**

1310 West 11th Street
CLEVELAND 13, OHIO

AREA CODE 216 PHONE 621-6318

CUST. ORD. NO. C-04117
CUST. REQ. NO. SP
P.O.B. SP

**SHIPPED FROM FACTORY DIRECT**

- STR EDMUND FITZGERALD
- ATTN: CAPTAIN
- OGLEBAY NORTON CO - P-53992
- SHIPPED TO MERCE BOILER & WELDING
- COLUMBIA TRANSPORTATION DIVISION
- TOLEDO OHIO
- P.O. BOX 6508
- CLEVELAND, OHIO 44101

**ASSOCIATED TRANSPORT PREPAY**

**VIA**

**NET 30**

<table>
<thead>
<tr>
<th>SIZE AND DESCRIPTION</th>
<th>TERMS</th>
<th>NET AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 PERSON SWITLIK LIFE RAFT, LIMITED SERVICE EQUIPMENT</td>
<td>NET 30</td>
<td>1705 00</td>
</tr>
<tr>
<td>LOT NO. 5 - SERIAL NO. 32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PREPAID FREIGHT INCLUDED IN M-499 STR. MIDDLETOWN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PER PRO 402502-401</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

03160 DPP

FORMERLY THE MARINE DIVISION OF THE UPSON-WALTON CO.

"WE CERTIFY THAT THESE GOODS WERE PRODUCED IN COMPLIANCE WITH ALL APPLICABLE REQUIREMENTS OF THE FAIR LABOR STANDARDS ACT, AS AMENDED, AND ALL APPLICABLE REGULATIONS AND ORDERS OF THE U.S. DEPT. OF LABOR."
<table>
<thead>
<tr>
<th>SIZE AND DESCRIPTION</th>
<th>QUANTITY SHIPPED</th>
<th>UNIT PRICE</th>
<th>LIST AMOUNT</th>
<th>NET AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 PERSON SVITLIK LIFE RAFT COMPLETE LIMITED SERVICE EQUIPMENT</td>
<td>1</td>
<td>1997.60</td>
<td>1997.60</td>
<td>1997.60</td>
</tr>
</tbody>
</table>

FREIGHT CHARGE INCLUDED IN M-597- STR. HURON-
**SAMSEL ROPE & MARINE SUPPLY CO.**

**MARINE INSPECTION DIVISION**

**SERVICE INSPECTION CERTIFICATE**

**Customer**  
OGLEBAY NORTON COMPANY  
COLUMBIA TRANS. DV

**Ship**  
STR. FITZGERALD

**Agent**  

**Date**  
2/24/75

**Address**  
P O BOX 6508  CLEVELAND, OHIO

<table>
<thead>
<tr>
<th>Raft Serial No.</th>
<th>Type</th>
<th>Date of Manufacture</th>
<th>Date of Last Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-SPC/MM-47</td>
<td>25 PERSON</td>
<td>5/67</td>
<td>2/74</td>
</tr>
</tbody>
</table>

**Manufactured By**  
SWITLIK PARACHUTE COMPANY

**Date of Inspection**  
2/24/75

**Date of Repack**  
2/24/75

**Port of Inspection**  
CLEVELAND, OHIO

**Date Shipped**  
2/75

**Shipped To**  
MERCE BOILER  
TOLEDO, OHIO

**Shipped Via**  
MERCE TRUCK

**Remarks**  
MODIFICATIONS COMPLETE

This is to certify that in accordance and compliance with annual inspection requirements of 46 CFR-160.051-6(e), the above raft has been serviced.

This service performed by:  
SAMSEL ROPE & MARINE SUPPLY CO.  
(Company Name)

U.S.C.G. Witness  

( ) Copy for Vessel's File  
( ) Copy for Servicing Facility File
SAMES ROPE & MARINE SUPPLY CO.

MARINE INSPECTION DIVISION

SERVICE INSPECTION CERTIFICATE

Customer: OGLEBAY NORTON COMPANY R COLUMBIA TRANS. DIV
Ship: STR. FITZGERALD
Agent: 
Date: 2/24/75

Address: P O BOX 6508 CLEVELAND, OHIO

<table>
<thead>
<tr>
<th>Raft Serial No.</th>
<th>Type</th>
<th>Date of Manufacture</th>
<th>Date of Last Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-SPC/MM-13</td>
<td>25 PERSON</td>
<td>5/67</td>
<td>2/74</td>
</tr>
</tbody>
</table>

Manufactured By: SWITLIK PARACHUTE COMPANY
Date of Inspection: 2/24/75
Date of Repack: 2/24/75
Port of Inspection: CLEVELAND, OHIO
Date Shipped: 2/75
Shipped To: MERCE BOILER

TOLEDO, OHIO
Shipped Via: MERCE TRUCK

Remarks: MXEEMMXMMXEMEMXEMXEMMXX MODIFICATIONS COMPLETE

This is to certify that in accordance and compliance with annual inspection requirements of 46 CFR-160.051-6(e), the above raft has been serviced.

This service performed by: SAMES ROPE & MARINE SUPPLY CO.
(Company Name)

U.S.C.G. Witness: 
(Name of Authorized Technician)

( ) Copy for Vessel's File

( ) Copy for Servicing Facility File
# 13

Invoices, Bailey Meter Company, 1975
Invoices to:
Oglebay Norton Company
Columbia Transportation Division
P. O. Box 6303
Cleveland, Ohio 44101

Terms: Net cash on receipt of invoice.

<table>
<thead>
<tr>
<th>Date</th>
<th>Hours</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/14</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Regular Time: 11½ Days @ $200.00 = $2,300.00

Overtime: 8 Hours @ $37.50 = $300.00

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenses</td>
<td>$511.5</td>
</tr>
<tr>
<td>Repair Parts Furnished</td>
<td>$428.3</td>
</tr>
<tr>
<td>Tax (if applicable)</td>
<td>$</td>
</tr>
<tr>
<td>Sub Total</td>
<td>$1,519.5</td>
</tr>
<tr>
<td>Less No Charge (2 day + expenses)</td>
<td>$-250.0</td>
</tr>
<tr>
<td>Total T &amp; E</td>
<td>$2,069.5</td>
</tr>
<tr>
<td>Parts</td>
<td>$492.35</td>
</tr>
</tbody>
</table>

Taxes: What State: 0% 
Net Total: $2,269.5

**FORM 50-3974** Seller represents that with respect to the production of the articles and/or the performance of the services covered by this invoice, it has fully complied with the Fair Labor Standards Act of 1938, as amended, including Section 12(a).
**BAILEY METER COMPANY**

**WICKLiffe, OHIO 44092**

**D-U-N-S 04-346-1359**

**PLEASE MAIL CHECK TO: POST OFFICE BOX 5156, CLEVELAND, OHIO 44101**

<table>
<thead>
<tr>
<th>YOUR ORDER NO.</th>
<th>REQUISITION NO.</th>
<th>SERVICE WORK AT (PLACE, PLANT, OR SHIP)</th>
<th>SERVICE ENG. INVOICE NO.</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-26365</td>
<td></td>
<td>Steezer Edmund Fitzgerald</td>
<td>DE75-326</td>
<td>6/3/75</td>
</tr>
</tbody>
</table>

**INVOICE TO**

- Oglebay Morton Company
- Columbia Transportation Division
- P. O. Box 6508
- Cleveland, Ohio 44101

- Attention: Purchasing Dept.

**TERMS: NET CASH ON RECEIPT OF INVOICE**

<table>
<thead>
<tr>
<th>Actual Service Dates</th>
<th>Regular Time</th>
<th>Overtime</th>
<th>Days @</th>
<th>Hours @</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3/11*, 3/12**, 3/13, 4/1***</td>
<td>4/2, 4/3, 4/6 &amp; 4/7</td>
<td>11½</td>
<td>3</td>
</tr>
</tbody>
</table>

(* = 1 man/day; ** = 2 men/day; *** = 3 men/day)

**BILLING DISTRIBUTION**

<table>
<thead>
<tr>
<th>District</th>
<th>Acct. No.</th>
<th>Time</th>
<th>Expenses</th>
<th>Repair Parts Furnished</th>
<th>Tax (if applicable)</th>
<th>Sub Total</th>
<th>Less No Charge</th>
<th>Total T &amp; E</th>
<th>Parts</th>
<th>Net Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
</tbody>
</table>

**Expenses** $529.25

**Repair Parts Furnished** $492.35

**Tax (if applicable)** $-

**Sub Total** $3517.55

**Less No Charge** $250.40

**Total T & E** $3267.15

**Parts** $-

**Net Total** $3267.15

**Taxes: What State** % Amt. $/ Net Total $3267.15

**FORM SD15-974**

-Seller represents that with respect to the production of the articles and/or the performance of the services covered by this invoice, it has fully complied with the Fair Labor Standards Act of 1938, as amended, including Section 12(a).
**DISTRICT OFFICE COPY**

**BAILEY METER COMPANY**

WICKLiffe, OHIO 44092

D-U-N-S 04-346-1359

PLEASE MAIL CHECK TO: POST OFFICE BOX 5156, CLEVELAND, OHIO 44101

<table>
<thead>
<tr>
<th>YOUR ORDER NO.</th>
<th>REQUISITION NO.</th>
<th>SERVICE WORK AT (PLACE, PLANT, OR SHIP)</th>
<th>SERVICE END. INVOICE NO.</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>C23335</td>
<td></td>
<td>Steamer Edmund Fitzgerald</td>
<td>DE75-326</td>
<td>4/10/75</td>
</tr>
</tbody>
</table>

**INVOICE TO**

Oglebay Norton Company
Columbia Transportation Division
P. O. Box 6508
Cleveland, Ohio 44101

ATTN: Purchasing Dept.

**TERMS:** NET CASH ON RECEIPT OF INVOICE

<table>
<thead>
<tr>
<th>Actual Service Dates</th>
<th>Regular Time 11½ Days @ $200.00</th>
<th>$2,200.00</th>
<th>Overtime 3 Hours @ $37.50</th>
<th>$112.50</th>
</tr>
</thead>
</table>

* ≈ 2 men on job
** ≈ 3 men on 2nd job

**BILLING DISTRIBUTION**

<table>
<thead>
<tr>
<th>District</th>
<th>DE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acct. No.</td>
<td>705</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>$2400.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenses</td>
<td>$461.15</td>
</tr>
<tr>
<td>Total T &amp; E</td>
<td>$2861.15</td>
</tr>
<tr>
<td>Parts</td>
<td>$400.35</td>
</tr>
</tbody>
</table>

| Expenses | $512.2 |
| Repair Parts Furnished | $493.3 |
| Tax (if applicable) | $ |
| Sub Total | $3519.5 |
| Less No Charge (1 day + expenses) | $259.0 |
| Net Total | $3260.5 |


**FORM SD15-974** Seller represents that with respect to the production of the articles and/or the performance of the services covered by this invoice, it has fully complied with the Fair Labor Standards Act of 1938, as amended, including Section 12(e).
**BAILEY METER COMPANY**  
**WICKLIFFE, OHIO 44092**  
**D-U-N-S 04-346-1359**

**PLEASE MAIL CHECK TO: POST OFFICE BOX 5156, CLEVELAND, OHIO 44101**

<table>
<thead>
<tr>
<th>ORDER NO.</th>
<th>REQUISITION NO.</th>
<th>SERVICE WORK AT (PLACE, PLANT, OR SHIP)</th>
<th>SERVICE ENG. INVOICE NO.</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>C28885</td>
<td>Steamer Edmund Fitzgerald</td>
<td>DE 75-326</td>
<td>April 18, 19</td>
<td></td>
</tr>
</tbody>
</table>

**INVOICE TO**

Oglebay Norton Company  
Columbia Transportation Division  
P. O. Box 6508  
Cleveland, Ohio 44101

<table>
<thead>
<tr>
<th>Attention: Purchasing Dept.</th>
</tr>
</thead>
</table>

**TERMS:** NET CASH ON RECEIPT OF INVOICE

**Actual Service Dates**

<table>
<thead>
<tr>
<th>3/11*, 3/12**, 3/13, 4/1***, 4/2</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Regular Time</th>
<th>11 1/2 Days @ 200.00</th>
<th>$2,300</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>4/3, 4/6 and 4/7</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>(* = 1 man/day)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>(** = 2 men/day)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>(** = 1 1/2 men/day)</th>
</tr>
</thead>
</table>

**Overtime**

<table>
<thead>
<tr>
<th>8 Hours @ 37.50</th>
<th>$300</th>
</tr>
</thead>
</table>

**Expenses**

<table>
<thead>
<tr>
<th>$50.9</th>
</tr>
</thead>
</table>

**Repair Parts Furnished**

<table>
<thead>
<tr>
<th>$408</th>
</tr>
</thead>
</table>

**Tax (if applicable)**

<table>
<thead>
<tr>
<th>$</th>
</tr>
</thead>
</table>

**Sub Total**

<table>
<thead>
<tr>
<th>$3,517</th>
</tr>
</thead>
</table>

**Less No Charge (1/Day)**

<table>
<thead>
<tr>
<th>$250</th>
</tr>
</thead>
</table>

**Net Total**

<table>
<thead>
<tr>
<th>$3,267</th>
</tr>
</thead>
</table>

**FORM SD18-974** Seller represents that with respect to the production of the articles and/or the performance of the services covered by this invoice, it has fully complied with the Fair Labor Standards Act of 1938, as amended, including Section 12 (e).
**BAILEY METER COMPANY**  
WICKLiffe, OHIO 44092

**SUMMARY OF SERVICE**  
**NOT AN INVOICE**

**CUSTOMER**  
[Customer Name]

**BILLING ADDRESS:**  
[Address]

**SUMMARY OF SERVICE ON BAILEY EQUIPMENT—PERIOD FROM:**  
[Start Date]  
**TO:**  
[End Date]

<table>
<thead>
<tr>
<th>Date</th>
<th>NATURE OF WORK PERFORMED</th>
<th>DAYS</th>
<th>REG. HOURS</th>
<th>OVERTIME</th>
<th>LIVING</th>
<th>TRAVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/11</td>
<td>Adjust &amp; meter control, to long &amp; narrow pipe, Power off 262 again and set proper repaired Start 162</td>
<td>1</td>
<td>8</td>
<td>28.70</td>
<td>7.00</td>
<td></td>
</tr>
<tr>
<td>4/12</td>
<td>Lubricate &amp; tighten,  &amp; complete</td>
<td>8</td>
<td>30.10</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/13</td>
<td>Lubricate &amp; tighten,  &amp; complete</td>
<td>1</td>
<td>20.70</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL MATERIAL FURNISHED (List Items):**  
[Items Listed]  
[Total Quantity]  
[Total Value]

**SHIPPING CHARGES**  
[Amount]

**TOTAL MATERIAL**  
[Total Material Cost]

**LIVING EXPENSES**  
[Amount]

**TRAVELING EXPENSES**  
[Amount]

**OTHER EXPENSES**  
[Amount]

**TOTAL MATERIAL**  
[Total Material Charge]

**TAX (if Applicable)**  
[Amount]

**TOTAL CHARGE FOR PERIOD**  
[Total Charge]

**PREVIOUS UNBILLED CHARGES**  
[Amount]

**TOTAL CHARGES TO DATE**  
[Total Charges]

**BILLING DATA**  
**INVOICE DATE**  
**AMT.**  
**CHECKED BY**  
**DATE**

**BAILEY METER COMPANY:**  
[Company Name]

**SERVICE ENGINEERING**  
**ORDER NUMBER**  
**DATE OPENED**  
**NUMBER OF INVOICES**  
**TO CUSTOMER**  
**WORK COMPLETE**  
**N/C**  
**N/C CAUSE CODE**  
**SYSTEM LINE**  
**PROD. NOWN.**  
**MODULE NAME**  
**PART NO.**  

**SERVICE WORK AT:**  
[Location]
**SUMMARY OF SERVICE  NOT AN INVOICE**

**CUSTOMER**
Oglebay Norton Co.

**BILLING ADDRESS:**
Columbus Transportation Div.

\[ /3 Edmund Fitzgerald \]

**SUMMARY OF SERVICE ON BAILEY EQUIPMENT—PERIOD FROM:** 4-7 TO: 4-19

<table>
<thead>
<tr>
<th>Date</th>
<th>NATURE OF WORK PERFORMED</th>
<th>DAYS</th>
<th>HOUR OVERTIME</th>
<th>LIVING</th>
<th>TRAVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-7</td>
<td>OBSERVING COAST GUARD CHECKING OUT OF BURNER SYSTEMS AND BOILER CONTROLS, OBSERVING SETTING OF CROSS LIMITING ON FUEL AND AIR CONTROLS.</td>
<td>1</td>
<td>-</td>
<td>10.05</td>
<td>40.00</td>
</tr>
</tbody>
</table>

**MATERIAL FURNISHED (List Items)**

- None

- Shipping Charges

- Total Material

- Tax (If Applicable)

**TOTAL CHARGES**

<table>
<thead>
<tr>
<th>Days</th>
<th>Hours @ (Regular Time)</th>
<th>(Overtime)</th>
<th>LIVING</th>
<th>TRAVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>200.00</td>
<td>-</td>
<td>No Charge</td>
<td>No Charge</td>
</tr>
</tbody>
</table>

- Living Expenses
- Traveling Expenses
- Other Expenses

**TOTAL MATERIAL**

- $2,700.05

- Tax (If Applicable)

- Total Charge For Period N/C

- Previous Unbilled Charges 2,950.15

**TOTAL CHARGES TO DATE**

- $27,000.20

**BILLING DATA**

**INVOICE DATE**

**Amt.**

**DATE**

**CUST. ORDER NO.** C28835

**REQUISITION NO.**

**SERVICE WORK AT** Toledo Overseas Terminal

**NAME OF PLACE, PLANT OR SHOP**

**SERVICE ENGINEERING**

**ORDER NUMBER** O75-3024

**DATE OPENED**

**NUMBER OF INVOICES** TO CUSTOMER 3

**WORK COMPLETE** YES NO

**WORK CHARGE** N/C

**IF N/C COMPLETE IN BELOW**

**N/C CAUSE CODE** A1

**SYSTEM LINE**

**PROD. HOMEM.**

**MODULE NAME**

**PART NO.**

**C.M. O. COPY**

**BAILEY METER COMPANY**

**WICKLiffe, Ohio 44092**

**BY** Jeff K. Perger Date 4-7-75

**Service Engineer**

**APPROVAL BY**

**TITLE** 1/1

**DATE** 4-7-75

**COMPANY**

Minimum Billing Per SM 64

**Form SD 14-1-1/74**
**BAILEY METER COMPANY**  
WICKLiffe, OHIO 44092

**CUSTOMER**  
Cicerny Norton Co.

**BILLING ADDRESS:**  
Columbia Transportation D.R.  
S/Edmond Fitzgerald

---

**SUMMARY OF SERVICE NOT AN INVOICE**

**SUMMARY OF SERVICE ON BAILEY EQUIPMENT—PERIOD FROM:**  
4-1 TO:  
4-3

<table>
<thead>
<tr>
<th>Date</th>
<th>NATURE OF WORK PERFORMED</th>
<th>DAYS REQ.</th>
<th>HOURLY RATE</th>
<th>LIVING</th>
<th>TRAVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-1</td>
<td>Working on spring fit out to</td>
<td>2/2</td>
<td>3 10/10</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>4-2</td>
<td>Prepare boat for season. Checking</td>
<td>1</td>
<td>28 15/10</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>4-3</td>
<td>TC system for problems. Checking</td>
<td>1</td>
<td>8.10 4/10</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transmitters and calibrating same</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Working on ignitors and power paks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>To secure proper ignition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MATERIAL FURNISHED (List Items)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
</table>

**TOTAL CHARGES**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days @ 200.00</td>
<td>$500.00</td>
</tr>
<tr>
<td>Hours @ (Overtime)</td>
<td></td>
</tr>
<tr>
<td>LIVING EXPENSES</td>
<td>40 15</td>
</tr>
<tr>
<td>TRAVELING EXPENSES</td>
<td>60 00</td>
</tr>
<tr>
<td>OTHER EXPENSES</td>
<td></td>
</tr>
<tr>
<td>TOTAL MATERIAL</td>
<td></td>
</tr>
<tr>
<td>TAX (If Applicable)</td>
<td></td>
</tr>
<tr>
<td>TOTAL CHARGE FOR PERIOD</td>
<td>$600 15</td>
</tr>
<tr>
<td>PREVIOUS UNBILLED CHARGES</td>
<td>1850 00</td>
</tr>
<tr>
<td>TOTAL CHARGES TO DATE</td>
<td>$2450 15</td>
</tr>
</tbody>
</table>

**BILLING DATA**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVOICE DATE</td>
<td></td>
</tr>
<tr>
<td>AMT. $</td>
<td></td>
</tr>
<tr>
<td>CHECKED BY</td>
<td>LIA</td>
</tr>
<tr>
<td>DATE</td>
<td>4/9</td>
</tr>
</tbody>
</table>

---

**Cust. Order No.:** C28885  
**Requisition No.:**  
**Service Work At:** Tulco  
**(Name of place, point or shop)**  
**Date Opened:**  
**Number of Invoices:** 3  
**Work Complete:** Yes  
**IP N/C Fill in Below:**  
**N/C Cause Code:**  
**System Line:**  
**Prod. Name:**  
**Module Name:**  
**Part No.:**  

---

**Service Engineer:** Jeff K. Perker  
**Date:** 4-5-75  
**Approval By:**

---

**Minimum Billing Per SM 64**  
Form SD 14-1-174
**SUMMARY OF SERVICE**  
**NOT AN INVOICE**

**CUSTOMER:**  
COLUMBIA TRANS. DIV.

**BILLING ADDRESS:**  
PO BOX 6194
CLEVELAND, OHIO

**SUMMARY OF SERVICE ON BAILEY EQUIPMENT—PERIOD FROM:**  
3/11 TO:  5/15

<table>
<thead>
<tr>
<th>Date</th>
<th>NATURE OF WORK PERFORMED</th>
<th>TIME on JOB AND TRAVEL</th>
<th>EXPENSES</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>DAYS REG. HOURS OVER-TIME</td>
<td>LIVING</td>
</tr>
<tr>
<td>3/11</td>
<td>ADD RELAYS AND WIRING</td>
<td>1 -</td>
<td>$28.75</td>
</tr>
<tr>
<td>3/15</td>
<td>IN IGNITOR CABLE TO</td>
<td>1 -</td>
<td>$29.50</td>
</tr>
<tr>
<td>3/15</td>
<td>PROTECT PC AUX RELAYS</td>
<td>1/2 -</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IN 262 SYSTEM OTHER</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>WIRING DONE ON RECIRC.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>VLV. TO PREVENT TRIP AT LIGHT OFF OF 2ND BURNER</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MATERIAL FURNISHED (List items):**  
OLD RELAY'S

**TOTAL CHARGES**  
2 1/2 Days @ 200.00  $500.00

**LIVING EXPENSES**  
5 - 8 - 25

**TRAVELING EXPENSES**  

**OTHER EXPENSES**  

**TOTAL MATERIAL**  

**TAX (If Applicable)**  

**TOTAL CHARGE FOR PERIOD**  
$558.25

**PREVIOUS UNBILLED CHARGES**  
1291.75

**TOTAL CHARGES TO DATE**  
$1850.00

**BILLING DATA**  

**INVOICE DATE**  

**AMT.**  

**CHECKED BY**  
L114  
**DATE**  
4/19

**BAILEY METER COMPANY:**  

**SERVICE ENGINEERING**  

**ORDR NUMBER**  
DE75-326

**DATE OPENED**  
3/11

**NUMBER OF INVOICES**  
0

**WORK COMPLETE**  
YES  
NO

**IF N/C FILL IN BELOW**  

**N/C CAUSE CODE:**  

**SYSTEM LINE:**  

**PROD. NOMEN:**  

**MODULE NAME:**  

**PART NO:**  

**COMPANY:**  
Minimum Billing Per SM 84

Form SD 14-4/714
**SUMMARY OF SERVICE**

**NOT AN INVOICE**

**CUSTOMER:** Ogle Bay Norton

**BILLING ADDRESS:** Columbia Transformer, S/S Commo, Pittsburgh

**SUMMARY OF SERVICE ON BAILEY EQUIPMENT—PERIOD FROM:** 2/12 **TO:** __________

<table>
<thead>
<tr>
<th>Date</th>
<th>NATURE OF WORK PERFORMED</th>
<th>DAYS</th>
<th>HOURS</th>
<th>LIVING</th>
<th>TRAVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/12</td>
<td>Helped make necessary changes in tubing system and 76Z</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>System to aid in lit-off</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>aid make system safer per letter of J.J. Wilsie Dated 2/4/75</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MATERIAL FURNISHED (List Items)**

- **Total**

**TOTAL CHARGES**

- **Days @ $200.00** ($200.00)
- **Regular Time**
- **Hours @** ($Overtime)

**LIVING EXPENSES**

- $35.40

**TRAVELING EXPENSES**

- $40.00

**OTHER EXPENSES**

- **TOTAL MATERIAL**
- **TAX (If Applicable)**
- **TOTAL CHARGE FOR PERIOD** $273.40
- **PREVIOUS UNBILLED CHARGES** $100.75
- **TOTAL CHARGES TO DATE** $1291.75

**BILLING DATA**

- **INVOICE DATE**
- **AMT.**
- **CHECKED BY** L14
- **DATE** 4/1

**INVOICE WILL FOLLOW**
BAILEY METER COMPANY

WICKLiffe, OHIO 44092

CUSTOM ORDER NO. 028885
REQUISITION NO.
SERVICE WORK AT:
Toldeo Doors & Ed. Fitzgerald

NAME OF PLACE, PLANT OR SHOP

SUMMARY OF SERVICE NOT AN INVOICE

CUSTOMER:
COLUMBUS METER Co.

COLUMBUS TRANSPORTATION DEP.
U.S. Spring Fireproof
P.O. Box 6538
Cleveland, Ohio 44108

BILLING ADDRESS:

SUMMARY OF SERVICE ON BAILEY EQUIPMENT–PERIOD FROM: 3-11 TO: 3-13

<table>
<thead>
<tr>
<th>Date</th>
<th>NATURE OF WORK PERFORMED</th>
<th>DAYS</th>
<th>HOURS</th>
<th>LIVING</th>
<th>TRAVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/11</td>
<td>Made necessary changes in panel</td>
<td>1</td>
<td>$34.10</td>
<td>$40.00</td>
<td></td>
</tr>
<tr>
<td>3/12</td>
<td>Tubing to aid in cut-off, added two</td>
<td>1</td>
<td>23.45</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>3/13</td>
<td>New solenoids and tubes and wired same, added external wiring on igniter guns, to aid grounding</td>
<td>1/2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This will keep safety of cut-off and head tips cleaner and change timing of recycle valve.

2 1/2 Days @ 200.00

$500.00

LIVING EXPENSES

$58.35

TRAVELING EXPENSES

$50.00

OTHER EXPENSES

$400.00

TOTAL MATERIAL

$1000.35

TAX (If Applicable)

$1000.35

TOTAL CHARGE FOR PERIOD

$1000.35

PREVIOUS UNBILLED CHARGES

$1000.35

TOTAL CHARGES TO DATE

$1000.35

BILING DATA

INVOICE DATE

AMT. $4,835

CHECKED BY LHA

DATE 4/15
# 14

Information and Diagram, Switlik Marine Inflatable Life Raft
BLUE INNER CANOPY

INFLATION VALVE LOCATIONS

NOT TINS IS AFTER 50,

BUT PERCIVAL AND MY SAVAGE
ARRANGEMENT, SEE FIGURE 3-1

LOOKED LIKE JUNK W.
SECTION III
GENERAL DESCRIPTION

3-1. A general description of the major components which make up the Switlik Marine Inflatable Life Rafts is contained in the subsequent paragraphs.

3-2. BUOYANCY TUBES.

3-3. The buoyancy tubes (17, figures 3-1 and 3-2) are constructed of neoprene coated nylon fabric. Each raft consists of two main buoyancy tubes, upper and lower, which are independent of one another. A lifeline (11) is secured in loops around the outside of the chamber, and there is also a lifeline fitted on the inside of the raft.

3-4. ARCHES.

3-5. There are three arches in the 20 and 25 man oval rafts and two in the 4 to 15 man rafts. The arches are constructed in such a manner as they receive a straight inflow of gas. In the case of the round type rafts, the arches are replaced by a single inflatable post which receives a straight inflow of gas from the upper tube.

3-6. THWART.

3-7. The thwart on the 15, 20, and 25 man oval rafts is constructed of neoprene coated nylon and is directly connected to the main buoyancy chambers. The thwart's main purpose is to make the raft more rigid.

3-8. BOARDING LADDER.

3-9. A boarding ladder (10) is attached to the main buoyancy tubes at each end of the raft in the case of the life rafts of sizes 6 to 25 man, and one in the case of the 4 man raft.

3-10. FLOOR.

3-11. The oval life raft has an inner and outer floor. The outer floor is made of single ply neoprene coated nylon. The inner floor is made of Infab neoprene coated nylon fabric which when inflated insulates survivors from the coldness of the water below them. In the case of the round raft, there is only one floor which has integral inflatable sections. Each of the inflatable sections of the 15 to 25 man rafts is independently inflated. Inflation is obtained by means of a topping-off valve; deflation is accomplished by removing the plug from the deflation valve. On the underside of the outer floor are attached the fabric pocket for the CO₂ cylinders, the four stabilizing pockets (13), and the righting strap (15).

3-12. CANOPY.

3-13. The outer canopy (4) is constructed of orange nylon fabric coated on one side with neoprene. The inner canopy is constructed of uncoated nylon fabric. On diagonally opposite sides of the life raft are rainwater catchments (8) fitted onto the canopy. Fitted to the stern arch is a water activated light (6).
3-14. **ENTRANCES.**

3-15. The inner and outer entrances are made of the same materials as the inner and outer canopies. Entrances are fitted at each end of the life raft, with the exception of the 4 man raft. They are secured back by tapes and are packed in this condition. To close the entrances the tapes are untied; then by pulling on the appropriate drawcords inside, the entrances can be adjusted for ventilation purposes or a complete closure.

3-16. **CO₂ EQUIPMENT.** (See Section IX for full details.)

3-17. The CO₂ cylinder is secured in a pocket fitted to the underside of the floor. The charge contains carbon dioxide (CO₂) mixed with nitrogen (N₂) and varies with different sizes of rafts. The gas is supplied from the cylinder to each main buoyancy chamber through the operating head, a high pressure hose, and a manifold secured to an inflation valve positioned in each of the two main buoyancy chambers. The operating mechanism is actuated by pulling a cable which is an integral part of the operating head. The pulling action results in the opening of the cylinder valve. The painter is attached to the cable of the operating head.

3-18. **VALVES AND DEFLATION PLUGS.**

3-19. There are four types of valves in the construction of the life raft:
   a. Inflation valves
   b. Pressure relief valves
   c. Topping-off valves
   d. Deflation plugs

3-20. Inflation valves are fitted to the outside of each main buoyancy chamber which allows the gas to enter the raft from the CO₂ cylinder.

3-21. The pressure relief valves are fitted to the buoyancy tubes on the outside of the raft. These valves also keep the raft at an even pressure due to varying temperatures.

3-22. There is a topping-pff valve fitted to each buoyancy chamber and one in each floor section. These valves are nonreturn and their purpose is to inflate the arches and buoyancy chambers should they lose pressure. They are also needed for inflating each floor section to protect the survivors from the extreme cold of the water below them. All the valves have stoppers which should be left in at all times.

3-23. There are deflation plugs fitted to the life raft, one in each main buoyancy chamber above the CO₂ cylinder, and one on each floor section. These valves are used for deflating the life raft when servicing, and it should be remembered that they are to be replaced before packing the life raft.

3-24. **LIGHTS.**

3-25. There are two lights fitted to the life raft, both powered by water activated batteries. The outside light (6) is fitted on the center of the stern arch. The battery (12) for this light is positioned on the floor near the buoyancy tube and
will give 12 hours of uninterrupted light. The inside light is fitted to the underside of the bow arch or inflatable post and gives 12 hours of uninterrupted light.

3-26. **EMERGENCY AND SURVIVAL PACK.**

3-27. The contents of the emergency pack vary with the size of the life raft and also with the Coast Guard regulations for vessels of different classes. All life rafts carry the standard emergency equipment. Some life rafts can dispense with the survival pack, some carry a partial or special pack, and others carry some life rafts with one type of pack and some with another type.

3-28. **CONTAINERS.**

3-29. The means of containing the life raft vary. The standard method is a neoprene coated fabric valise or a fiber glass container. Where a fiber glass container is used, no further protection of the life raft is required; however, the inside finish must be of a currently approved type.
11-6. PACKING - 25 MAN ROUND RAFT. (See Figure 11-4.)

   a. Remove the deflation plugs in the buoyancy tubes and canopy support tube of
      the raft and completely evacuate all compartments of air. Return the deflation
      plugs to their seating position and insure they are tight.

   b. Lightly powder the outside of the raft with French chalk or powdered soap-
      stone.

   c. Place the flaked line and sea anchor in its pocket and snap shut making sure
      that it is placed so as not to fall out while packing the raft.

   NOTE
      Do not wrap line or shrouds around sea anchor.

   d. Attach painter line by a bowline knot to outer loop of the forward towing
      bridle.

   e. Fold starboard side of raft over so that the CO2 cylinder and equipment packs
      are on the bottom. (See Step 2.) Complete folding raft. (See Steps 3 and 4.)

   f. Fold stern end over and place folded raft in lower half of container so that
      the CO2 cylinders and equipment packs are evenly distributed. (See Steps 5 and 6.)
      Make sure that the pull cable housings and pull cables are free of bends or entan-
      glements and that the free end of the pull cables are readily accessible.

   g. Lay towing bridle on top of folded raft, placing tube holding painter on top
      of raft as per Step 2. At this time attach the operating cables to the nylon loop
      by means of the 15" length of nylon cord provided, using bowline knots at either
      end. (See enlargement B.)

   h. Commence rolling the raft from the bow portion lifting the finished roll on
      top of the survival equipment. Then roll the stern end of the life raft, lifting
      and packing the finished roll on top. (See Step 10.)

   i. Secure the lacing flaps using temporary lacing cord.

   j. Insert breaking cord through lacing holes and secure; then remove the tempo-
      rary cord.

   k. Place top half of container in position making sure not to bind or trap the
      painter. Finally, secure with stainless steel bands. (See Step 11.)
# 15

Crew Lists, FITZGERALD, 1975
<table>
<thead>
<tr>
<th>NO.</th>
<th>NAME AS APPEARING ON VESSEL</th>
<th>TEXAS NO.</th>
<th>LICENSE NO. OR CERTIFICATE OF INSURANCE NO.</th>
<th>ALIEN (Y/N)</th>
<th>YEAR OF BIRTH</th>
<th>CAPACITY IN WHICH ENGAGED</th>
<th>DATE AND PLACE OF ENGAGEMENT</th>
<th>DATE AND PLACE OF DISCHARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Allen C. Kalman</td>
<td>93206448</td>
<td>31866723</td>
<td>N</td>
<td>1922</td>
<td>Mate</td>
<td>1 Dec. 15 - St. Louis, Mo.</td>
<td>1 Dec. 15 - St. Louis, Mo.</td>
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<td>2</td>
<td>Ralph G. Nelson</td>
<td>10773129</td>
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<td>3</td>
<td>James A. Taylor</td>
<td>11319556</td>
<td>31866723</td>
<td>Y</td>
<td>1931</td>
<td>Cap'n</td>
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<td>4</td>
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<td>33000000</td>
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<td>5</td>
<td>Michael Himangoz</td>
<td>1102575</td>
<td>31866723</td>
<td>N</td>
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<tr>
<td>6</td>
<td>John McHendry</td>
<td>235101208</td>
<td>4426638</td>
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<td>7</td>
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<td>8</td>
<td>Deere S. Holm</td>
<td>913024340</td>
<td>31866723</td>
<td>N</td>
<td>1955</td>
<td>Mate</td>
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<td>9</td>
<td>Reeser Huddo</td>
<td>900546000</td>
<td></td>
<td>N</td>
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<td>10</td>
<td>Richard Bishop</td>
<td>122122</td>
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<td>N</td>
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<td>11</td>
<td>Frederick Drescher</td>
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<td>N</td>
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<td>Cook</td>
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<tr>
<td>12</td>
<td>Frederick Drescher</td>
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<td>N</td>
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<td>597101</td>
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<td>422713</td>
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<td>19</td>
<td>Nolan F. Church</td>
<td>7605685</td>
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<td>N</td>
<td>1920</td>
<td>Mate</td>
<td>26 Sep. 15 - St. Louis, Mo.</td>
<td>26 Sep. 15 - St. Louis, Mo.</td>
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<tr>
<td>20</td>
<td>Paul Pudleson</td>
<td>16869574</td>
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<td>N</td>
<td>1945</td>
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<tr>
<td>21</td>
<td>Nolan F. Church</td>
<td>416098619</td>
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<td>N</td>
<td>1920</td>
<td>Mate</td>
<td>18 Aug. 15 - St. Louis, Mo.</td>
<td>18 Aug. 15 - St. Louis, Mo.</td>
</tr>
</tbody>
</table>
### Reporting Instructions

1. Every person employed on United States merchant vessels of 100 gross tons and over is required to possess a U. S. Merchant Marine's Document bearing the stamp “Validated for Emergency Service.”

2. The information contained in this report should be identical with the same information required on form CG-718A and CG-718E.

3. This report must be submitted by the master of every merchant vessel of the United States of 100 gross tons or upward, when the vessel’s crew is not engaged under the supervision of a shipping commissioner, except vessels employed exclusively on the navigable rivers, fishing or whaling vessels, yachts and ferry or tug used in connection with the ferry operation on the Great Lakes, lakes, bays and sounds, bays, canals and harbors.

4. **ALIEN COLUMN ABOVE**—Check (X) for aliens only. Blank space will indicate United States citizens.

### Citizenship Requirements

Seamen claiming American Citizenship who have not presented documentary evidence of such citizenship and whose continuous discharge book of Merchant Marine's Document shows a question mark with reference to citizenship shall not be employed except within the percentage of aliens authorized.

### Master's Statements

(Strike out inapplicable items, if any)

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

1. I have entered into an agreement with the crew as required by law. (46 USC 673)
2. Not less than 65 per cent of the deck crew exclusive of licensed officers are of a rating not less than able seaman. (46 USC 672)
3. Not less than 75 per cent of the crew in each department are able to understand any order given by officers of the vessel. (46 USC 672)
4. Number of lifeboats in accordance with certificate of inspection; every lifeboatman possesses a document endorsed for this rating. (46 USC 222)
5. Every member of the crew possesses a license, certificate of registry, or U. S. Merchant Marine's Document for the rating in which he is employed. (46 USC 222, 224a, 229, 240, 643)

### Vessel Category

- [ ] Subsidized Passenger Vessels (50 percent Americans including in-cased officers)
- [ ] Subsidized Cargo Vessels (100 percent Americans)
- [ ] Non-Subsidized Vessels (75 percent Americans excluding in-cased officers)

### Citizenship

- [ ] United States Citizens
- [ ] Aliens

### Total Crew

25
<table>
<thead>
<tr>
<th>LINE NO.</th>
<th>NAME AS APPEARING ON U.S. SEAMAN DOCUMENT</th>
<th>Z OR BK NUMBER</th>
<th>ALIEN NUMBER OR CERTIFICATE OF REGISTRY NO.</th>
<th>Z OR BK NUMBER</th>
<th>ALIEN NUMBER OR CERTIFICATE OF REGISTRY NO.</th>
<th>LICENSE ON CERTIFICATE OF REGISTRY NO.</th>
<th>CAPACITY MENTIONED IN CERTIFICATE OF REGISTRY NO.</th>
<th>DATE AND PLACE OF ENGAGEMENT</th>
<th>DATE AND PLACE OF DISCHARGE</th>
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<tr>
<td>1</td>
<td>Charles L. Craig</td>
<td>24-5410</td>
<td></td>
<td></td>
<td></td>
<td>1924, September 28</td>
<td>11/15-30, Kakeh, Ohio</td>
<td>11/25-30, Kakeh, Ohio</td>
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</tr>
</tbody>
</table>

...
### Reporting Instructions

1. Every person employed on United States merchant vessels of 100 gross tons and over is required to possess a U.S. Merchant Mariner’s Document bearing the stamp “Validated for Emergency Service.”

2. The information contained in this report should be identical with the same information required on form CG–718A and CG–718E.

3. This report must be submitted by the master of every merchant vessel of the United States of 100 gross tons or upward, when the vessel’s crew is not engaged under supervision of a shipping commission, except vessels employed exclusively on the navigable rivers, fishing or whaling vessels, yachts and ferry or tug used in connection with the ferry operation on the Great Lakes, lakes, bays and sounds, bays and harbors.

4. ALIEN COLUMN ABOVE — Check (X) for aliens only. Blank space will indicate United States citizens.

### Master’s Statements

1. I have entered into an agreement with the crew as required by law. (46 USC 373)

2. Not less than 65 per cent of the deck crew exclusive of licensed officers are of a rating not less than able seaman. (46 USC 672)

3. Not less than 75 per cent of the crew in each department are able to understand any order given by officers of the vessel. (46 USC 672)

4. Number of lifeboatsmen is in accordance with certificate of inspection; every lifeboatman possesses a document endorsed for this rating. (46 USC 222)

5. Every member of the crew possesses a license, certificate of registry, or U.S. Merchant Mariner’s Document for the rating in which he is employed. (46 USC 222, 224a, 229, 246, 643)

### Vessel Category

- **Subsidized Passenger Vessels** (90 percent Americans including licensed officers) (Aliens may be employed only in steward’s department)
- **Subsidized Cargo Vessels** (100 percent American)
- **Non-Subsidized Vessels** (75 percent Americans excluding licensed officers)

### Citizenship

- **United States Citizens**
- **Aliens**

### Summary

- **Total Crew**: 29
- **Percentage of United States Citizens**: 29%
1. Every person employed on United States merchant vessels of 100 gross tons and over is required to possess a U. S. Merchant Marine's Document bearing the stamp "Validated for Emergency Service."

2. The information contained in this report should be identical with the same information required on form CG-718A and CG-718E.

3. This report must be submitted by the master of every merchant vessel of the United States of 100 gross tons upward. When the vessel's crew is not engaged under supervision of a shipping commissioner; except, vessels employed exclusively on the navigable river, fishing or whaling vessels, yachts and ferry or tug used in connection with the ferry operation on the Great Lakes, lakes, bays and sounds, boatways, canals and harbors.

4. ALIEN COLUMN ABOVE — Check (x) for aliens only. Blank space will indicate United States citizens.

---

### Master's Statements

<table>
<thead>
<tr>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I have entered into an agreement with the crew as required by law. (46 USC 574)</td>
</tr>
<tr>
<td>2. Not less than 65 percent of the deck crew exclusive of licensed officers are of a rating not less than able seaman. (46 USC 672)</td>
</tr>
<tr>
<td>3. Not less than 75 percent of the crew in each department are able to understand any order given by officers of the vessel. (46 USC 672)</td>
</tr>
<tr>
<td>4. Number of lifeboats is in accordance with certificate of inspection; every lifeboatman possesses a document endorsed for this rating. (46 USC 222)</td>
</tr>
<tr>
<td>5. Every member of the crew possesses a license, certificate of registry, or U. S. Merchant Marine's Document for the rating in which he is employed. (46 USC 222, 224a, 229, 240, 543)</td>
</tr>
</tbody>
</table>

### Vessel Category

<table>
<thead>
<tr>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ SUBSIDIZED PASSENGER VESSELS</td>
</tr>
<tr>
<td>(90 percent American including licensed officers)</td>
</tr>
<tr>
<td>(Aliens may be employed only in steward's department)</td>
</tr>
<tr>
<td>YES</td>
</tr>
<tr>
<td>□ SUBSIDIZED CARGO VESSELS</td>
</tr>
<tr>
<td>(100 percent American)</td>
</tr>
<tr>
<td>NO</td>
</tr>
<tr>
<td>□ NON-SUBSIDIZED VESSELS</td>
</tr>
<tr>
<td>(75 percent American excluding licensed officers)</td>
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</table>

### Citizenship

<table>
<thead>
<tr>
<th>United States Citizens</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aliens</td>
<td>71</td>
</tr>
<tr>
<td>Total Crew</td>
<td>28</td>
</tr>
</tbody>
</table>

---

**Certification.**

I hereby certify that all the above entries and statements on this form are true to the best of my knowledge and belief.

**Date**

**License Number**

**For Be Number**

**Signature of Master** / /
<table>
<thead>
<tr>
<th>LINE</th>
<th>NO.</th>
<th>NAME AS APPEARING ON U.S. SEAMAN'S PAPER</th>
<th>Z OR BK NUMBER</th>
<th>LICENSE OR CERTIFICATE OF REGISTRY NO.</th>
<th>YEAR OF BIRTH</th>
<th>CAPACITY IN WHICH ENGAGED</th>
<th>DATE AND PLACE OF ENGAGEMENT</th>
<th>DATE AND PLACE OF DISCHARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Paul R. Kipnis</td>
<td>21-9767-716</td>
<td></td>
<td>1943</td>
<td>March 3</td>
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<td>3 July 1975, Cleveland, Ohio</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Gordon Maclean</td>
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<td>1945</td>
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<td>3</td>
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<td>3 July 1975, Cleveland, Ohio</td>
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<tr>
<td>4</td>
<td>4</td>
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<td>1946</td>
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<td>3 July 1975, Cleveland, Ohio</td>
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<td>5</td>
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<td>6</td>
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<td>1946</td>
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<td>7</td>
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<td>Russell L. Ciechelli</td>
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<td>8</td>
<td>8</td>
<td>John L. Boulding</td>
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<td>3 July 1975, Cleveland, Ohio</td>
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<td>9</td>
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<td>Donald E. Folks</td>
<td>29-0758-6-5</td>
<td></td>
<td>1923</td>
<td>W, C, D</td>
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<td>3 July 1975, Cleveland, Ohio</td>
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<td>W, C, D</td>
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<td>3 July 1975, Cleveland, Ohio</td>
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<td>11</td>
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<td>Donald E. Lee</td>
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<td>3 July 1975, Cleveland, Ohio</td>
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<td>13</td>
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<td>3 July 1975, Toledo, Ohio</td>
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<td>16</td>
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<td>Blaine H. Wilhelm</td>
<td>110-724-23</td>
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<td>W, C, D</td>
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<td>16 July 1975, Silver Bay, Men</td>
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<td>17</td>
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<td>Lawrence Olson</td>
<td>98-2428-84</td>
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<td>28 July 1975, Toledo, Ohio</td>
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<tr>
<td>19</td>
<td>19</td>
<td>Helen D. Simmons</td>
<td>26-38041</td>
<td></td>
<td>1919</td>
<td>W, C, D</td>
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<td>107-9531</td>
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<td>1916</td>
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<td>21 July 1975, Silver Bay, Men</td>
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<td>21</td>
<td>Raymond Lundy</td>
<td>113-957</td>
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<td>1922</td>
<td>W, C, D</td>
<td>21 July 1975, Silver Bay, Men</td>
<td>21 July 1975, Silver Bay, Men</td>
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<tr>
<td>22</td>
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<td>George Maclean</td>
<td>118-1024</td>
<td></td>
<td>1945</td>
<td>W, C, D</td>
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<td>29 July 1975, Toledo, Ohio</td>
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<td>23</td>
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<td>Thomas E. Dixon</td>
<td>104-4000-7</td>
<td></td>
<td>1953</td>
<td>W, C, D</td>
<td>29 June 1975, Superior, Wis</td>
<td>28 July 1975, Toledo, Ohio</td>
</tr>
</tbody>
</table>
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4. ALIEN COLUMN ABOVE -- Check (X) for aliens only. Blank space will indicate United States citizens.

---

**MASTER'S STATEMENTS**

(Strike out inapplicable items, if any)

1. I have entered into an agreement with the crew as required by law.

(46 USC 574)

2. Not less than 65 per cent of the deck crew exclusive of licensed officers are of a rating not less than able seaman. (46 USC 672)

3. Not less than 75 per cent of the crew in each category are able to understand any order given by officers of the vessel. (46 USC 672)

4. Number of lifeboatmen is in accordance with certificate of inspection; every lifeboatman possesses a document endorsed for this rating. (46 USC 222)

5. Every member of the crew possesses a license, certificate of registry, or U. S. Merchant Marine's Document for the rating in which he is employed. (46 USC 222, 224a, 229, 246, 643)

---

**VESSLE CATEGORY**

(Strike out inapplicable box)

- [ ] SUBSIDIZED PASSENGER VESSELS
  - (90 percent American including licensed officers)
  - (Aliens may be employed only in steward's department)

- [ ] SUBSIDIZED CARGO VESSELS
  - (100 percent American)

- [ ] NON-SUBSIDIZED VESSELS
  - (75 percent American, excluding licensed officers)

**CITIZENSHIP**

<table>
<thead>
<tr>
<th>UNITED STATES CITIZENS</th>
<th>ALIENS</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>0</td>
</tr>
</tbody>
</table>

**CERTIFICATION**

I hereby certify that all the above entries and statements on this form are true to the best of my knowledge and belief.

[Signature]

DATE

LICENSE NUMBER

IMO NUMBER

SIGNATURE OF MASTER
<table>
<thead>
<tr>
<th>Line</th>
<th>Name</th>
<th>License No.</th>
<th>Year of Birth</th>
<th>License No.</th>
<th>Date and Place of Engagement</th>
<th>Date and Place of Discharge</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Robert Handysee</td>
<td>271408</td>
<td>1944</td>
<td></td>
<td>April 75 - Cleveland, Ohio</td>
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<tr>
<td>2</td>
<td>Frederick VanHorn</td>
<td>254163</td>
<td>1946</td>
<td></td>
<td>May 12 - Sandusky, Ohio</td>
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<tr>
<td>3</td>
<td>Nolan F. Church</td>
<td>268275</td>
<td>1949</td>
<td></td>
<td>May 16 - Lakeview, Ohio</td>
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<tr>
<td>4</td>
<td>Robert Handysee</td>
<td>264726</td>
<td>1951</td>
<td></td>
<td>May 16 - Sandusky, Ohio</td>
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<tr>
<td>5</td>
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<td>250645</td>
<td>1952</td>
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<td>May 16 - Cleveland, Ohio</td>
<td></td>
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<tr>
<td>6</td>
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<td>250534</td>
<td>1953</td>
<td></td>
<td>May 16 - Toledo, Ohio</td>
<td></td>
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<tr>
<td>7</td>
<td>Dale Newker</td>
<td>279491</td>
<td>1955</td>
<td></td>
<td>May 16 - Toledo, Ohio</td>
<td></td>
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<td>David E. Weiss</td>
<td>5509199</td>
<td>1956</td>
<td></td>
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<td>250590</td>
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<td></td>
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<tr>
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<td>Anthony M. Slavica</td>
<td>106923</td>
<td>1958</td>
<td>404139</td>
<td>May 16 - Cleveland, Ohio</td>
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<tr>
<td>11</td>
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<td>110381</td>
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<td>398312</td>
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<tr>
<td>12</td>
<td>Lowell A. Balceri</td>
<td>108320</td>
<td>1965</td>
<td>412808</td>
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<td>110397</td>
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<td>398312</td>
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<td>1447038</td>
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<td></td>
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<td>1969</td>
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<td>1218701</td>
<td>1973</td>
<td></td>
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<td>21</td>
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<td>1044007</td>
<td>1974</td>
<td></td>
<td>May 16 - Cleveland, Ohio</td>
<td></td>
</tr>
</tbody>
</table>
### Reporting Instructions

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4. ALIEN COLUMN ABOVE = Check (X) for aliens only. Blank space will indicate United States citizens.

### Master's Statements

| Strike out unnecessary items, if any |

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### Vessel Category

<table>
<thead>
<tr>
<th>Subsidized Passenger Vessels</th>
</tr>
</thead>
<tbody>
<tr>
<td>(70 percent American including licensed officers)</td>
</tr>
<tr>
<td>(Aliens may be employed only in steward's department)</td>
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<table>
<thead>
<tr>
<th>Subsidized Cargo Vessels</th>
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<tr>
<td>(100 percent American)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-Subsidized Vessels</th>
</tr>
</thead>
<tbody>
<tr>
<td>(75 percent American excluding licensed officers)</td>
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</tbody>
</table>

### Citizenship

- **United States Citizens**
  - 29
- **Aliens**
  - 0
- **Total Crew**
  - 29

### Confirmation

I hereby certify that all the above masters and statements on this form are true to the best of my knowledge and belief.
<table>
<thead>
<tr>
<th>LINE NO.</th>
<th>NAME AS APPEARING ON U.S. Seaman's Document (First, middle initial, last)</th>
<th>2 OR BK NUMBER</th>
<th>LICENSE OR CERTIFICATE OF REGISTRATION NO.</th>
<th>ALIEN REGISTRATION NO.</th>
<th>YEAR OF BIRTH</th>
<th>CAPACITY IN WHICH ENGAGED</th>
<th>DATE AND PLACE OF ENGAGEMENT</th>
<th>DATE AND PLACE OF DISCHARGE</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td>1952</td>
<td>COOK</td>
<td>B Exc, 75, Sack By, New.</td>
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<td></td>
<td>4.15.0. O. SMITH</td>
<td>2595585</td>
<td>3974211</td>
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<td>3974215</td>
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<td>9</td>
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<td>1919</td>
<td>M.E.</td>
<td>B Exc, 75, Sack By, New.</td>
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<td></td>
<td>1919</td>
<td>M.E.</td>
<td>B Exc, 75, Sack By, New.</td>
<td></td>
</tr>
</tbody>
</table>

U.S. COAST GUARD.

JUN 6 1975

SEAMAN'S DOCUMENTATION CARD
1. Every person employed on United States merchant vessels of 100 gross tons and over is required to possess a U. S. Merchant Marine’s Document bearing the stamp “Validated for Emergency Service.”

2. The information contained in this report should be identical with the same information required on form CG-718A and CG-718E.

3. This report must be submitted by the master of every merchant vessel of the United States of 100 gross tons or upward, when the vessel’s crew is not engaged under supervision of a shipping commission; except, vessels employed exclusively on the navigable rivers, fishing or whaling vessels, yachts and ferry or tug used in connection with the ferry operation on the Great Lakes, lakes, bays and sounds, harbors and harbors.

4. ALIEN COLUMN ABOVE—Check (X) for aliens only. Blank space will indicate United States citizens.

MASTER’S STATEMENTS
(Strike out inapplicable items, if any)

1. I have entered into an agreement with the crew as required by law. (46 USC 574)
2. Not less than 65 per cent of the crew exclusive of licensed officers are of a rating not less than able seaman. (46 USC 572)
3. Not less than 75 per cent of the crew in each department are able to understand any order given by officers of the vessel. (46 USC 572)
4. Number of lifeboats in accordance with certificate of inspection; every lifeboatman possesses a document endorsed for this rating. (46 USC 227)
5. Every member of the crew possesses a license, certificate of registry, or U. S. Merchant Marine’s Document for the rating in which he is employed. (46 USC 227, 228a, 229, 246, 643)

VEssel Category

☐ Subsidized Passenger Vessels
☐ Subsidized Cargo Vessels
☐ Non-Subsidized Vessels

Citizenship

☐ United States Citizens
☐ Aliens

Percentage of United States Citizens 100%
<table>
<thead>
<tr>
<th>LINE NO.</th>
<th>NAME AS APPEARING ON US NAVAL DOCUMENT</th>
<th>LICENSE OR CERTIFICATE NUMBER</th>
<th>DATE AND PLACE OF ENGAGEMENT</th>
<th>DATE AND PLACE OF DISCHARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Raymond J. Yan</td>
<td>145-46-5166</td>
<td></td>
<td>U. S. COAST GUARD</td>
</tr>
<tr>
<td>2</td>
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<tr>
<td>41</td>
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</tr>
</tbody>
</table>
### Reporting Instructions

1. Every person employed on United States merchant vessels of 100 gross tons and over is required to possess a U. S. Merchant Marine’s Document bearing the stamp “Validated for Emergency Service.”

2. The information contained in this report should be identical with the same information required on forms CG-718A and CG-718E.

3. This report must be submitted by the master of every merchant vessel of 100 gross tons or upward, when the vessel’s crew is not engaged under supervision of a shipping commissioner, except vessels employed exclusively on the navigable rivers, fishing or whaling vessels, yachts and ferry or tug used in connection with the ferry operations on the Great Lakes, lakes, bays and sounds, bays and harbors.

4. **ALIEN COLUMN ABOVE** – Check (X) for aliens only. Blank space will indicate United States citizens.

### Citizenship Requirements

Seniors claiming American Citizenship who have not presented documentary evidence of such citizenship and whose continuous discharge book of Merchant Marine’s Document shows a question mark with reference to citizenship shall not be employed except within the percentage of aliens authorized.

### Master’s Statement

(Enter not applicable items, if any)

1. I have entered into an agreement with the crew as required by law. (46 USC 573)

2. Not less than 65 per cent of the deck crew exclusive of licensed officers are of a rating not less than able seaman. (46 USC 672)

3. Not less than 75 per cent of the crew in each department are able to understand any orders given by officers of the vessel. (46 USC 672)

4. Number of lifeboats is in accordance with certificate of inspection. Every lifeboatman possesses a document endorsed for this rating. (46 USC 222)

5. Every member of the crew possesses a license, certificate of registry, or U. S. Merchant Marine’s Document for the rating in which he is employed. (46 USC 222, 224a, 229, 246, 643)

### Vessel Category

<table>
<thead>
<tr>
<th>Description</th>
<th>United States Citizens</th>
<th>Aliens</th>
<th>Total Crew</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsidized Passenger Vessels (100% Americans)</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Subsidized Cargo Vessels (100% Americans)</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Non-Subsidized Vessels (75% Americans excluding filipino alien)</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

### Citizenship

<table>
<thead>
<tr>
<th>Percentage of United States Citizens</th>
<th>[ ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME</td>
<td>MASTERS NAME</td>
</tr>
<tr>
<td>------</td>
<td>--------------</td>
</tr>
<tr>
<td>John H. M. Dunham</td>
<td>Lt.</td>
</tr>
<tr>
<td>Ralph N. Deitz</td>
<td>Lt.</td>
</tr>
<tr>
<td>Michael E. Passman</td>
<td>Lt.</td>
</tr>
<tr>
<td>John F. Simmons</td>
<td>Lt.</td>
</tr>
<tr>
<td>John J. Rice</td>
<td>Lt.</td>
</tr>
<tr>
<td>Hanssen K. Cundy</td>
<td>Lt.</td>
</tr>
<tr>
<td>James L. Williams</td>
<td>Lt.</td>
</tr>
<tr>
<td>Raymond M. Gipfel</td>
<td>Lt.</td>
</tr>
<tr>
<td>Ross A. Harps</td>
<td>Lt.</td>
</tr>
<tr>
<td>Mark A. Thomas</td>
<td>Lt.</td>
</tr>
<tr>
<td>Bruce L. Huskey</td>
<td>Lt.</td>
</tr>
<tr>
<td>Paul A. Riden</td>
<td>Lt.</td>
</tr>
<tr>
<td>George Hall</td>
<td>Lt.</td>
</tr>
<tr>
<td>Edward F. Binks</td>
<td>Lt.</td>
</tr>
<tr>
<td>Russell G. Haswell</td>
<td>Lt.</td>
</tr>
<tr>
<td>Franklin H. Stelzer</td>
<td>Lt.</td>
</tr>
<tr>
<td>Oliver J. Champion</td>
<td>Lt.</td>
</tr>
<tr>
<td>Harry E. Moore</td>
<td>Lt.</td>
</tr>
<tr>
<td>John L. Kern</td>
<td>Lt.</td>
</tr>
<tr>
<td>Blaine H. Williams</td>
<td>Lt.</td>
</tr>
<tr>
<td>Joseph W. Morse</td>
<td>Lt.</td>
</tr>
<tr>
<td>Gordon C. MacLean</td>
<td>Lt.</td>
</tr>
<tr>
<td>George H. Bultter</td>
<td>Lt.</td>
</tr>
<tr>
<td>Allen G. Kalm $</td>
<td>Lt.</td>
</tr>
<tr>
<td>Frederick J. Becker</td>
<td>Lt.</td>
</tr>
<tr>
<td>Robert E. Pointry</td>
<td>Lt.</td>
</tr>
</tbody>
</table>
### REPORTING INSTRUCTIONS

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4. ALIEN COLUMN ABOVE - Check (x) for aliens only. Blank space will indicate United States citizens.

### CITIZENSHIP REQUIREMENTS

Seamen claiming American Citizenship who have not presented documentary evidence of such citizenship and whose continuous discharge book of Merchant Marine's Document shows a question mark with reference to citizenship shall not be employed except within the percentage of aliens authorized.

### MASTER'S STATEMENTS

(Strike out inapplicable items, if any)

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### VESSEL CATEGORY

(Strike out inapplicable box)

- [ ] SUBSIDIZED PASSENGER VESSELS
  - (10 percent Americans excluding licensed officers)
  - (Allots may be employed only in stevedore's department)

- [ ] SUBSIDIZED CARGO VESSELS
  - (100 percent Americans)

- [ ] NON-SUBSIDIZED VESSELS
  - (15 percent Americans excluding licensed officers)

### CITIZENSHIP

- [ ] UNITED STATES CITIZEN
- [ ] ALIENS

### TOTAL CREW

- [ ] UNITED STATES CITIZENS
- [ ] ALIENS

### PERCENTAGE OF UNITED STATES CITIZENS

**CERTIFICATION**

I hereby certify that all the above entries and statements on this form are true to the best of my knowledge and belief.
# 16

Captain's Vessel Orders, FITZGERALD, 1975
CAPTAIN'S VESSEL ORDER

5/22/75  Check all hatch covers and coamings and straighten as designated  $3,774.21

5/22/75  Repair buckled main deck plating in port tunnel at forward end together with web frame  $3,172.00

3/10/75  Repair floor covering in galley  $11,200.00
**CAPTAIN'S VESSEL ORDER**

No. M 4185

Vessel: *Ys Edmund Fitzgerald*  
Address: *Cleveland, Ohio*  
Date: 9-9-75

To: *Messrs. Baker and Welding Co.*  
Date Required:  

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reinforcing material to renew inside panel of watertight door serving passengers' dining room</td>
</tr>
</tbody>
</table>

**PURCHASING DEPT. COPY**

CAPTAIN: [Signature]
OCT. 14, 1975

INVOICE

OGLEGAY HORTON COMPANY - P-40392
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6503
CLEVELAND, OHIO 44101

YOUR ORDER NO. 14185
OUR ORDER NO. 15043

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERALD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LABOR AND MATERIAL TO RENEW INSIDE PANEL</td>
<td>26 HRS</td>
<td>13.50</td>
<td>351.00</td>
</tr>
<tr>
<td>OF WATER TIGHT DOOR FROM PASSENGERS</td>
<td>60. #</td>
<td>.30</td>
<td>18.00</td>
</tr>
<tr>
<td>DINING ROOM TO BOAT DECK</td>
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</tr>
<tr>
<td>MECHANICS</td>
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<tr>
<td>60# STEEL PLATE</td>
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<tr>
<td>MISC. MATERIAL</td>
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</tbody>
</table>

RECEIVED
PURCHASING DEPT.
OCT 14 1975

APPROVED

PLEASE PAY LAST
AMOUNT THIS COLUMN
**CAPTAIN'S VESSEL ORDER**

**Vessel:** [Handwritten: Designed, Welded]  Date: 5-15-75  
**To:** [Handwritten: Eric Lavin & Co.]  
**Address:** [Handwritten: Cleveland, Ohio]  
**Date Required:** [Handwritten: 01-02-65]

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials, and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Complete description of material to be purchased</th>
<th>DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Handwritten: Provided]</td>
<td>[Handwritten: Welding, Insulated]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[Handwritten: Insulation applied]</td>
<td></td>
</tr>
</tbody>
</table>

**PURCHASING DEPT. COPY**

[Handwritten signature: R. E. Holmes]  
[Handwritten: CAPTAIN]
**MERCE BOILER & WELDING CO. INC.**

TANKS • STACKS • PLATE CONSTRUCTION • BOILERMASHERS • WELDERS
MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS
205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

**MAY 29, 1975**

**INVOICE**

**SOLD TO**

OGLEBAY NORTON COMPANY - P-40392
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6508
CLEVELAND, OHIO 44101

**YOUR ORDER NO.** M 3095
**OUR ORDER NO.** 14790

<table>
<thead>
<tr>
<th><strong>ITEMS</strong></th>
<th><strong>QUANTITY</strong></th>
<th><strong>RATE</strong></th>
<th><strong>AMOUNT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERALD</td>
<td>12 HRS</td>
<td>12.50</td>
<td>150.00</td>
</tr>
</tbody>
</table>

**RECEIVED**
PURCHASING DEPT.
MAY 30, 1975

**APPROVED**

PLEASE PAY LAST AMOUNT THIS COLUMN

150.00$
**CAPTAIN'S VESSEL ORDER**

**Vessel:** Edmund Fitzgerald  
**At:** Duluth, Minn  
**Date:** 5-15-75

**To:** Milwaukee Steel Co.  
**Address:** Milwaukee, Wis.

**Date Required:**

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Cu pipes, flanges and material</td>
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<tr>
<td></td>
<td>galvanized &amp; aluminum floors</td>
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</tbody>
</table>

**PURCHASING DEPT. COPY**

**CAPTAIN**
**MERCE BOILER & WELDING CO. INC.**  
TANKS • STACKS • PLATE CONSTRUCTION ... BOILERMAKERS • WELDERS  
MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS  
205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

**MAY 29, 1975**  
**INVOICE**

**SOLD TO**  
**OGLEBAY NORTON COMPANY - P=40392**  
**COLUMBIA TRANSPORTATION DIVISION**  
P.O. BOX 6508  
CLEVELAND, OHIO 44101

**YOUR ORDER NO.**  
**M 3094**  
**OUR ORDER NO.**  
**14782**

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<th>ITEMS</th>
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<td>STR. EDMUND FITZGERALD</td>
<td>8 HRS</td>
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<td>100.00</td>
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<td>LABOR AND MATERIAL TO INSTALL ALUMINUM FLOOR PLATE IN GALLEY.</td>
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<tr>
<td>MECHANICS</td>
<td>1 PC. ALUMINUM FLOOR PLATE</td>
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<td>25.00</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td><strong>125.00</strong></td>
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**RECEIVED**  
Purchasing Dept.  
May 30 1975

**APPROVED**

PLEASE PAY LAST AMOUNT THIS COLUMN
**Oglebay Norton Company**

**Columbia Transportation Division**

**CAPTAIN'S VESSEL ORDER**

**No. M 3093**

**Vessel:** Edward D. Higgins 3rd  
**Address:** Toledo, Ohio

**Date:** 5-15-75

**To:** Wessel Marine  
**Address:** Toledo, Ohio

**Date Required**

---

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description of Material to be Purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Repair saloon handrails</td>
</tr>
<tr>
<td>2</td>
<td>Repair handrail mechanism</td>
</tr>
</tbody>
</table>

---

Purchasing Dept. Copy

[Signature]

CAPTAIN
MERCE BOILER & WELDING CO. INC.

TANKS • STACKS • PLATE CONSTRUCTION • BOILERMAKERS • WELDERS
MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS
205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

MAY 29, 1975

INVOICE

SOLD TO

OGLEBAY NORTON COMPANY - P-40392
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6508
CLEVELAND, OHIO 44101

YOUR ORDER NO. M 3093
OUR ORDER NO. 14783

<table>
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<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
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<tbody>
<tr>
<td>STR. EDMUND FITZGERALD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LABOR AND MATERIAL TO REPAIR LOCK IN MESSROOM</td>
<td>10 HRS</td>
<td>12.50</td>
<td>125.00</td>
</tr>
</tbody>
</table>

RECEIVED
PURCHASING DEPT.
MAY 3 9 1975

APPROVED

PLEASE PAY LAST AMOUNT THIS COLUMN

125.00
OGLEBAY NORTON COMPANY
COLUMBIA TRANSPORTATION DIVISION

CAPTAIN'S VESSEL ORDER

No. M 3089

Vessel  Edmond D.  Date 5-15-75
To: Merce Bailey and Wedding Co.
Address: Toledo, Ohio

Date Required

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
<th>DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prime Red Oak Material</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repaired Head Fastening</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Head Fastening Material</td>
<td></td>
</tr>
</tbody>
</table>

Purchasing Dept. Copy

CAPTAIN

[Signature]
**MERCE BOILER & WELDING CO. INC.**  
TANKS • STACKS • PLATE CONSTRUCTION • BOILERMAKERS • WELDERS  
MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS  
205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

**MAY 29, 1975**  
**INVOICE**

**SOLD TO**  
OGLEBAY NORTON COMPANY – P-40392  
COLUMBIA TRANSPORTATION DIVISION  
P.O. BOX 6508  
CLEVELAND, OHIO 44101

**YOUR ORDER NO.** M 3039  
**OUR ORDER NO.** 14581

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
</table>
| STR. EDMUND FITZGERALD  
FURNISH NECESSARY LABOR TO REMOVE CEILING AND REWELD BROKEN STIFFENERS AS NECESSARY IN 1ST ASSISTANT ENGINEER'S ROOM.  
MECHANICS  
WELDING AND MATERIAL | 18 HRS | 12.50 | 225.00 |

**RECEIVED**  
PURCHASING DEPT.  
MAY 30, 1975  
APPROVED

**PLEASE PAY LAST AMOUNT THIS COLUMN**  
241.00
**CAPTAIN'S VESSEL ORDER**

**No. M 3088**

**Vessel**  
Edmund Fitzgerald  
At Ohio  
Date 5-15-75

**To**  
Thomas W. Haering & Welling Co.

**Address**  
Tallula, Ohio

**Date Required**

---

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
<th>DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mariners Loops for Leads all lines and fitting of towing machinery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-19-75</td>
<td></td>
</tr>
</tbody>
</table>

---

**PURCHASING DEPT. COPY**

---

CAPTAIN
**MERCE BOILER & WELDING CO. INC.**  
TANKS • STACKS • PLATE CONSTRUCTION • BOILERMAKERS • WELDERS  
MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS  
205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

**MAY 29, 1975**

**INVOICE**

**SOLD TO**  
OGLEBAY NORTON COMPANY • P-40392  
COLUMBIA TRANSPORTATION DIVISION  
P.O. BOX 6508  
CLEVELAND, OHIO 44101

Your Order No. M 3088  
Our Order No. 14606

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
</table>
| STR. EDMUND FITZGERALD  
FURNISH NECESSARY LABOR TO HANDLE  
LINES 3/14/75 • MECHANICS | 24 HRS | 12.50 | 300.00 |

**RECEIVED**  
PURCHASING DEPT.  
MAY 30, 1975

**APPROVED**

**PLEASE PAY LAST**  
AMOUNT THIS COLUMN  

300.00
**CAPTAIN'S VESSEL ORDER**

**Vessel**  
216 Edmond Fitzgerald  
At Toledo  
Date 2.10.75

**To**  
Messrs. Bradley & Weddington Co.

**Address**  
Toledo, Ohio

**Seller** shall render invoice in duplicate to **Purchaser** c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tin plated steel and metal</td>
</tr>
<tr>
<td></td>
<td>Insulation and installation</td>
</tr>
<tr>
<td></td>
<td>Ventilation, doors and head</td>
</tr>
<tr>
<td></td>
<td>Deck cover and partitions</td>
</tr>
</tbody>
</table>

**PURCHASING DEPT. COPY**
## Invoices

**MERCE BOILER & WELDING CO. INC.**

**FEB, 12, 1975**

**SOLD TO**
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6508
CLEVELAND, OHIO 44101

**OGLEBAY NORTON COMPANY - P=40392**

**JOINERY**

**INVOICE**

**YOUR ORDER NO.** M 2972

**OUR ORDER NO.** 13979

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERALD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LABOR AND MATERIAL TO FABRICATE AND INSTALL VENTILATOR DOORS.</td>
<td></td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>MECHANICS</td>
<td>61 HRS</td>
<td>12.50</td>
<td>762.50</td>
</tr>
<tr>
<td>PORTABLE WELDING MACHINE W/ MATERIAL OXYGEN AND ACETYLENE</td>
<td>4 HRS</td>
<td>8.00</td>
<td>32.00</td>
</tr>
<tr>
<td>PLATE - BARS - ROUND STEEL</td>
<td>336 #</td>
<td>0.28</td>
<td>94.24</td>
</tr>
<tr>
<td>3/4&quot; BLK. PIPE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 - 1/8&quot; COUPLINGS</td>
<td>42</td>
<td>0.25</td>
<td>10.50</td>
</tr>
<tr>
<td>42 - 1/8&quot; ZERK FITTINGS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RECEIVED**
PURCHASING DEPT.
FEB 13 hrs

**APPROVED**

PLEASE PAY LAST AMOUNT THIS COLUMN

**936.33**
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Provide labor + material</td>
</tr>
<tr>
<td></td>
<td>enamel, Inside flats (register)</td>
</tr>
<tr>
<td></td>
<td>reconditioned</td>
</tr>
</tbody>
</table>

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.
## MERCE BOILER & WELDING CO. INC.

**TANKS • STACKS • PLATE CONSTRUCTION • BOILERMAKERS • WELDERS**

**MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS**

205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

**FEB. 12, 1975**

## INVOICE

**SOLD TO**

OGLEBAY NORTON COMPANY • P-40392

COLUMBIA TRANSPORTATION DIVISION

P.O. BOX 6508

CLEVELAND, OHIO 44101

**YOUR ORDER NO.**

M 2971

**OUR ORDER NO.**

14082

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERALD</td>
<td>6 HRS</td>
<td>12.50</td>
<td>75.00</td>
</tr>
</tbody>
</table>

LABOR AND MATERIAL TO FABRICATE 2 HATCH CLAMPS WRENCHES -

MECHANICS MATERIAL

**RECEIVED**

PURCHASING DEPT.

02-13-1975

APPROVED

PLEASE PAY LAST AMOUNT THIS COLUMN

82.00
CAPTAIN'S VESSEL ORDER

Vessel: Edmund Fitzgerald At: Toledo, Ohio Date: 2-4-75

To: Weco Builders Welding Co.

Address: Toledo, Ohio

Date Required: WU 17-13-75

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inflatable life crafts for service</td>
</tr>
</tbody>
</table>

DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY

PURCHASING DEPT. COPY

[Signature] CAPTAIN
MERCE BOILER & WELDING CO. INC.

TANKS • STACKS • PLATE CONSTRUCTION • BOILERMAKERS • WELDERS
MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS
205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

JUNE 17, 1975

INVOICE

OGLEBAY NORTON COMPANY • P-40392
SOLD TO
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6500
CLEVELAND, OHIO 44101

YOUR ORDER NO. M 2934
OUR ORDER NO. 14367

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. FITZGERALD</td>
<td>6 HRS</td>
<td>12.50</td>
<td>75.00</td>
</tr>
<tr>
<td>W/H 12-13-6-5 PROVIDE SERVICES TO HANDLE INFLATABLE LIFE RAFTS FOR SERVICE.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECHANICS LABOR AND TRUCK EXPENSE TO DELIVER TO CLEVELAND, O. AND RETURN.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RECEIVED
PURCHASING DEPT.
JUN 19 1975

APPROVED

PLEASE PAY LAST AMOUNT THIS COLUMN

201.00
### CAPTAIN'S VESSEL ORDER

**No. M 2932**

**Vessel**

Edmund Fitzgerald  
At Lakeshore, Date 2-4-75

**To**

K & C Marine Inc.

**Address**

Cleveland, Ohio

**Date Required**

03-10-65

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
<th>DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Repair hull and deck in chief</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engine room and deck to receive</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PURCHASING DEPT. COPY**

[Signature]
CAPTAIN
Repairs bulkhead tile in chief engineer's bath and reserve bath tub.

<table>
<thead>
<tr>
<th>ORDERED</th>
<th>SHIPPED</th>
<th>DESCRIPTION</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Repaired bulkhead tile in chief engineer's bath and reserve bath tub.</td>
<td>1,444.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

INVOICE NO.
June 23, 1975
M 2932
WW03-10-6-5

SOLD TO
Oglebay Norton Company
P.O. Box 6503
Cleveland, Ohio 44101

SHIP TO
Str. Ed. Fitzgerald

RECEIVED
PURCHASING DEPT.
JUL 3 1975

APPROVED
CAPTAIN'S VESSEL ORDER

Vessel: 

To: K & L Marine Repairs Co.

Address: Cleveland, Ohio

Date Required: 2-4-75

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Repairs overhead breathing in boiler and diesel engine room as directed.</td>
</tr>
</tbody>
</table>

Purchasing Dept. Copy

CAPTAIN
K & O Marine Repair Company
Markus Joint Contractors
1631 Harwin Avenue Cleveland, Ohio 44113 Phone 216 771-2667

SOLD TO
Cglebay Norton Company
P.O. Box 6508

SHIP TO
Str. Ed. Fitzgerald

INVOICE NO.
June 23, 1975
H 2031
PM03-09-6-5

<table>
<thead>
<tr>
<th>TERMS</th>
<th>CUSTOMERS ORDER NO.</th>
<th>STORE NO.</th>
<th>DEPT. NO.</th>
<th>WEIGHT</th>
<th>SHIPPED VIA</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDERED</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHIPPED</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Repairoed overhead sheathing in 1st assistant engineer's room as directed.

RECEIVED
PURCHASING DEPT.
JUL 3, 1975

APPROVED
OGLEBAY NORTON COMPANY  
COLUMBIA TRANSPORTATION DIVISION  

CAPTAIN'S VESSEL ORDER  

No. M 2930  

Vessel: Edmund J. Fitzgerald  
At: Cleveland, Ohio  
Date: 2-9-75  

To: Kis & Marine Repair Inc.  
Address: Cleveland, Ohio  

Date Required: 03-08-65  

Seller shall render Invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side thereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Repairs to Dawson pilothouse and deck wiring</td>
</tr>
</tbody>
</table>

Purchasing Dept. Copy  

[Signature]  
CAPTAIN
K & C Marine Repair Company
Marine Joiner Contractors
1651 Marwin Avenue    Cleveland, Ohio  44113    Phone 216 771-2757

SOLD TO

Oglebay Norton Company
P.O. Box 5508
Cleveland, Ohio  44101

SHIP TO

Str. Ed. Fitzgerld

INVOICE NO.

June 23, 1975
   M 2950
   WY03-08-6-5

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDERED</td>
<td>Folds windows in Pilot House and chart room as marked.</td>
<td>$1,050.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RECEIVED
PURCHASING DEPT.
JUL 3 1975

APPROVED
**CAPTAIN'S VESSEL ORDER**

**Vessel:** Edmund Fitzgerald  at Toledo, Ohio  
**To:**  Henry Hansen Welding Co.  
**Address:**  Toledo, Ohio  
**Date Required:**  WW01-06-65  

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting the vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials, and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
<th>DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Removed Deck and material</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2000 tons 10000 Gal. of POL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Install Boiler under foundation as directed</td>
<td></td>
</tr>
</tbody>
</table>

**PURCHASING DEPT. COPY**
TO

Columbia Transportation Division
Oglebay Norton Company
1200 Hanna Building
Cleveland, Ohio 44115

Provide labor and material to resecure incinerator and install header under foundation, as directed

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5/22/75</td>
<td>N 2928</td>
<td>Str. Edmund Fitzgerald</td>
<td>H 5697</td>
</tr>
<tr>
<td>Provide labor and material to resecure incinerator and install header under foundation, as directed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2(\frac{1}{2}) hours foreman @ $16.50</td>
<td>41.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25(\frac{1}{2}) hours mechanic @ $15.00</td>
<td>382.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 pcs 3(\frac{1}{8}) x 3(\frac{1}{2}) f.b. x 27(\frac{1}{2})&quot;</td>
<td>15.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>welding rod w/machine</td>
<td>10.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10' gas tax</td>
<td>1.80</td>
<td>28.05</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RECEIVED

PURCHASING DEPT.
MAY 23 1975

APPROVED

FORM 1
### CAPTAIN'S VESSEL ORDER

**No. M 2927**

**Captain**

**Vessel**: Edmund Fitzgerald  
**Address**: Toledo, Ohio  
**Date**: 2-4-75

**To**: Thomas Thomas  
**Address**: Toledo, Ohio  
**Date Required**: WW01-05-65

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Provide labor and material to secure double lifts</td>
</tr>
<tr>
<td></td>
<td>post side, second set off</td>
</tr>
<tr>
<td></td>
<td>head, forward boom, stays</td>
</tr>
<tr>
<td></td>
<td>dead level, chocks, loads</td>
</tr>
</tbody>
</table>

**Purchasing Dept. Copy**

**Signature**: (Robert)  
**Position**: Captain
Columbia Transportation Division
Oglebay Norton Company
1200 Hanna Blvd.
Cleveland, Ohio 44115

Labor and material to secure double bitts port side,
second set aft of forward house spar deck level
(rivets loose)

<table>
<thead>
<tr>
<th>Description</th>
<th>Hours</th>
<th>Cost</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 1/2 hours foreman</td>
<td>2</td>
<td>$16.50</td>
<td>$33</td>
</tr>
<tr>
<td>44 1/2 hours mechanic</td>
<td>8</td>
<td>$15.00</td>
<td>$66.75</td>
</tr>
<tr>
<td>1 hr. ac</td>
<td></td>
<td></td>
<td>$12.00</td>
</tr>
<tr>
<td>40° gastex</td>
<td></td>
<td></td>
<td>$7.20</td>
</tr>
<tr>
<td>bolts</td>
<td></td>
<td></td>
<td>$72.76</td>
</tr>
</tbody>
</table>

**Received**
Purchasing Dept.
May 23, 1975

**Approved**
OGLEBAY NORTON COMPANY  
COLUMBIA TRANSPORTATION DIVISION
CAPTAIN'S VESSEL ORDER

No. M 2926

Vessel: Edmund Fitzgerald  
To: Hans Hansen Welding Co.  
Address: Toledo, Ohio

Date Required: 01-04-65

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Check all that covers and roaminings and straighten, was designated.</td>
</tr>
</tbody>
</table>

DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY

PURCHASING DEPT. COPY

CAPTAIN
Columbia Transportation Division  
Coyle Merton Company  
1200 Hanna Bldg.  
Cleveland, Ohio 44115  

W.W. 01-04-8-5

Terms: 

Net Cash: 5/22/75  
Your Org. No. : N 2926  

Str. Edmund Fitzgerald  
Job No. : N 5699  
Invoice No. : 0333

Check all hatch covers and coamings and straighten, as designated:

- 21 hours foreman @$16.50  
  - 346.50
- 1 hr arc gouge  
  - 23.00
- 212 hours mechanic @$15.00  
  - 3,180.00  
  - 3,549.50

- 122' gustox  
  - 21.96
- 1 hr air compressor  
  - 12.00
- 8 hours machine time  
  - 8.00
- scaffold  
  - 73.55
- 12 kits 3/8 x 9" x 22"  
  - 48.65
- 36 pcs 1/2 x 1 1/2 x 4"  
  - 10.85
- 36 pcs 5/8 rd bar x 4"  
  - 4.20
- welding rod w/machine  
  - 45.50

RECEIVED  
Purchasing Dept.  
May 23 1975

Approved.
OGLEBAY NORTON COMPANY
COLUMBIA TRANSPORTATION DIVISION
CAPTAIN'S VESSEL ORDER

Vessel: Edmund Fitzgerald  Date: 2-4-75
To: Hanna Steel & Welding Co.
Address:  

Date Required: 2-3-75

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Repair deflected main deck, welding in prod of the forward side together with adjacent weld frame.</td>
</tr>
</tbody>
</table>

DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY

Purchasing Dept. Copy
TO: Columbia Transportation Division
Oglebay Norton Company
1200 Hanna Blvd.
Cleveland, Ohio 44115

W.O. 01-03-6-5

<table>
<thead>
<tr>
<th>TERMS: NET CASH</th>
<th>DATE: 5/22/75</th>
<th>YOUR ORD. NO. #2925</th>
<th>Str. Edmund Fitzgerald</th>
<th>JOB NO. #5799</th>
<th>INVOICE NO. 0334</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 1/2 hours foreman @16.50</td>
<td>272.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>166 hours mechanic @15.00</td>
<td>2,490.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.10</td>
<td></td>
<td></td>
<td>2,762.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36&quot; 1/4 x 1 1/2 f.b.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 hts 3/8 x 33&quot; x 72&quot;</td>
<td>178.50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 1 1/4&quot; pipe unions</td>
<td>3.26</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 pcs 3/8 x 3&quot; x 36&quot;</td>
<td>8.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>488' gasto</td>
<td>87.84</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 hrs ac</td>
<td>35.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 grinding discs</td>
<td>10.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>welding rod w/machine</td>
<td>70.00</td>
<td>mat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RECEIVED
PURCHASING DEPT.
MAY 23 1975

APPROVED

FORM 1
<table>
<thead>
<tr>
<th>quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Install new TOV antenna system sensing equipment</td>
</tr>
<tr>
<td></td>
<td>Fund was directed</td>
</tr>
</tbody>
</table>

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

Purchasing Dept. Copy
### Service Report/Invoice

**Customer Order No.**

**Requested By**

**Date**

**Date Shipped**

**Job**

**Invoice No.**

**Invoice Date**

**Location**

---

**Invoice To**

**Ship To**

---

**Model**

**Serial No.**

---

**Description**

**Line**

**Hours**

**Complaint**

---

**Trouble Found/Work Performed**

---

---

**Quan.**

**Part Number**

**Description**

**ckt. Sym.**

**Unit Price**

**Total Price**

---

**Date Init.**

**Hours**

**Travel**

**Miles**

**Fare**

**Method**

**Meals**

**Other**

**Equip./Parts Total**

---

**Received**

**Purchasing**

**Aug. 1975**

---

**Engineer**

**Operation**

**Sub-Contractor**

**Approved**

**Subc. Invoice No.**

**Next Port Notified?**

---

**The Material and/or Services Shown Hereon Have Been Received.**

**RCVD. By:**

**Date**

**Title**

**Invoice Amount**

---
**CAPTAIN'S VESSEL ORDER**

**Vessel**: EDWARD H. MANN
**Address**: Vero Beach, FL
**To**: [Signature]
**Date**: 5-15-75

**Date Required**

---

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Provide Johnson D. material</td>
</tr>
<tr>
<td></td>
<td>to fabricate ladders for</td>
</tr>
<tr>
<td></td>
<td>steering in order to paint</td>
</tr>
<tr>
<td></td>
<td>our work.</td>
</tr>
</tbody>
</table>

---

**PURCHASING DEPT. COPY**

[Signature]

**CAPTAIN**
**MERCE BOILER & WELDING CO. INC.**
TANKS • STACKS • PLATE CONSTRUCTION ... BOILERMAKERS • WELDERS
MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS
205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

**MAY 29, 1975**

**INVOICE**

**SOLD TO**
OGLEBAY NORTON COMPANY • P-40392
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6508
CLEVELAND, OHIO 44101

**YOUR ORDER NO.** M 3096

**OUR ORDER NO.** 14624

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERALD</td>
<td>10 HRS</td>
<td>12.50</td>
<td>125.00</td>
</tr>
<tr>
<td>LADOR AND MATERIAL TO MAKE FOUR (4) BAR BRACKETS FOR PAINTING OVER BOW</td>
<td></td>
<td></td>
<td>26.00</td>
</tr>
<tr>
<td>MECHANICS MATERIAL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RECEIVED**
PURCHASING DEPT.
MAY 30, 1975

**APPROVED**

**151.00**

**PLEASE PAY LAST AMOUNT THIS COLUMN**
**CAPTAIN'S VESSEL ORDER**

**No. M 3092**

**Vessel:** Edmund Fitzgerald  
**Date:** 5-15-75

**To:** [Purchasing Department]  
**Address:** Toledo, Ohio

**Date Required**

---

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Furnished items and materials</td>
</tr>
<tr>
<td></td>
<td>Supplies and materials</td>
</tr>
</tbody>
</table>

**Purchasing Dept. Copy**

[Signature]  
CAPTAIN
MAY 29, 1975

INVOICE

SOLD TO
OGLEBAY NORTON COMPANY - P-40392
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6503
CLEVELAND, OHIO 44101

YOUR ORDER NO. M 3092
OUR ORDER NO. 14724

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERALD</td>
<td>24 HRS</td>
<td>12.50</td>
<td>300.00</td>
</tr>
<tr>
<td>LABOR AND MATERIAL TO MAKE NECESSARY REPAIRS TO INCINERATOR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECHANICS TOLEDO COMBUSTION EQUIPMENT INVOICE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOR MATERIAL</td>
<td></td>
<td></td>
<td>102.10</td>
</tr>
</tbody>
</table>

RECEIVED
PURCHASING DEPT.
MAY 30 1975

APPROVED

PLEASE PAY LAST AMOUNT THIS COLUMN

402.10
CABLEBAY NORTON COMPANY
COLUMBIA TRANSPORTATION DIVISION
CAPTAIN'S VESSEL ORDER

No. M 3091

Vessel: Edmund D. Byrd

To: Vessel Builders & Welding Co.

Address: CLEVELAND OHIO

Date Required:

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY

PURCHASING DEPT. COPY

CAPTAIN: D. Byrd
MERCE BOILER & WELDING CO. INC.
TANKS • STACKS • PLATE CONSTRUCTION • BOILERMakers • WELDERS
MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS
205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

Y 29, 1975

INVOICE

OGLEBAY NORTON COMPANY • P.
SOLD TO
COLUMBIA TRANSPORTATION DIVIS. 
P.O. BOX 6508
CLEVELAND, OHIO 44101

YOUR ORDER NO. M 3091
OUR ORDER NO. 14739

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERALD</td>
<td>26 HRS</td>
<td>12.50</td>
<td>325.00</td>
</tr>
</tbody>
</table>

FURNISH NECESSARY LABOR TO ASSIST WITH MOVING OF VESSEL AT WINTER MOORING.

MECHANICS

RECEIVED
PURCHASING DEPT.
MAY 16, 1975
APPROVED

325.00

PLEASE PAY LAST AMOUNT THIS COLUMN
OCEBAY NORTON COMPANY
COLUMBIA TRANSPORTATION DIVISION
CAPTAIN'S VESSEL ORDER

No. M 3090

Vessel: Edmund Fitzgerald Address: Toledo, Ohio
Date: 5/15/75

To: Never Bailer & Welding Co.

Date Required:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
<th>DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chemical Linner and Material</td>
<td></td>
</tr>
<tr>
<td></td>
<td>repairs boarding ladder</td>
<td></td>
</tr>
</tbody>
</table>

Purchasing Dept. Copy
### MERCE BOILER & WELDING CO. INC.

**TANKS • STACKS • PLATE CONSTRUCTION • BOILERMASERS • WELDERS**

**MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS**

205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

---

**MAY 29, 1975**

**INVOICE**

**SOLD TO**

OGLEBAY NORTON COMPANY - P-40392

COLUMBIA TRANSPORTATION DIVISION

P.O. BOX 6508

CLEVELAND, OHIO 44101

---

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERALD</td>
<td>16 HRS</td>
<td>12.50</td>
<td>200.00</td>
</tr>
<tr>
<td>FURNISH NECESSARY LABOR TO REPAIR BOARDING LADDER.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECHANICS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>THREADED ROD, LOCK NUTS</td>
<td></td>
<td></td>
<td>7.78</td>
</tr>
</tbody>
</table>

---

**RECEIVED**

Purchasing Dept.

MAY 30, 1975

**APPROVED**

---

PLEASE PAY LAST AMOUNT THIS COLUMN

207.78
**CAPTAIN'S VESSEL ORDER**

**Vessel**: Edmund Fitzgerald, Elyria, Ohio. **Date**: 5-15-75

**To**: West Boilermakers, Toledo, Ohio.

**Address**: Toledo, Ohio.

**Date Required**: 

---

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
<th>DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Turnbuckles and staples</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To remove disabled company and fillets</td>
<td></td>
</tr>
</tbody>
</table>

---

**PURCHASING DEPT. COPY**

[Signature: Captain]
**INVOICE**

**MAY 29, 1975**

**SOLD TO**
OGLEBAY NORTON COMPANY - P-40392
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6508
CLEVELAND, OHIO 44101

**YOUR ORDER NO.** 113087
**OUR ORDER NO.** 14706

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FURNISH NECESSARY LABOR TO REMOVE REFUSE ON DOCK &amp; LAY UP SITE.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECHANICS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USE OF DISPOSAL SITE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RENTAL OF DUMP TRUCK</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33 HRS</td>
<td></td>
<td>12.50</td>
<td>412.50</td>
</tr>
<tr>
<td>3 DA</td>
<td></td>
<td>25.00</td>
<td>75.00</td>
</tr>
</tbody>
</table>

**RECEIVED**
PURCHASING DEPT.
MAY 30 1975

APPROVED

514.00

PLEASE PAY LAST AMOUNT THIS COLUMN
### Captain's Vessel Order

**Oglesby Norton Company**  
**Columbia Transportation Division**  

**No. M 2933**

**Vessel:** Edmund Fitzgerald  
**Address:** Cleveland, Ohio  
**Date:** 2-4-75

**To:**  
**Address:** Cleveland, Ohio

**Date Required:**  

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Repair flooring in hold, footings and crowns, as directed</td>
</tr>
</tbody>
</table>

**Purchasing Dept. Copy**

**Captain's Signature:**

R. F. [Signature]

**[Inscription in the margins]**
<table>
<thead>
<tr>
<th>TERMS:</th>
<th>CUSTOMERS ORDER NO.</th>
<th>STORE NO.</th>
<th>DEPT. NO.</th>
<th>WEIGHT</th>
<th>SHIPPED VIA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDERED</td>
<td>Shipped</td>
<td>Repairing floor covering in galley, pantry and crews' mess and dining room, as directed.</td>
<td>11,200.00</td>
<td></td>
</tr>
</tbody>
</table>

RECEIVED
PURCHASE ORDER
MAR 11, 1975

APPROVED.
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pick up Boarding ramp from the Wavemaster and deliver to vessel.</td>
</tr>
</tbody>
</table>

**Purchasing Dept. Copy**

**Captain**
MERCE BOILER & WELDING CO. INC.
TANKS • STACKS • PLATE CONSTRUCTION ... BOILERMAKERS WELDERS
MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS
205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

FEB. 12, 1975

INVOICE

SOLD TO
OGLEBAY NORTON COMPANY - P-40392
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6508
CLEVELAND, OHIO 44101

YOUR ORDER NO. M 2960
OUR ORDER NO. 13943

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. FITZGERALD</td>
<td>12 HRS</td>
<td>12.50</td>
<td>150.00</td>
</tr>
</tbody>
</table>

RECEIVED
PURCHASING DEPT.
FEB 18 1975
APPROVED

150.00

PLEASE PAY LAST AMOUNT THIS COLUMN
**OGLEBAY NORTON COMPANY**  
**COLUMBIA TRANSPORTATION DIVISION**

**CAPTAIN'S VESSEL ORDER**

<table>
<thead>
<tr>
<th>No.</th>
<th>M 1970</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vessel</td>
<td>Edward S. Norton</td>
</tr>
<tr>
<td>To</td>
<td>Purchasing Dept.</td>
</tr>
<tr>
<td>Address</td>
<td></td>
</tr>
<tr>
<td>Date Required</td>
<td></td>
</tr>
</tbody>
</table>

**Caption:**

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>1</th>
<th>1000</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>45-29 HP Cummins</td>
<td>45-29 HP Cummins</td>
<td>45-29 HP Cummins</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**PURCHASING DEPT. COPY**

[Signature]

CAPTAIN
CAPTAIN'S VESSEL ORDER

Vessel: Edward White

To: Kennedy

Address: J. K. B. Way

Date Required: 11-29-71

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Purchasing Dept. Copy

CAPTAIN
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oglebay Norton Company</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Columbia Transportation Division</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2 100# Tri Sodium  | 23.75 | 47.50  

47.50

RECEIVED
PURCHASING DEPT.
OCT 27 1975
APPROVED
OGLEBAY NORTON COMPANY  
COLUMBIA TRANSPORTATION DIVISION  

CAPTAIN'S VESSEL ORDER  

No. M 1968  

Vessel: Edward H. Norton  
Address:  

At:  
Date Required:  

Date 10-14-75  

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 case</td>
<td>Tape, Trap, Bollard Tape, size</td>
</tr>
<tr>
<td>1</td>
<td>Latex Paint Can</td>
</tr>
<tr>
<td>1</td>
<td>Latex Primer</td>
</tr>
<tr>
<td>10</td>
<td>Tape, Wholesale Quantity</td>
</tr>
</tbody>
</table>

Purchasing Dept. Copy

CAPTAIN

[Signature]
OGLEBAY NORTON COMPANY
COLUMBIA TRANSPORTATION DIVISION

CAPTAIN'S VESSEL ORDER

No. M 1967

Vessel Edward E. Day at Date 7-22-13

To: Purchasing Dept.

Address

Date Required

Seller shall render invoice in duplicate to Purchaser c/o Box 6608, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
<th>DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 gal.</td>
<td>Oil (Pump Priming)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>&quot; Cable &quot;</td>
<td></td>
</tr>
</tbody>
</table>

Purchasing Dept. Copy

[Signature] Captain
OGLEBAY NORTON COMPANY
COLUMBIA TRANSPORTATION DIVISION

CAPTAIN'S VESSEL ORDER

Vessel: Edward V. Norton

At: 

Date: 7-1-73

To: Purchasing Dept.

Address: 

Date Required: 

---

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>36 x 115' 6 x 10 DEC. lining composite.</td>
</tr>
<tr>
<td></td>
<td>female on one side - male on other side</td>
</tr>
</tbody>
</table>

DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY

---

PURCHASING DEPT. COPY

CAPTAIN
**CAPTAIN'S VESSEL ORDER**

**No. M 1965**

**Vessel:** Edward T. Lippincott  
**At:** Steubenville  
**Date:** 9-15-75

**To:**  
**Address:**

(Date Required)

---

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
<th>DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lawn Chairs</td>
<td></td>
</tr>
</tbody>
</table>

---

**PURCHASING DEPT. COPY**

(Captain's Signature)
1 Case (8/3#) Hills Bros. Coffee 34.95 34.95

34.95

RECEIVED
PURCHASING DEPT
SEP 19 1975
APPROVED
OGLEBAY NORTON COMPANY  
COLUMBIA TRANSPORTATION DIVISION  

CAPTAIN'S VESSEL ORDER  

No. M 1964  

Vessel: Edward J. Pignone  
At:  
Date: 7-8-15  
To: Purchasing Dept.  
Address:  

Date Required:  

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
<th>DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Marine cables - 50' x 1/4 R L. 1/4 FL MM</td>
<td></td>
</tr>
</tbody>
</table>
| 1        | Steel eye hooks Fd. 1/2

12 7/8" ship leads
2 7/8" round grommets
24 Steel Rings 1/4" grommets
1 Steel Ring for Anchor Chipping

PURCHASING DEPT. COPY

CAPTAIN

G. E. Shank
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
</table>

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.
# CAPTAIN'S VESSEL ORDER

**Vessel:** Edward J. Oglethorpe  
**At:**  
**Date:** 6-20-75  
**To:** Purchasing Dept.  
**Address:**  
**Date Required:**

---

**Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.**

**Quantity** | **Give complete description of material to be purchased** | **DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY**
---|---|---
1 | Tarp  |  

---

**PURCHASING DEPT. COPY**

[Signature]

**CAPTAIN**
<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.02&quot; long handle, 2&quot; seam, phenolic</td>
</tr>
<tr>
<td>1</td>
<td>3/4&quot; ID. all high-tech</td>
</tr>
<tr>
<td>1</td>
<td>25 ft. Phenolic Teflon</td>
</tr>
<tr>
<td>1</td>
<td>100 cu. ft. Teflon</td>
</tr>
<tr>
<td>1</td>
<td>Dept. pay</td>
</tr>
<tr>
<td>1</td>
<td>Hight lat design</td>
</tr>
</tbody>
</table>
**CAPTAIN'S VESSEL ORDER**

**Vessel**: Edmund Fitzgerald  
**At**:  
**Date**:  

**To**: Purchasing Dept.  
**Address**:  
**Date Required**:  

---

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>100 feet Lead Inert Tape</td>
</tr>
<tr>
<td>1.</td>
<td>100 feet Lead Imp. Tape</td>
</tr>
<tr>
<td>1.</td>
<td>100 feet Lead Imp. Tape</td>
</tr>
<tr>
<td>1.</td>
<td>100 feet Lead Imp. Tape</td>
</tr>
<tr>
<td>1.</td>
<td>100 feet Lead Imp. Tape</td>
</tr>
<tr>
<td>10.</td>
<td>100 feet Red Silk Paint Felt</td>
</tr>
<tr>
<td>15.</td>
<td>100 feet Red Silk Paint Felt</td>
</tr>
</tbody>
</table>

**PURCHASING DEPT. COPY**

---

(Captain's signature)

---
OGLEBAY NORTON COMPANY
COLUMBIA TRANSPORTATION DIVISION

CAPTAIN'S VESSEL ORDER

No. M 1958

Vessel: Edmund Repiquet
At: Stanley
Date: 7/6/73

To: General Office

Address: Stanley F. Bills

Date Required

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
<th>DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cone Coffee</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PURCHASING DEPT. COPY

CAPTAIN
<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case (8/3#) Hills Bros. Coffee</td>
<td>1</td>
<td>29.75</td>
<td>29.75</td>
</tr>
</tbody>
</table>

**Total**

29.75
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Material Description</th>
<th>DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>HS 15 Seize AP Monoxide Solution</td>
<td></td>
</tr>
</tbody>
</table>

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.
Jordan Marine Supply
Phone: area code 218 226-3231
Silver Bay, Minnesota

Str. Edmund Fitzgerald
Ogelbay Norton Company
Columbia Transportation Division

Reg. No. H 1957
Date 7-5-77 8:16 a.m.

24 Penlite Batteries .30

7.20

7.20

RECEIVED
purchasing dept.
JUL 1 7 1975
APPROVED
CAPTAIN'S VESSEL ORDER

Vessel: Oglebay Norton Company

At: 9-7-75

To: Purchasing Dept.

Address:

Date Required:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>HS15 Sere AA Carbonate Batteries</td>
</tr>
<tr>
<td>10</td>
<td>1/2 Moun Lig.</td>
</tr>
<tr>
<td>10</td>
<td>Flashlight Batteries</td>
</tr>
<tr>
<td>1</td>
<td>Leveler, #125</td>
</tr>
<tr>
<td>12</td>
<td>Celeulor, #195</td>
</tr>
</tbody>
</table>

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

PURCHASING DEPT. COPY

CAPTAIN
CAPTAIN'S VESSEL ORDER

Vessel: Edward Dechend At: Date: 6-17-25
To: Purchasing Dept.
Address: 
Date Required: 

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 gal.</td>
<td>Ray Lack (Pint = 30.21)</td>
</tr>
<tr>
<td>26</td>
<td>Plastic Case (40 X 15 X 20)</td>
</tr>
<tr>
<td>1</td>
<td>Junction box with 3 pole connections</td>
</tr>
<tr>
<td>6</td>
<td>3 spring connections with 50 pl. cord.</td>
</tr>
<tr>
<td>1</td>
<td>case tape</td>
</tr>
<tr>
<td>1</td>
<td>Light Strip</td>
</tr>
<tr>
<td>1</td>
<td>Light Planner</td>
</tr>
</tbody>
</table>

Purchasing Dept. Copy
CAPTAIN'S VESSEL ORDER

Vessel: Edward J. Silagnick
At: Lake
Date: 6-7-75

To: Sperry Rand, Cleveland

Address: Sperry Rand

Date Required:

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1261.700 net for one liner gaskets</td>
</tr>
<tr>
<td></td>
<td>1361.100 gasket material for frame</td>
</tr>
<tr>
<td></td>
<td>Metal seal liner for one metal frame, 42&quot; x 12&quot; for fire control</td>
</tr>
</tbody>
</table>

Purchasing Dept. Copy

Captain: [Signature]
## MERCE BOILER & WELDING CO. INC.

TANKS • STACKS • PLATE CONSTRUCTION • BOILERMakers • WELDERS
MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS
205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

JUNE 30, 1975

INVOICE

SOLD TO

OGLEBAY NORTON COMPANY - P-40392
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6508
CLEVELAND, OHIO 44101

YOUR ORDER NO. M 1952
OUR ORDER NO. 15009

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERALD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LABOR AND MATERIAL TO FABRICATE ONE METAL FRAME 48&quot; X 12&quot; FOR FIRE CONTROL PLAN AND DATA. MECHANICS</td>
<td>6 HRS</td>
<td>12.50</td>
<td>75.00</td>
</tr>
<tr>
<td>1 STAINLESS STEEL FRAME</td>
<td></td>
<td></td>
<td>9.65</td>
</tr>
<tr>
<td>1 CLR. PLEXIGLASS</td>
<td></td>
<td></td>
<td>8.55</td>
</tr>
</tbody>
</table>

RECEIVED
PURCHASING DEPT.
JUL 3 1975

APPROVED

PLEASE PAY THIS AMOUNT THIS COLUMN

93.20%
MERCE BOILER & WELDING CO. INC.
TANKS • STACKS • PLATE CONSTRUCTION • BOILERMAKERS • WELDERS
MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS
205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

AUGUST 25, 1975

OGLEBAY NORTON COMPANY - P-40392
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6508
CLEVELAND, OHIO 44103

SOLD TO

INVOICE

M 1952
YOUR ORDER NO. ________________
OUR ORDER NO. 15008

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERALD</td>
<td>500 POP RIVETS</td>
<td>2 HRS</td>
<td>12.50</td>
</tr>
<tr>
<td></td>
<td>150 GASKET MATERIAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TRUCK AND DRIVER</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RECEIVED
AUG 26 1975

APPROVED

PLEASE PAY LAST
AMOUNT THIS COLUMN

270.75
CAPTAIN'S VESSEL ORDER

Vessel: Edward J. Nagle

To: [Address]

Date Required: 5-17-75

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tension pins, 4, scaffolds for 4th deck.</td>
</tr>
<tr>
<td></td>
<td>Tension material to facilitate lowering of 4th deck.</td>
</tr>
<tr>
<td></td>
<td>Hydrants, firehose, air conditioners.</td>
</tr>
<tr>
<td></td>
<td>Check materials for 2 teak tables.</td>
</tr>
<tr>
<td></td>
<td>1 &quot; &quot; to measure 3 wide.</td>
</tr>
<tr>
<td></td>
<td>2 &quot; for material to measure 3 port.</td>
</tr>
<tr>
<td></td>
<td>Life pieces.</td>
</tr>
<tr>
<td></td>
<td>2 fronts for galley.</td>
</tr>
<tr>
<td></td>
<td>Exterior cabinet.</td>
</tr>
</tbody>
</table>

Purchasing Dept. Copy
MERCE BOILER & WELDING CO. INC.
TANKS + STACKS + PLATE CONSTRUCTION ... BOILERMakers WELDERS
MARINE AND INDUSTRIAL REPAIRS + COMPLETELY EQUIPPED WORK BOATS & TRUCKS
205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

JUNE 17, 1975

OGLEBAY NORTON COMPANY – P-40392
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6508
CLEVELAND, OHIO 44101

INVOICE

M 1951
OUR ORDER NO. 14795

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERALD</td>
<td>FURNISH SCOW AND SCAFFOLD FOR HULL PAINTING.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>USE OF SCOW</td>
<td>5 DA</td>
<td>15.00</td>
<td>75.00</td>
</tr>
<tr>
<td>SCAFFOLD RENTAL</td>
<td>1 WK</td>
<td>26.00</td>
<td>26.00</td>
</tr>
<tr>
<td>DELIVER AND RETURN SCOW</td>
<td>4 HRS</td>
<td>12.50</td>
<td>50.00</td>
</tr>
<tr>
<td>SCAFFOLDING AND RELATED EQUIPMENT LOST</td>
<td></td>
<td></td>
<td>74.00</td>
</tr>
<tr>
<td>CREW</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RECEIVED
PURCHASING DEPT.
JUN 19 1975

APPROVED

PLEASE PAY LAST AMOUNT THIS COLUMN

225.00
SPEED LETTER

Merce Boiler & Welding Co.  FROM  Oglebay Norton Company
205 Utah Street  P. O. Box 6508
Toledo, Ohio 43605  Cleveland, Ohio 44101

SUBJECT  

MESSAGE  DATE  July 2, 1975

Gentlemen:

We have the following req. for our S/S Edmund Fitzgerald open

in our files: M-1951, E-5133, E-5107 and E-5553. Please forward your

invoices as soon as possible so we may clear up our files.

Thank you for your prompt attention to this request.

SIGNED  Leslie Kresse; Purchasing Dept.

REPLY  DATE  19

SIGNED

SNAP-A-WAY AND RETAIN YELLOW COPY. SEND WHITE AND PINK COPIES WITH CARBON INTACT
OGLEBAY NORTON COMPANY - P-40392  
COLUMBIA TRANSPORTATION DIVISION  
P.O. BOX 6508  
CLEVELAND, OHIO 44101  

JULY 10, 1975

INVOICE

SOLD TO

M 1951

YOUR ORDER NO. 14942

OUR ORDER NO.

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERALD</td>
<td>24</td>
<td>1 HR</td>
<td>12.50</td>
</tr>
<tr>
<td>FURNISH 24 CUPBOARD CATCHES:</td>
<td></td>
<td></td>
<td>145.80</td>
</tr>
<tr>
<td>24 - #9211 BZ-LN CABINET LATCHES</td>
<td>1</td>
<td>12.50</td>
<td></td>
</tr>
<tr>
<td>TRUCK AND DRIVER</td>
<td></td>
<td></td>
<td>12.50</td>
</tr>
</tbody>
</table>

RECEIVED
PURCHASING DEPT.
JUL 15 1975

APPROVED

PLEASE PAY LAST AMOUNT THIS COLUMN

158.30
## MERCE BOILER & WELDING CO. INC.
TANKS • STACKS • PLATE CONSTRUCTION • BOILERMAKERS • WELDERS
MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS
205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

### JULY 10, 1975

**INVOICE**

**SOLD TO:**

OGLEBAY NORTON COMPANY • P.O. 40392
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6508
CLEVELAND, OHIO 44101

**YOUR ORDER NO.:** M 1951

**OUR ORDER NO.:** 14948

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FURNISH AND DELIVER 1 AIR CONDITIONER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOR CAPTAIN'S OFFICE.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 WESTINGHOUSE A/C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRUCK AND DRIVER</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3 HR 12.50 37.50

**RECEIVED**
PURCHASING DEPT.
JUL 10 1975

**APPROVED**

PLEASE PAY LAST AMOUNT THIS COLUMN

384.8
<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MECHANICS</td>
<td>9 HRS</td>
<td>12.50</td>
<td>112.50</td>
</tr>
<tr>
<td>STEEL</td>
<td>20 #</td>
<td>0.22</td>
<td>4.40</td>
</tr>
</tbody>
</table>

TOTAL AMOUNT: $116.90
MERCE BOILER & WELDING CO. INC.
TANKS + STACKS + PLATE CONSTRUCTION + BOILERMAKERS + WELDERS
MARINE AND INDUSTRIAL REPAIRS + COMPLETELY EQUIPPED WORK BOATS & TRUCKS
205-207 UTAH STREET • TOLEDO, OHIO 43605-693-0548

JULY 23, 1975

INVOICE

OGLEBAY NORTON COMPANY • P 40392
COLUMBIA TRANSPORTATION DIVISION
P.O. BOX 6508
CLEVELAND, OHIO 44101

SOLD TO

YOUR ORDER NO. M 1951
OUR ORDER NO. 14941

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDMUND FITZGERALD</td>
<td>18 HRS</td>
<td>12.50</td>
<td>225.00</td>
</tr>
<tr>
<td>LABOR AND MATERIAL TO REPAIR PORT HOLE SCREENS AND WIND SCOPS</td>
<td>20 SQ. COPPER SCREEN MISCELLANEOUS MATERIAL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RECEIVED
PURCHASING DEPT.
JUL 25 1975

APPROVED

253.00

PLEASE PAY LAST AMOUNT THIS COLUMN
**MERCE BOILER & WELDING CO. INC.**  
TANKS • STACKS • PLATE CONSTRUCTION • BOILERMAKERS • WELDERS  
MARINE AND INDUSTRIAL REPAIRS • COMPLETELY EQUIPPED WORK BOATS & TRUCKS  
205-207 UTAH STREET • TOLEDO, OHIO 43605-692-0548  

**AUGUST 21, 1975**

**INVOICE**

**OGLEBAY NORTON COMPANY • P-40392**  
**COLUMBIA TRANSPORTATION DIVISION**  
**P.O. BOX 6508**  
**CLEVELAND, OHIO 44101**

**SOLD TO**

**YOUR ORDER NO.**

**M 1951**

**OUR ORDER NO.**

**14940**

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>QUANTITY</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR. EDUARD FITZGERALD</td>
<td>7 HRS</td>
<td>12.50</td>
<td>87.50</td>
</tr>
<tr>
<td>LABOR AND MATERIAL TO FABRICATE 4 HATCH CLAMP WRENCHES.</td>
<td></td>
<td></td>
<td>7.00</td>
</tr>
<tr>
<td>MECHANICS MATERIAL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RECEIVED**  
**PURCHASING DEPT**  
**AUG 25 1975**

**APPROVED**

PLEASE PAY LAST AMOUNT THIS COLUMN

94.50
**CAPTAIN'S VESSEL ORDER**

No. M 1951

Vessel

At

Date 5/11/75

To

Address

Date Required

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PURCHASING DEPT. COPY**

**MATERIAL RECEIVED**

CAPTAIN
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1/244 Columbia Steel Plate</td>
</tr>
<tr>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>7 1/8</td>
</tr>
<tr>
<td>4</td>
<td>7 1/4</td>
</tr>
<tr>
<td>2</td>
<td>7 3/8</td>
</tr>
<tr>
<td>2</td>
<td>7 1/2</td>
</tr>
<tr>
<td>1</td>
<td>7 3/4</td>
</tr>
</tbody>
</table>

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

Purchasing Dept. Copy

CAPTAIN
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>28 Sept. 29 Yarnarm Sases</td>
</tr>
<tr>
<td>2</td>
<td>27 &quot; 30 &quot; &quot;</td>
</tr>
<tr>
<td>1</td>
<td>31 &quot; 29 &quot; &quot;</td>
</tr>
<tr>
<td>1</td>
<td>34 &quot; 30 &quot; &quot;</td>
</tr>
<tr>
<td>2</td>
<td>34 &quot; 33 &quot; &quot;</td>
</tr>
<tr>
<td>2</td>
<td>35 &quot; 29 &quot; &quot;</td>
</tr>
</tbody>
</table>

Purchasing Dept. Copy
OGLEBAY NORTON COMPANY
COLUMBIA TRANSPORTATION DIVISION

CAPTAIN'S VESSEL ORDER

Vessel: Edward J. Smith
At:

To: Purchasing Dept.

Address:

Date Required:

No. M 1922

Seller shall render invoice in duplicate to Purchaser c/o Box 6608, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
<th>DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Size 37 Linen Coats</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0&quot; 40 &quot;</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0&quot; 40 &quot;</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0&quot; 40 &quot;</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0&quot; 40 &quot;</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Neck 14 1/2 Sleeve 30 Chambray Shirts</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>15 &quot; 30 &quot;</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>15 &quot; 30 &quot;</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>15 &quot; 30 &quot;</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>16 &quot; 30 &quot;</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>16 &quot; 30 &quot;</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>17 &quot; 30 &quot;</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>17 &quot; 30 &quot;</td>
<td></td>
</tr>
</tbody>
</table>

PURCHASING DEPT. COPY

CAPTAIN
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>15% Short Sleeve White Shit</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>2</td>
<td>Chest 30 6th 33 White Chintzens</td>
<td>2</td>
<td>32</td>
</tr>
<tr>
<td>2</td>
<td>36</td>
<td>2</td>
<td>29</td>
</tr>
<tr>
<td>1</td>
<td>40</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Selling shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>age 38 ft. l. dan. (t. u. v.)</td>
</tr>
<tr>
<td>2</td>
<td>&quot; 40 &quot;</td>
</tr>
<tr>
<td>1/4</td>
<td>&quot; 42 &quot;</td>
</tr>
<tr>
<td>1</td>
<td>&quot; 44 &quot;</td>
</tr>
<tr>
<td>2</td>
<td>&quot; 46 &quot;</td>
</tr>
<tr>
<td>2</td>
<td>&quot; 48 &quot;</td>
</tr>
<tr>
<td>2</td>
<td>&quot; 50 &quot;</td>
</tr>
<tr>
<td>Quantity</td>
<td>Give complete description of material to be purchased</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>1 case Coffee</td>
</tr>
</tbody>
</table>

Note: Seller shall render invoice in duplicate to Purchaser c/o Box 6608, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

Purchasing Dept. Copy

Captain
<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Case (8/3#) Hills Bros. Coffee</td>
<td></td>
<td>31.00</td>
<td>31.00</td>
</tr>
</tbody>
</table>

**Total:** 31.00
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>[Handwritten text not legible]</td>
</tr>
</tbody>
</table>

Purchasing Dept. Copy
### THE VALLEY CAMP STORES COMPANY

GROCERIES, MEAT AND STEAMSHIP SUPPLIES  
CORNER OF LAGRANGE & ENI STS.  
TOLEDO, OHIO 43604

Sold To  
Oglebay Norton Company  
P. O. Box 6500  
Cleveland, Ohio 44101  

Req. No.: 1918  
Invoice No.: 659-17  
Date: 5-22-75

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot; Horse hair brushes</td>
<td>2 only</td>
<td>$10.00</td>
</tr>
<tr>
<td>tax</td>
<td></td>
<td>.45</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$10.45</strong></td>
</tr>
</tbody>
</table>

RECEIVED  
PURCHASING DEPT.  
MAY 13 1975  
APPROVED
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Special Legs</td>
</tr>
<tr>
<td>1</td>
<td>Spindles</td>
</tr>
<tr>
<td>1</td>
<td>6&quot; side out pieces</td>
</tr>
<tr>
<td>6</td>
<td>Trench Screws</td>
</tr>
<tr>
<td>4</td>
<td>Beach Face Screws</td>
</tr>
</tbody>
</table>

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

Purchasing Dept. Copy

[Signature]

[Signature]
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>10 lbs. 10 cts.</td>
</tr>
<tr>
<td>2</td>
<td>11 lbs. 11 cts.</td>
</tr>
<tr>
<td>1</td>
<td>12 lbs. 12 cts.</td>
</tr>
</tbody>
</table>

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.
OGLEBAY NORTON COMPANY
COLUMBIA TRANSPORTATION DIVISION

CAPTAIN'S VESSEL ORDER

Vessel: Edward F. Elings, Jr.
To: Purchasing Dept.

Date: "Jan." 15

Address:

Date Required:

Seller shall render invoices in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Red Paint. Top - 36&quot; High - 36&quot; Wide - 12&quot; Deep</td>
</tr>
<tr>
<td>12</td>
<td>20 3/4&quot; x 11&quot; White Mica Labeled 5066 Shingle</td>
</tr>
<tr>
<td>1</td>
<td>1 1/2&quot; White Letters - Document</td>
</tr>
<tr>
<td>1</td>
<td>White Paint - 6 - Pail - 36&quot; High - 36&quot; Wide - 12&quot; Deep</td>
</tr>
</tbody>
</table>

DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY

PURCHASING DEPT. COPY

CAPTAIN
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. 5' x 7/16 - 6x37 - IP - P.t. Wire</td>
</tr>
<tr>
<td></td>
<td>w/ 3/8&quot; body thimbles &amp; 2 1/4&quot; 2 rat</td>
</tr>
<tr>
<td></td>
<td>Hitch Crown cables</td>
</tr>
</tbody>
</table>

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.
OGLEBAY NORTON COMPANY
COLUMBIA TRANSPORTATION DIVISION

CAPTAIN'S VESSEL ORDER

No. M 1913

Vessel: Edmund Fitzgerald  Set out Date: 1975

To: Purchasing Dept.

Address: 

Date Required: 

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description of Material to be Purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. gal.</td>
<td>Hardware nails Black</td>
</tr>
<tr>
<td>15.</td>
<td>Chrome Glass White Paint</td>
</tr>
<tr>
<td>3</td>
<td>Hardware fixtures</td>
</tr>
</tbody>
</table>

Purchasing Dept. Copy

CAPTAIN

[Signature]
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>126' x 12' opening Impressed</td>
</tr>
</tbody>
</table>
OGLEBAY NORTON COMPANY  
COLUMBIA TRANSPORTATION DIVISION

CAPTAIN'S VESSEL ORDER

No. M 1899

Vessel: Captain Fitzpatrick  At:  
To: Captain John Smith  Date: 4-10-75

Address:  

Date Required:  

Seller shall render invoice in duplicate to Purchaser c/o Box 6508, Cleveland, Ohio 44101, Attention: Purchasing Department, noting thereon vessel name and vessel order number. The terms and conditions on the reverse side hereof shall apply to all goods, materials and services ordered hereunder.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Give complete description of material to be purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>2 3/8&quot; x 1 1/2&quot; Heavy Gauge Tin (Catalog No. 1)</td>
</tr>
<tr>
<td>2</td>
<td>Corrugated Tin</td>
</tr>
<tr>
<td>25</td>
<td>1/2&quot; Packed Chix</td>
</tr>
</tbody>
</table>

DO NOT WRITE IN THIS SPACE FOR OFFICE USE ONLY

PURCHASING DEPT. COPY

CAPTAIN
Master's Reports of Damage to Vessel by Dock Machinery, EDMUND FITZGERALD, 24 December 1974 and 23 September 1975
Master's Report of Damage to Vessel by Dock Machinery

If part or all of the damage was repaired by the dock company before leaving, or in fact if partial or complete repairs are made by them or yourself at any future time, master should not fail to notify the office as soon as possible of the fact.

Dock people frequently do damage and make temporary or partial repairs only. They also sometimes make permanent repairs which are by no means satisfactory. In either case, the office should be notified.

Bills for repairs will follow this report in due course. If there is any reason why the damage specified should not be repaired at the expense of the dock company, it is expected that they will take it up with the office of the Columbia Transportation Div., Cleveland, Ohio, at once.

Vessel Fitzgerald  Trip No. 115  Date Accident Occurred 19-21-1976

Name of Dock Great Lakes Steel  Port Detroit

What Kind of Machinery did the Damage Unloading Rig

Each item should be listed separately, location carefully given, and prior condition of damaged parts stated.

Description of damage and how done

No. 3 Side Tank Starboard Side, Two Feet Above Main Deck directly underneath No. 5 Hatch. A four inch long rash about ½ of an inch wide.

The above stated damage was taken care of by shore personnel (completed)

Exact time when you notified Dock Company 01:30

Did the Foreman see the Damage above referred to

If Foreman's signature is not given, state if he was requested to sign and why he refused

For Dock Co. For Vessel

NOTE THE YELLOW COPY OF THIS REPORT SHOULD BE LEFT WITH THE DOCK PEOPLE BEFORE LEAVING, OR MAILED TO THEM AT THE NEXT PORT OR PASSING PORT, WHETHER DAMAGE IS ACKNOWLEDGED OR NOT. THE WHITE COPY IS TO BE MAILED TO THE OFFICE, AND THE PINK COPY IS TO BE KEPT ABOARD THE VESSEL.

Office Copy

ENCL No. 1 to ENCL (2)
Master's Report of Damage to Vessel by Dock Machinery

IF PART OR ALL OF THE DAMAGE WAS REPAIRED BY THE DOCK COMPANY BEFORE LEAVING, OR IF PARTIAL OR COMPLETE REPAIRS ARE MADE BY THEM OR YOURSELF AT ANY FUTURE TIME, MASTER SHOULD NOT FAIL TO NOTIFY THE OFFICE AS SOON AS POSSIBLE OF THE FACT.

DOCK PEOPLE FREQUENTLY DO DAMAGE AND MAKE TEMPORARY OR PARTIAL REPAIRS ONLY. THEY ALSO SOMETIMES MAKE PERMANENT REPAIRS WHICH ARE BY NO MEANS SATISFACTORY, IN EITHER CASE, THE OFFICE SHOULD BE NOTIFIED.

BILLS FOR REPAIRS WILL FOLLOW THIS REPORT IN DUE COURSE. IF THERE IS ANY REASON WHY THE DAMAGE SPECIFIED SHOULD NOT BE REPAIRED AT THE EXPENSE OF THE DOCK COMPANY, IT IS EXPECTED THAT THEY WILL TAKE IT UP WITH THE OFFICE OF THE COLUMBIA TRANSPORTATION DIV., CLEVELAND, OHIO, AT ONCE.

Vessel: Edm. Fitzgerald
Trip No.: 30
Date Accident Occurred: 9-23-75

Name of Dock: Inland Steel
Port: Indiana Harbor, Ind.

What Kind of Machinery did the Damage: Bridge Crane (Bucket)

Each item should be listed separately, location carefully given, and prior condition of damaged parts stated.

**Damage #1**

Corner of bucket came against No. 3 Starboard Ballast Tank denting and breaking through plating leaving a 10 inch open slit. Repaired 9-23-75

**Damage #2**

Same as above at No. 13 Hatch Starboard Side. No. 5 Ballast Tank about 8 ft above tank top. Repaired 9-23-75

**Damaged Upper Radar Antenna - Hit with Rig. Antenna will not turn.**

Replaced by spoon at 9-28-75 Tel. Co./16:10

Exact time when you notified Dock Company: 16:30

Did the Foreman see the Damage above referred to: YES

If Foreman's signature is not given, state if he was requested to sign and why he refused.

M. Fairweather For Dock Co.

F. Fairweather For Vessel

NOTE: THE YELLOW COPY OF THIS REPORT SHOULD BE LEFT WITH THE DOCK PEOPLE BEFORE LEAVING, OR MAILED TO THEM AT THE NEXT PORT OR PASSING PORT, WHETHER DAMAGE IS ACKNOWLEDGED OR NOT. THE WHITE COPY IS TO BE MAILED TO THE OFFICE, AND THE PINK COPY IS TO BE KEPT ABOARD THE VESSEL.

Office Copy
# 18

Rough Notes—Preliminary Investigation by Cdr. D. C. Mania, St. Ignace
Rough Notes - preliminary

Investigation by Cdr D. C. Maia

MID St. Ignace

includes
1) handwritten list of debts
2) oral info
3) rough io. notes.
Debris at sea as of 1830, 13 November 1755 - listed on 3 attached sheets.

Subsequently recorded additional items including additional inflatable lifeboat, lifeboat 5 guns, and 1 lifeboat 67 persons.

Note 1: Second lifeboat was lost, damaged, and some double flasks were picked up previously by a vessel, but were found on实际Shore. Lifeboats were assigned to float free (via small inflatable inflatable) and presumably the raft were probably hanging up on reef. Painter pulled off would take about 3000 ft. But, painter 75 person sternwhips.

Note 2: All debris marcelle usually found on deck, with exception of one steel and sounding board which probably are from pilot house.
Received from CGC NAUHATUCK
1830 - 12, November '75

3 ea. Air Tanks - Lifeboat
1 ea. Bumper Block, with line
1 ea. Propane Cylinder
3 ea. Lifeboat Cans

Signed by
DC Maxie, Lt, USCG

DATE - TIME GROUP | PRECEDENCE | ACTION | INFO
--- | --- | --- | ---

DRAFTED BY: | RELEASED BY: | 

SECURITY CLASSIFICATION -

PREVIOUS EDITIONS MAY BE USED
Evening of 12 Nov at Bear Sea
from 40° UT East

1 ea. Steel Boat or
1 ea. 2" x 12" plank about 12' long
1 ea. Chain Hook Type
1 ea. 9" x 6" plank about 15' long
1 ea. 2" x 12" plank broken ship 5' long
1 ea. Propose Tank Valve Cover
about 1/2 in diameter x 4 ft long

DC Maric, Lt USCG
Rec'd from Rincheloe, (Eastport) 11/2/75

1 ea. Life Preservers
1 ea. Air
2 ea. inflatable decks for rafts
1 ea. sounding board

Delivered 11/14/75
1 ea. Liferaft (self-inflatable) 4 ft 14/16
with CO2 Tank & Canopy

Received from Roger Durr

7 ea. Life rings with Fittred
4 ea. Life Preservers - Cork
2 ea. Flotation - Cork
5 ea. Cans
1 ea. Section of Fiberglass
1 ea. Tread
1 ea. Section of Wooden Teakel
1 ea. Aluminum Tank, 6.4 CU ft

Rec'd from PC 45873, (Ketchikan)

2 ea. Life Rigs
1 ea. On Board
3 ea. Pieces, Tack, 6 to 6 ft
Assorted Acute Wood
Weather Data - 11.5

From Hamilton Street Agency
10th & 11th December 1975

[Signature]
ALL STATIONS IN EFFECT ON THE FOLLOWING WATERS:

WATERFORD BAY...WATERFORD Fmts TO INCLUDE STRAIT.
The 60.6 KNOTS ARE 10 TO 15 KNOTS WITH OCCASIONAL HUDDLE.

The STRAIT OF MACKINAC...FOG HAZARD NEAR TO WET FOG.

SHOWERS FALLING TEMPERATURES THIS AFTERNOON...TONIGHT.

SHOWERS...HIGH TEMPERATURES AT SHORE...MILE IS 50 DEGREES.

17/1975 SSV R V K
LV 18 K GCN An
MM MA x GW An
MD SH x GC An

as CH 1/04 05

the national weather service...at 06:00.

All SSV R V K

The strait of Mackinac...10 to 15 knots with occasional huddle.

The strait of Mackinac...fog hazard near to wet fog.

Showers falling temperatures this afternoon...tonight.

High temperatures at shore...mile is 50 degrees.

1/1975 SSV R V K
LV 18 K GCN An
MM MA x GW An
MD SH x GC An
ALBAY TO BILL FOR NEW RESPONSES

ONCE MORE FOR THE NEXT WEEK, FUNDING PROBLEMS FOR IPA AND
WALKER. INTEREST IN 2004 THOUGHT THAT FUNDING UP TO DATE WOULD
REMEMBER LACK TIME THOUGH LEGISLATION BUT NOT SURE THAT WOULD
BE ENOUGH. AT THIS POINT FUNDING WOULD BE CRUCIAL FOR NEW
WALKER AND TANDON. IF ipA AND TANDON, THEN WOULD NEED CHANGED WITH
THIS SITUATION. WOULD NEED TO WEAVE FUNDING BY IPA AND TANDON.

WALKER PERCENTS TO MOVE UP AND CONSIDER its NEW
WEAR THE OPTIONS ACROSS LIFESTYLE WITH WALKER LIVING SOUTH
AND MEDICAL.

LIFESTYLE LIVING

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WALKER PERCENTAGE MOVING UP AND CONSIDER its NEW
WEAR THE OPTIONS ACROSS LIFESTYLE WITH WALKER LIVING SOUTH
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WALKER PERCENTAGE MOVING UP AND CONSIDER its NEW
WEAR THE OPTIONS ACROSS LIFESTYLE WITH WALKER LIVING SOUTH
AND MEDICAL.
OUTLOOK FOR SATURDAY NIGHT THROUGH MONDAY:

LAKES SUPERIOR

WINDS LESS THAN 10 KNOTS, CHANCE OF SHOWERS.

LAKES HURON

WINDS LESS THAN 10 KNOTS, CHANCE OF SHOWERS.

LAKES ERIE ANDONTARIO

WINDS LESS THAN 10 KNOTS, CHANCE OF SHOWERS.

LAKES MICHIGAN

WINDS LESS THAN 10 KNOTS, CHANCE OF SHOWERS.

WEDNESDAY NIGHT THROUGH THURSDAY:

LAKES SUPERIOR

WINDS LESS THAN 10 KNOTS, CHANCE OF SHOWERS.

LAKES HURON

WINDS LESS THAN 10 KNOTS, CHANCE OF SHOWERS.

LAKES ERIE ANDONTARIO

WINDS LESS THAN 10 KNOTS, CHANCE OF SHOWERS.

LAKES MICHIGAN

WINDS LESS THAN 10 KNOTS, CHANCE OF SHOWERS.

FRIDAY NIGHT THROUGH SATURDAY:

LAKES SUPERIOR

WINDS LESS THAN 10 KNOTS, CHANCE OF SHOWERS.

LAKES HURON

WINDS LESS THAN 10 KNOTS, CHANCE OF SHOWERS.

LAKES ERIE ANDONTARIO

WINDS LESS THAN 10 KNOTS, CHANCE OF SHOWERS.

LAKES MICHIGAN

WINDS LESS THAN 10 KNOTS, CHANCE OF SHOWERS.

SUNRISE AND SUNSET:

LAKES SUPERIOR

SUNRISE 1015, SUNSET 2030.

LAKES HURON

SUNRISE 1015, SUNSET 2030.

LAKES ERIE ANDONTARIO

SUNRISE 1015, SUNSET 2030.

LAKES MICHIGAN

SUNRISE 1015, SUNSET 2030.
SAN ANTONIO, TX, 28 APR 1979

NATIONAL WEATHER SERVICE, SALEM, OREGON

FAX 445-5700, TUE, JUL 11, 1979

SATELLITE FLOOD ATTN

NICHT отметить данные:

WEATHER FORECAST:

WINDS...WEST TO NORTHEAST 10-20 KNOTS DIMINISHING TO 5-10 KNOTS BY THIS AFTERNOON, BECOMING SOUTHEAST 5-15 KNOTS THIS EVENING AND INCREASING TO 10-20 KNOTS TONIGHT. WINDS...1-5 KNOT SLOWLY INCREASING TO CALM TO 1 FOOT TODAY.

TIDES...HIDDEN VIRGE

INCREASED POINT TO CALM POINT

WINDS...WEST TO NORTHEAST 10-20 KNOTS DIMINISHING TO 5-10 KNOTS DECREASING SLOWLY SOUTHEAST 5-15 KNOTS THIS EVENING AND INCREASING TO 10-20 KNOTS TONIGHT. WINDS...1-5 KNOTS SLOWLY INCREASING TO CALM TO 1 FOOT TODAY.

TIDES...HIDDEN VIRGE

SPECTACULAR...NOW TO 10 INCHES

WINDS...SOUTHEAST 10-20 KNOTS DECREASING SOUTHEAST 10-15 KNOTS THIS AFTERNOON, INCREASING TO 10-20 KNOTS TONIGHT, WINDS...1-5 KNOTS SLOWLY INCREASING TO CALM TO 1 FOOT TODAY.

WEATHER OVER THE NEXT 2 DAYS WILL BE MOSTLY CLOUDY WITH SCATTERED SHOWERS.

WATER TEMPERATURE AT SALT LAKE RANGE IS 50 DEGREES.

TIDAL FORECAST FOR: IN THE ASSOCIATE IN THE GULF SHORES IN THE 45TH.

11/22252 DEG N 45K

BE ENSA DESK 45K

IN 24 HOURS 45K
WHITEFRIARS Saturday 19 July 1976

An open-air evening meeting for young people

The meeting will be held at 8.00 p.m. on Saturday 23 July 1976 at the Church of St. Paul, Whitefriars, London SW1.

The meeting will be open to all young people who wish to attend. There will be an opportunity for young people to bring their own ideas and suggestions to the meeting.

Outlook for weather: Cloudy with a chance of light rain.

Date of next meeting: 27 July 1976

Please contact...
...
...
...
Chief LeFevre - CIC, 11/1/92 - 1715

Figueroa cell (101, Mendocino)

1650 E 85 - 25 - 1715

Rialto, 118-20, 1874 - 25

M. Residence was said of his

son in the camp. It should

linked to check to see if it could be

been. Whispers filled the air

are asked, they did not know what

the place would be needed. When

in turns and the importance to the

Figueroa. No other cell, any

operations of Figueroaichael.
Meeting of Soo on 13 November 1915

With Company Agents

Donald D. Thompson - Exec. Vice-Prs.
Edgar M. Jacobsen - Secy. & Prs.

S. A. Thomas - Gen. Counsel

SS No. 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31

Thomas O. Murphy - Librarian - Support - Murphy
Radar Conversations with Office from time of departure - Suspicion?

Supervision - S&K Cleveland

Canadian U.S. Waters - Are Canadian investigating?

District Dept.

TOR & Crew Shortage report for entire season

Obtain from MVP

Photos of debris - Location - Collection

NIO SW Goose

Work file - Repairing - Requirements - New Model

Company

Vessel report - Copy / Humes

Temporary sounds from Chew.
- See Content -
- Browse on content -

... Other ships in section...
Not B Included in this list.
(Without any food, water, medical supplies)
Born FREE & Now FREE.
Start with...

Station Heart Throes - City of Hope -
Statement now or until SWIGER - (Are there tapes?)
Confirm anybody's calls.
- Under the Date -
- All present - sign above

Considerate wishes
Mr. Superior:
Roger Blough - DIB
Jesse - DIB
Cygler - DIB
Coad - DIB

- 3 Selmas?

William Clay Ford

24th March 1948
Ruble, Marguerite
Upton, Lott
From C.E. DelRos
11/13/75 BFNRI

(CST) 1757 - Action of Whitfield
C.T. Blackman - at PM

(CST) 1900 - 170.8 - 11" gage - 6" Nipple

3415.71 = 7.6 lbs.

11.5 lbs.

between 2000 & 3100 CST blue bell

with full bell

Don
# 19

Correspondence—Miscellaneous
From: Commandant
To: Commander, Ninth Coast Guard District (m)

Subj: Substitution of Inflatable Liferafts for Lifeboats; Great Lakes Vessels

Ref: (a) CCGD(m) ltr dtd 19 Mar '74, file 9320
(b) 46 CFR 94.10-40
(c) 46 CFR 94.10-55(d)

1. Reference (a) forwarded correspondence from the American Ship Building Company, Lorain, Ohio, requesting authorization to equip two vessels under construction for Great Lakes service with inflatable liferafts in lieu of lifeboats. Your forwarding endorsement recommended favorable consideration be given to their request.

2. The specific proposal of the American Ship Building Company is not acceptable; however, actual experience, testing programs and the research and development program underway on the Great Lakes do indicate that alternates to those items now specified in the regulations may be acceptable. Accordingly, under the authority of 46 CFR 94.10-55(d), you are authorized to permit the following substitution for lifeboats and related equipment on new and existing Great Lakes vessels:

   a. Sufficient Coast Guard approved davit launch inflatable liferafts on each side of the vessel to accommodate 100% of the total persons allowed.

   b. A minimum of one Coast Guard approved inflatable liferaft launching device shall be provided on each side of the vessel. On vessels with both aft and forward accommodation spaces, one launching device shall be located aft and one at the forward accommodation space on the opposite side of the vessel. Operation of the raft launching system shall not require anyone to remain on board. Installation shall meet the requirements outlined in 46 CFR 75.27 and 75.37.

   c. In addition to the required davit launch rafts, there shall be sufficient float free type inflatable rafts provided with capacity to accommodate not less than 50% of the total persons allowed on board. On vessels with both aft and forward accommodation spaces, the float free rafts shall be divided between the two spaces in proportion to the number of persons normally carried at each location.
Subj: Substitution of Inflatable Liferafts for Lifeboats; Great Lakes Vessels

d. An open water rescue boat with a davit or other suitable launching gear capable of launch by no more than two men.

3. The sixteen foot boat proposed by the American Ship Building Company is not considered suitable to meet the requirements of a rescue boat. Until such time as specific boats are approved, the performance criteria of 94.10-5(e)(1) applies. Final acceptance of a rescue boat will be subject to concurrence by this office. Submit a description of the craft, testing program and results to G-WF-3 for review. Prior coordination would be appropriate to assure minimum delays.

4. This office is to be kept informed of any difficulties in administering this program.

/\[Signature\]/
W. M. Bennett
Chief, Office of Merchant Marine Safety

typed 24 July 1974
December 8, 1975

Captain Walter C. Ochman  
Chief, Marine Safety Division  
Ninth Coast Guard District  
1240 East Ninth Street  
Cleveland, Ohio 44199

Dear Captain Ochman:

Oglebay Norton Company has been asked to produce certain documents in connection with the Coast Guard Board of Inquiry into the sinking of the Fitzgerald and we have been instructed during the adjournment of the hearing to deliver these documents to you. Xerox copies are enclosed herewith as follows:

1. Captain's vessel orders (requisitions) for 1975.
2. Engineer's vessel orders (requisitions) for 1975.
4. Electrical one-line diagram.
6. (a) Purchase invoice dated April 14, 1967 for the 20 person Switlik life raft in the amount of $1,707;
   (b) Purchase invoice dated May 4, 1967 for the 25 person Switlik life raft in the amount of $1,997.60;
   (c) Service inspection certificates for both life rafts dated February 24, 1975 issued by Samsel Rope & Marine Supply Company.
7. Blank forms used by Oglebay Norton for General Condition Inspection for deck and steward departments. No forms have been devised for engine department.

Equal 2(g)
includes two damages to ballast tanks, both of which were repaired by dock crew. This report also includes damage to the upper radar antenna which was replaced by Sperry on September 28, 1975 at Toledo.

9. Accident reports, including company departmental records and casualty, GLPA, ABS, U.S. Salvage, Coast Guard and American Ship Building invoice [(a) only] for casualties as follows:

(a) Casualty of June 9, 1972 involving damage to propeller while vessel was maneuvering astern at the CGO Dock in Toledo. The damage was repaired in dry dock during the winter of 1973-1974.

(b) Casualty of May 4, 1973, struck lock wall. The damage was confined to the port side #2 and #3 ballast tanks and was repaired January 1974.

10. Mixing and Feeding Instructions on use of Zimmite.

11. Charter between The Northwestern Mutual Life Insurance Company and Oglebay Norton Company. (Consideration to be given to substitution by affidavit after examination of Charter by Board).

12. Service records for electronic equipment.

In answer to questions propounded by the Board, we respond as follows:

1. Engineers do not make entries in the engine room logs for the period in which the engines are off automatic and on manual operations.

2. No prior deck logs have been found and it is believed that they went down with the vessel.

3. Venting procedures are determined by the master in accordance with good safety practices.

4. The repair to the damage to No. 8 hatch is included in the invoice of Hans Hansen dated May 22, 1975 in the amount of $3,774.21 contained in requisitions and invoices for the deck department referred to in 1.

5. No repairs were required to be made to ballast pumps during the past three years other than routine crew maintenance. ABS surveys have already been produced and ballast pump inspections appear on the Continuous Machinery Survey.
6. There are no instructions as to what specifically should be included in the office logs.

Very truly yours,
Chairman, Marine Board of Investigation  
c/o Commander Ninth  
Coast Guard District  
1240 E. 9th Street  
Cleveland, Ohio 44199

December 3, 1975

Dear Sir:

On November 25, 1975 Burlington Northern employees Donald L. Amys and Clarence Dennis were subpoenaed to Cleveland to give testimony before the Marine Board investigating the sinking of the ore boat Fitzgerald. At the conclusion of their testimony the Board asked to be furnished with further facts on other boat loadings at Superior and also with respect to the identity of any visitors to the Fitzgerald on November 9, 1975. This letter is intended as a response to the Board's request.

Burlington Northern's records show that the previous loading from the east side of Dock No. 1 at Superior was on November 7, 1975 when the vessel J. H. Thompson took on 21,128 long tons of National taconite pellets. The draft readings provided us by ship personnel after that loading was complete were 26'6" forward and 26'10" aft. The loading at the east side of Dock No. 1 following the Fitzgerald on November 9, 1975 was made on November 11, 1975. On that date the vessel J. H. Frantz was loaded with 11,605 long tons of National taconite pellets. The draft readings were 19'3" forward and 20'1" aft.

Enclosed you will find a photocopy of the identification sheet kept at Burlington Northern's ore dock gate with respect to the Fitzgerald on November 9, 1975. The persons listed thereon as having passed through the gate are presumed to be Fitzgerald personnel and are not otherwise known to Burlington Northern. The figures listed in
Chairman, Marine Board
of Investigation
Page 2
December 3, 1975

the pass number column do not identify any passes issued by Burlington Northern. In addition to the above persons, I am advised that Mr. Herb Nelson representing the M. E. B. R. entered our premises at 8:00 a.m. on November 9, 1975 and apparently boarded the Fitzgerald. We have no knowledge as to the time of Mr. Nelson's departure.

Very truly yours,

[Signature]

Richard V. Wicka

RVW/dw/3
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**Remarks**

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From: Chief, Merchant Marine Technical Branch, Ninth Coast Guard District
To: Chairman, Marine Board of Investigation into the Sinking of the SS EDMUND FITZGERALD, O.N. 277,437, with Loss of Life
Via: Chief, Marine Safety Division, Ninth Coast Guard District
Commander, Ninth Coast Guard District

Subj: Information to the Marine Board of Investigation, forwarding of

1. Forwarded herein is the information requested by the Marine Board of Investigation on 25 November 1975.

2. Enclosure (1) is the request for a waiver of the stability test on the SS EDMUND FITZGERALD, O.N. 277,437 (GLEW HULL No. 301) from Great Lakes Engineering Works. Enclosure (2) is the Coast Guard response dated 28 July 1958, granting a waiver of a stability test for the aforementioned vessel.

3. Enclosures (3) and (4) are copies of the "file copies" of the COMMANDER (m), Ninth Coast Guard District letter, file 5948, dated 14 June 1973; one type addressed "SENT TO INDUSTRIES" and the other addressed to the American Bureau of Shipping, Cleveland, Ohio. Interviews with the clerical staff of the Ninth Coast Guard District, Marine Safety Division, indicates that no documented mailing list is available for "INDUSTRIES" distribution.

R. W. MASON
LCDR, U.S.C.G.

Encl: (1) Great Lakes Engineering Works letter dated 24 July 1958
(2) CCGD9 (m) letter to Great Lakes Engineering Works dtd 28 July 1958
(3) CCGD9 (m) ltr, file 5948, dtd 14 June 1973 - SENT TO INDUSTRIES
(4) CCGD9 (m) ltr, file 5948, dtd 14 June 1973 - to A.B.S., Cleveland

5 December 1975

From: Commander, Ninth Coast Guard District (m)
To: Chairman, Marine Board of Investigation

1. Delivered.

W. C. OCHMAN
By direction
Commander
9th Coast Guard District
Main Post Office Building
Cleveland 13, Ohio

Subject: G.L.E.W. Hull No. 301

Gentlemen:

We desire to apply for a waiver of your requirement for a stability test on our Hull No. 301.

The vessel is the conventional type of bulk freighter intended for service on the Great Lakes and St. Lawrence River, and such vessels inherently possess the characteristic of large G.M.

Your advice would be appreciated respecting any information required by you in support of a formal application for a waiver of this requirement.

Very truly yours,

GREAT LAKES ENGINEERING WORKS

[Signature]

Naval Architect

T. Corin/be
Great Lakes Engineering Works
River Rouge 18, Michigan

Attention: Mr. T. Corin, Naval Architect

Subject: OIL W. H. 301 - Stability Test

Gentlemen:

With regard to the information requested in your letter of 24 July 1958 you are advised that even though the subject vessel will be used in the St. Lawrence Seaway trade a stability test will not be required. In the past, stability tests have not been required for Great Lakes bulk ore or grain carriers and it is not contemplated that tests will be required in the future unless there is a radical change over present design.

The only Great Lakes freighters that are required to be inclined at the present time are self-unloaders of the conveyor built and barge unloading type.

Very truly yours,

C. T. FITZGERALD
Commander, U. S. Coast Guard
Marine Inspection Officer
By direction of the District Commander

Copy to:

COMDT (CNS) w/1 copy CES ltr.
OCUS, Detroit w/1 copy CES ltr.

26 July 1958
Subj: Great Lakes Load Lines
Rule Revision
Coast Guard Approval Action

Ref: (a) Federal Register, Vol. 38, No. 90, dated 10 May 1973

Gentlemen:

The new Great Lakes Load Line Regulations published in reference (a) include several paragraphs where action by the Coast Guard is required. This letter will explain Coast Guard review/approval procedures and should answer many questions which have been raised as to submittal requirements. American Bureau of Shipping requirements can be obtained from their Cleveland Office.

Several regulations call for approval by the Commandant. It is recommended your submittals for this approval be forwarded to the Coast Guard Merchant Marine Technical Office in Cleveland.

Vessels under construction will be reviewed during the certification plan review and approval and therefore pose no problem. Submittals will be required for existing vessels as outlined below, and when the Coast Guard has completed its review, the load line assigning authority will be so notified. We recognize the interest in promptly taking advantage of the new regulations and will expedite our procedures as much as possible.

46 CFR 45.105 calls for information approved by the Commandant to be on board each vessel for guidance of the master in the loading and the stability of his vessel. For all vessels a loading manual should be submitted containing as a minimum the information below:

(a) Full load condition at each assigned Load Line Mark
(b) Ballast Condition
(c) Cubic Cargo Condition
(d) Conditions of Special Loading such as progressive loading from one end or pinpoint loading
(e) Bending moment curves for the above loading conditions.

There is no format prescribed at present. We will accept what has been past practice for the time being. When and if a standard form is developed and prescribed, we will allow time for notice and revision. The assigning authority should be directed to forward their stamped approved copies to us so that we may affix our approval stamp. We will then return the CG and ABS approved loading manual to the submitter for placement on the vessel.

As regards to stability, straight deck bulk carriers and certain barges will be accepted with no required submittals. For all self-unloaders, data and calculations should be submitted giving the information below:

(a) Date of Stability test
(b) Copy of present Stability Letter
(c) Weight added calculations for the loading conditions contained in the new Loading Manual and showing the resultant G.M.

Should basic stability data not be available then the vessel may require Inclining.

46 CFR 45.107 calls for approval by the Commandant of the structural strength of the hull. A Midships Section Drawing and Scantling Plan should be submitted for review and evaluation. This Midships Section drawing should include calculations of the Section Modulus to the Deck and to the Bottom.

If questions arise related to the new regulations in general or to a particular vessel, please do not hesitate to contact us. Additional copies of the regulations may be obtained from our Merchant Marine Technical Office.

Very truly yours,

[Signature]

J. H. AUSTIN
Captain, U.S. Coast Guard
Chief, Marine Safety Division
By direction of Commander
Ninth Coast Guard District
American Bureau of Shipping

Great Lakes Department
815 Superior Avenue
Cleveland, Ohio 44114

Attention Mr. George Fialk
Principal Surveyor for Great Lakes

Subj: Great Lakes Load Lines
Rule Revision
Coast Guard Approval Action

Ref: (a) Federal Register, Vol. 33, No. 90, dated 10 May 1973

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Very truly yours,

J. R. AUSTIN
Captain, U.S. Coast Guard
Chief, Marine Safety Division
By direction of Commander
Ninth Coast Guard District

[Signature]

CCGGD9(m) ltr 5948 dtd 14 June 1973

DCG/INGHAM:ajk 6-14-73
From: Commandant  
To: Chairman, Marine Board of Investigation  
Subj: SS Edmund Fitzgerald  
Electric Floating Waterlight  
Ref: (a) Your letter of 28 November 1975

1. The information and a sample end cap submitted with reference (a) have been reviewed. The manufacturer of this particular waterlight is Automatic Lite Company.

2. This company received approval number 161.010/3/0 on 19 May 1972 for their waterlight design. Early in 1974, G-MMT began receiving failure reports on this light. One of the problems was the case and end caps were made from different materials. After the light was in service for a while, the two materials became dimensionally incompatible and the caps loosened and fell or pulled out very easily.

3. Shortly after receipt of the failure reports on the 161.010/3/0 waterlight, the manufacturer was notified of the failures. The manufacturer redesigned the waterlight to correct the deficiencies and on 18 March 1975 received a new approval number 161.010/3/1. The manufacturer also agreed to stop shipments of the 161.010/3/0 model waterlight.

4. It was considered to be impractical to recall the 161.010/3/0 model waterlights which were in service. Therefore, the end caps recovered from the SS Edmund Fitzgerald are probably from a 161.010/3/0 model waterlight. However, a positive identification is not possible.

5. The information we have received from several sources including reference (a) indicates that there may be some problems with the floating waterlight specification. This specification is being reviewed and changes as necessary will be proposed. Two specific requirements being reviewed are the weathering test and the requirement for 16 threads per inch for the end caps.
September 9, 1976

Captain James Wilson
Cdr. (m) 9th Coast Guard District
1240 E. 9th Street
Cleveland, Ohio 44199

Re: Steamer Edmund Fitzgerald

Dear Captain Wilson:

In accordance with our telephone conversation yesterday, enclosed herewith is a xerox copy of the articles published in the Milwaukee newspapers, to which I referred.

Very truly yours

[Signature]

Enc.
Survey Studied in Ship Sinking

Cleveland, Ohio — AP — A three volume report on a naval survey of the sinking of the ore carrier Edmund Fitzgerald has been completed, but it will be at least two months before hearings into the disaster will be resumed.

A Coast Guard spokesman said Wednesday that there was only one copy of the report available, and it was being passed from one member of the Coast Guard board of inquiry to another.

The 10 inch thick report was prepared by the Naval Undersea Laboratory at San Diego, Calif., based on pictures of the wreckage taken at the bottom of Lake Superior from a vessel equipped with television cameras.

The Fitzgerald sank in a storm last Nov. 10. All 29 members of its crew perished.

The hearings were recessed pending the naval survey of the wreckage, which was delayed until spring because of the difficulties of operating on the lake in winter weather.

The spokesman, Lt. Dan Shotwell, said the hearings would be resumed after the board members have had a chance to review the report.

He said photographs taken from the television film were a part of the report and would not be released until the entire report was made public.
From: Recorder, Marine Board of Investigation
To: CAPT J. A. Wilson, USCG, Member, Marine Board of Investigation

Subj: Logs from USCG Group, Sault Ste. Marie, Exhibits to Marine Board

1. At the end of CAPT Millradt's testimony before the Marine Board he was requested to forward some additional information to the Board, and I was instructed to make this a part of Exhibit 81 (T. 1866). On reviewing the exhibits recently, I find that the information was received from CAPT Millradt but never made part of the exhibits.

2. The enclosure, consisting of a complete set of information from USCG Group, Sault Ste. Marie, has been marked 81-CC through -SS. The original of exhibit 81A-GG is in your custody in Cleveland. Would you please discard pages 81-CC through 81-GG and substitute the enclosure for them.

3. A copy of new pages 81-CC through 81-SS is enclosed for your copy of the exhibits.

C. S. LOOSMORE

Encl: (1) pp. 81-CC - 81-SS, w/one copy

Copies to:
RADM W. W. Barrow, w/copy of encl
CAPT A. S. Zabinski, w/copy of encl
From: Recorder, Marine Board of Investigation
To: Chairman, Marine Board of Investigation

Subj: Additional Exhibits to Marine Board

1. Since the last formal session of the Marine Board, there have been several items which you have said would have to be made exhibits to the Board. I have reviewed the materials I have and, as far as I can tell, the following items should be made exhibits to the Board.

   3. Special Examination (Spar Deck Examination), M10 Cleveland, 10-17-74
   4. CCGD9 SAR Plan
   5. CCGDNINE INST 3120.3F, 19 November 1974, (Vessel Employment Schedule)
   6. CO USCGAS Traverse City, MI, letter 3130, 29 January 1976 (Analysis of FITZGERALD SAR Case)
   7. Field Sheet 3908, Canadian Hydrographic Service

2. I believe that these items can be entered as exhibits to the Marine Board on your written order, without reconvening the Marine Board. Accordingly, I have prepared a draft of an order admitting them and a draft of a letter to the representatives of the Parties in Interest advising them of your intention to admit these additional exhibits.
Subj: Additional Exhibits to Marine Board

3. Also enclosed is a list of the exhibits to the Board, which includes those yet to be entered.

C. S. LOOMMORE

Encl: (1) Draft, Order Admitting Exhibits
(2) Draft, Letter to Representatives of Parties in Interest
(3) List of Exhibits to the Board

Copies to:
CAPT A. S. Zabinski, w/copies of encls
CAPT J. A. Wilson, w/copies of encls
U. S. Coast Guard Analysis of FITZGERALD SAR Case
From: Commanding Officer, USCG Air Station Traverse City
To: Commander, Ninth Coast Guard District (osr)

Subj: Local analysis of Steamer Fitzgerald SAR case

1. The enclosed analysis is forwarded for your information and use as you deem appropriate.

2. As in any large scale effort, the Coast Guard received considerable assistance from other sources. If it has not already been done, I suggest that the District Commander address letters of appreciation to each of the following:

   a. The Masters and owners of the M/V's who aided in the search, particularly the Arthur M. ANDERSON.

   b. Kincheloe AFB Operations and Transient Alert personnel, and the units which provided the fuel truck and personnel who manned it for long hours at Whitefish Point.

   c. Canadian personnel manning the tower and Flight Service Station at Sault Ste. Marie, Canada Airport for their cooperation and assistance.

   C.A. BIONDO

Encl: (1) Comments on Steamer Edmund Fitzgerald SAR case
COMMENTS ON STEAMER EDMUND FITZGERALD SAR CASE

1. On the night of 11 November 1975, Ninth District SAR forces entered into a massive search for survivors of the ill-fated Steamer Edmund Fitzgerald. The management and the conduct of the units involved were excellent but, in our view, some problem areas were evident. This brief analysis is submitted in the hope that both the good and the not-so-good can be highlighted and used to promote greater efficiency in future large scale SAR efforts. The conclusions contained herein are based solely on information available locally, i.e., from the unit case file and from our participating personnel. We made no effort to obtain information from other sources. It is possible, therefore, that some of the items we see as "problems" were unavoidable. It should also be remembered that, though we may learn from this case, there was nothing done or undone which would have made any difference in the outcome.

2. The major difficulties we see were:
   a. Delay in response.
   b. Confusion regarding control.
   c. Problems in communication.

3. The amount of time which elapsed between initial notification of the Coast Guard (110125Z) and the arrival of the first Coast Guard unit on scene (110353Z) was an item of major concern. We know of several factors which contributed to the delay, but cannot account for the delay in RCC's being notified by Group 500 nor the delay in the Air Station being notified by RCC. It may well be that the disaster was so sudden, the information so vague, and the inclination to disbelieve such a disaster could occur so strong that there was a natural tendency to obtain better information before acting. This would easily account for the fifteen minutes which passed before Group 500 advised RCC of the M/V Anderson's call. Similarly, the factors above, as well as the weather (winds of 45 knots gusting to 75 and seas of 20 - 25 feet) and attempts to find assisting units closer to the scene caused RCC to delay an additional thirty-five minutes before notifying the Air Station. Even then, the Controller was uncertain as to whether a distress existed and was only seeking information as to whether an HU-16E could be launched in the existing weather. Another five minutes passed before the Air Station replied that we could launch an aircraft and asked if flares were desired. Apparently this led to another brief delay, by raising the question of who had the authority to order flares placed aboard the aircraft. (Recent changes in the three senior Air Station billets and in District billets, infrequent use of the flares, and restrictions placed upon their use because of the fatal 1974 HU16 accident created the uncertainty.) The ensuing discussion was resolved as soon as the Commanding Officer was called, but time had already been lost. Delivery of the flares from the bunker to the aircraft, and their loading, caused additional delay. And, finally, mechanical difficulties with the primer on one engine of the ready HU16 prevented a normal start. Evaluation of the problem, weighing of alternatives, and final starting of the engine by emergency procedures consumed still more time. The combination of all factors resulted in the aircraft not becoming airborne until 51 minutes (110306Z) after the Air Station was initially called. Nevertheless, the aircraft was on scene
at 110353Z, one hour and thirty-eight minutes after we received the first call from RCC, but a full two hours and twenty-eight minutes from the time that Group 500 received the Anderson's transmission. Our records also indicate that at approximately the time the aircraft was getting airborne, ships in the Whitefish Bay area were requested to diver and search (110300Z).

4. Before proceeding, I will comment on the foregoing. Even as I realize how easy hindsight makes it to determine what decisions should have been made, I do feel strongly that:

a. We should have immediately assumed that a distress did exist and acted accordingly. The Lakes have a long history of sudden sinkings. The information provided, sketchy as it was, fit well into the historical pattern and was at least as meaningful and positive as routine flare sightings. Efforts to obtain additional information were appropriate but should have been pursued while rescue forces were getting underway.

b. Uncertainty over the loading of the flares simply should not have existed. There was no question of their potential usefulness on that first night and they should have been put aboard without hesitation. Nevertheless, some questions did exist. These have been resolved internally.

5. The second problem described by my pilots and duty officers centered about confusion as to who was controlling the search. There were several instances of aircraft movements directed by Group Sault Ste Marie. Although the Group may have been relaying instructions from RCC, it appeared that the Group was acting as SMC, although not apparently designated as such.

a. After being released from scene and arriving at Kincheloe AFB at 110711Z and 110804Z respectively, the crews of HH-52A 1428 and 1372 had been told by the Air Station ODO to get some rest. They were advised that fresh crews would be flown in by HU-16E to fly the helos on first light searches, and later they would switch places with those crews for afternoon searches. The crews retired to their reserved quarters. Meanwhile the two HU-16's had landed at Kincheloe to transfer flares and conduct relief of OSC. At approximately 110940Z, the crews were directed by the Group, without the knowledge of the Air Station, to get airborne again because a lifeboat had been reported sighted. All four aircraft got airborne again, with the HH-52 1428 subsequently advised to return to Kincheloe AFB, before ever reaching the scene, since the 1428 was not equipped with the Nite Sun and no survivors had been sighted. Because the aircraft had been launched before any flares were transferred between the HU-16's, the 1016 orbited at 4500 to 6500 ft. to reduce the mid-air collision hazard, while the 7236 attempted to simultaneously drop flares for the Anderson, search for survivors, and perform the duties of OSC until able to pass these duties to the 1016. The C-130 1349, also directed by the Group to the vicinity of the Anderson to drop flares, complicated the problem of aircraft separation even further. The confined area (approximately 30 sq. miles), low visibility, darkness, and lack of previous sightings of survivors should have prompted a single aircraft response, instead of the five that were sent to investigate the lifeboat sighting. The 1428 was again launched at 111255Z with its original crew, by direction of the Group and request of the OSC, without consultation with the Air Station, in an abortive attempt to maintain continuous helo coverage on scene, in the event survivors might be sighted. Mean-
while the Air Station was planning the use of pilots and aircraft on the basis of requirements provided by RCC and the rest time we thought our pilots were getting. The intermittent use of the aircraft without Air Station knowledge resulted in a total lack of rest for the pilots involved and, unknown to us until later, caused unnecessary violations of the parameters of CG-333.

b. In the late afternoon of the 11th, the Group diverted one of the on scene helicopters to check out a report of a "man on a log" off Jackson Island. The HU-16E 7236 monitored the conversation, advised the OSC and also diverted to investigate since they were not far north of the helicopter. Information on the exact location of Jackson Island and the position of the man on the log in relation to the island was initially confusing and slow in coming from the Group. Poor weather and the close proximity of the reported sighting to the control zone of the Sault Ste. Marie, Canada Airport resulted in the HU-16E departing to return to its assigned search area. The helicopter located the log but found it was only a branch that looked like a man. Once again, it appears that Group S00 was exercising direct control over the aircraft on scene when, in this case, the information should have been passed to the OSC for his action.

c. Some communications breakdowns between the RCC, the Air Station, the Group, and the units on scene created quite a bit of confusion and mishandling of the quarters arrangements and staging area for the aircraft. Reservations for eight aircrewmembers, at Kincheloe AFB, had initially been made by the Air Station to provide a place to sleep for whichever crews were on deck from Traverse City. No one apparently made reservations for the C-130 crews, although the relief crew was apparently able to find quarters when they first arrived. During the daylight search the helo crews recommended and the C-130 OSC concurred that the best place to stage the helos on the second night was Sault Ste. Marie, Canada, since it was 12 to 14 miles closer to scene. Arrangements were made for blanket customs clearance and motel reservations. The Air Station Commanding Officer was led to believe the plan had been changed from Kincheloe to Sault Ste. Marie, Michigan. Seeing no sense in that arrangement, due to lack of fuel for the HU-16E planned to ferry in fresh crews, and a shorter runway, plus garbled word that they were going to land at the S00 and drive to Kincheloe for quarters, the crews were ordered to land at Kincheloe. The crews meanwhile were aware that quarters were no longer available at Kincheloe, but the Air Station Commanding Officer was not. The result was the helos landed at Kincheloe and drove 20 miles back and forth to motel accommodations at Sault Ste. Marie, Michigan. In this case, the OSC and the search aircraft were attempting to position themselves for maximum effectiveness but failed to pass accurate information to the Air Station Commanding Officer, who in turn was trying to facilitate the transfer of relief crews and ensure proper crew rest. In this case, however, the action of the Commanding Officer achieved just the opposite.

6. In general, communications, other than immediate on scene control, were very poor leading directly to misunderstanding and error.

a. During the first daylight searches, C-130 1349 acting as OSC was assigning new search areas to units on scene while message traffic from RCC was using the same designators to define completely different areas for the units on scene.
b. On scene communications quality was excellent but there was no reliable direct link between the SMC (District) and the OSC. The consequent reliance on VHF-FM comms via the Group and the use of Channel 12 as primary On Scene Control frequency, contributed to the confusion as to who was controlling and coordinating the search efforts. Similarly, communication between the Air Station and its aircraft was virtually non-existent. This problem may be solved in the near future if the new HF antenna system for the Air Station is approved by the Commandant. In view of recent setbacks in the A&I project for the new hangar to which the antenna system is tied, a recommendation for separate, immediate action is indicated.

7. Finally, some additional evaluations of various techniques and equipment:

a. The HH-3F would have been a much more capable aircraft than the HH-52A in this case. Perhaps sufficient justification could be found for the overall SAR, Aids to Navigation, and Ice Observation missions to merit replacing the HH-52A with the HH-3F at Traverse City. The HH-52A weight carrying capacity and related fuel endurance required the first helo airborne, (1372), which had the Night Sun aboard, to refuel at Kinfelhoe enroute scene in order to have enough endurance for a meaningful search effort. Also the high winds from the NW and the distance to scene, coupled with the slow cruise speed of the HH-52A, resulted in long transit times from both Traverse City and Kinfelhoe AFB. The first helicopter on scene (1428) took 76 minutes to travel 115 miles direct from Traverse City. The 1372, with a fuel stop at Kinfelhoe AFB, took 157 minutes to reach the scene. Average time for sorties from Kinfelhoe to scene, about 40 miles, was 45 minutes. Finally, the high, gusty winds (40-45 kts gusting to 75 kts) and mountainous seas (20-25 ft) would have made hovering or landing the HH-52A, to recover survivors, extremely hazardous if not impossible. The weather also prevented the Group from dispatching any surface vessels, and hampered maneuvering by the big ore carriers on scene. Any hope of rescuing survivors rested with the helicopters.

b. Lack of navigational aids on shore, and lack of self-contained (e.g. AYN-1 computer, inertial, etc.) or long range (LORAMC) equipment on the search aircraft, combined with marginal weather, darkness, confined area, and number of aircraft on scene to make search effectiveness questionable in the early stages of the search. The new MRS aircraft, with its sophisticated electronics navigation system, should do a great deal to improve search accuracy when it finally arrives. The proposed LORAN C chain for the Great Lakes area will also make a great contribution in that regard, provided our search units have receivers.

c. The Night Sun can be a highly useful tool, in the right circumstances, for a night search. However, it does not turn night into day, as its name might imply, and it is not a panacea for all night search problems. Only one or two of the helo crew can watch where the light shines, depending on which side of the aircraft it is trained to, and what the flight environment is. The narrow beam, judged the most effective, only illuminates a circle of about 50 yds diameter, from a search altitude of 300 ft, and it is moving over the surface at the same ground speed as the helicopter (40-60 kts. at cruise upwind). It is most useful in a small or well defined search area, such as a shoreline search, where there is something to train the light on other than open water. The M/V Anderson stated that it did not help at all for the surface search. An overnight visit by each
RCC controller to an Air Station, with a flight in an HH-52A to observe the limitations and capabilities of the Night Sun, might be helpful to the controllers in their search planning for night operations.

d. The MK 45 parachute flares were ineffective as an aid to visual search by either surface vessels or aircraft. The reflection from the seas, spray, and foam produced so much glare as to render them useless.

e. The request for a C-130 was an excellent step in a case of this magnitude. However, it should have been planned to use the C-130 as OSC and an occasional flare launching platform but not as a search vehicle. With sufficient aircraft on scene to cover the desired search area, the OSC should orbit at high altitude, in a reserved block of airspace, for best communications capability. He can then concentrate on his primary responsibilities of control and coordination, without concern for avoiding other aircraft, searching, etc. In this case, picking up an observer from the Group with local area knowledge on geography, vessels, communications, etc. might also have helped the C-130 crew.

f. The initial plan (foiled by weather), to keep the C-130 on scene through the second night, would have been a waste of resources. Since there were no confirmed sightings of lights or flares the first night, and no survivors among all the debris the first day, chances of spotting a signal the second night were non-existent. This, of course, considers the confined area and on-shore wind that existed.

g. The placing of a fuel truck at Whitefish Point was an outstanding innovation which increased the on scene time and effectiveness of the helos. If the need should recur, some thought should also be given to providing food and hot drinks for the helo crews using the fuel cache. This will do much to fend off crew fatigue and ennui.

h. When HF communications are poor, RCC should consider designating the nearest large shore unit as SMC. Periodic training and evaluation of SMC capabilities should ensure that the authority and responsibility of the OSC and parent commands over search units is not usurped, and lines of command and control are kept intact.

i. Coordination of arrangements for priority and availability of quarters by RCC would eliminate some of the problems experienced on the FITZGERALD case.
# 21

Letters from Vice Admiral Paul E. Trimble
September 16, 1977

Mr. Webster B. Todd, Jr.
Chairman
National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Subject: Coast Guard Investigation Report dated July 26, 1977 on FITZGERALD sinking

Dear Mr. Chairman:

The lake shipping industry, proud of its safety record through the years, completely rejects the Coast Guard theoretical cause of the FITZGERALD sinking. We are setting forth the basis for our position and urge that our statement be considered in your deliberations in the case.

Lake Carriers' Association consists of 15 domestic bulk shipping companies on the lakes. 135 vessels are involved with a registered gross of 1,395,065 tons.

Owners and operators have a paramount interest in navigation safety. In addition to their prime asset, an experienced crew, there is a significant investment in the vessel and value of any cargo on board. Where changes in design or regulations are found necessary from operating experience or casualties, there is no question as to a corrective course of action. When changes running into millions of dollars are recommended based only on a
possible cause of an accident industry most vigorously objects. And further, when the possibility is poorly supported by known factors, industry is even more upset.

In its conclusions, the Coast Guard Marine Board stated: " .......... the proximate cause of the loss of the S/S EDMUND FITZGERALD cannot be determined."

In his action on the Board's findings, conclusions and recommendations, the Commandant stated: "With regard to opinions as to the causes of damage and the final sequence of events, an analysis has been made which demonstrates a possibility of capsizing and/or foundering. The analysis of various stages of flooding indicates that bending moment magnitudes and distribution would not support a conclusion of general structural failure as a primary cause of the casualty."

"The Commandant concurs with the Board that the most probable cause of the sinking was the loss of buoyancy resulting from massive flooding of the cargo hold. This flooding most likely took place through ineffective hatch closures. As the boarding seas rolled over the spar deck, the flooding was probably concentrated forward. The vessel dove into a wall of water and never recovered, with the breaking up of the ship occurring as it plunged or as the ship struck the bottom. The sinking was so rapid and unexpected that no one was able to successfully abandon ship."
It should be emphasized that the proximate cause of the sinking could not be determined, so any theoretical rationale advanced could only be a possible cause. Thereafter the recommendations of the Board with general approval of the Commandant proceed on structural and hatch closure details with specificity as if the actual cause of sinking had been determined.

The Coast Guard has pointed its finger at ineffective hatch closures as the most likely cause of the sinking. Let's examine that thesis, then look at another much more likely cause.

The present hatch covers are an advanced design and are considered by the entire lake shipping industry to be a most significant improvement over the telescoping leaf covers previously used for many years. The one-piece covers have proven completely satisfactory in all-weather operations without a single vessel loss in almost 40 years of use. Closure clamps have been greatly improved over the years to the present cast steel clamps that have also been found to be completely satisfactory in service.

Raised coamings that support the hatch covers on non-self-unloading vessels sustain minor damage from time to time by shore based unloading equipment. It is necessary to have periodic repairs and straightening done on such vessels. The Board noted that some work was scheduled for the FITZGERALD at her next shipyard availability. But the Board failed to note that this is an annual winter layup work item for most straight deck vessels,
such as the FITZGERALD, depending upon the unloading docks traded at. The FITZGERALD was in a trade that involved much less damage than many other similar vessels. There was nothing unusual about this repair item on the next shipyard work list. It is important to note that the spar deck inspection of the FITZGERALD, conducted ten days before the sinking by the Coast Guard OCMI at Toledo and the American Bureau of Shipping, the classification society relied upon by the Coast Guard, revealed no significant damage of the hatch coamings or closure fittings.

We call attention to almost forty years' experience with the current type of hatch covers and closure clamps that have been improved during the period. If ineffective closings exist, as alleged by the Coast Guard, surely during the forty years operating experience there would have been watery cargo to unload, be it ore, coal, grain or stone. This not only would have been readily apparent, but also a costly problem that vessel and cargo owners would not tolerate. If significant water did enter the cargo holds in this manner during a downbound voyage there would be a corresponding change in draft. Draft readings are recorded by the vessel before leaving the loading port, by the Corps of Engineers at the Soo Locks and by the vessel upon arrival at the unloading port. Periodically the Coast Guard checks the drafts. There are few unexplained changes that have occurred enroute, and none of these were accompanied by water accumulation in the cargo holds ... in over almost forty years of experience.
The Board has pointed to improper hatch closure procedures being observed on other vessels to support the contention that those on the FITZGERALD probably were not closed properly. We submit that there is no validity to such an imputation theory. What might have been observed on one or more vessels in other than heavy weather conditions should under no circumstances be assumed to have been the case on the FITZGERALD in the weather she was experiencing. Consequently, we question the Coast Guard's conclusions on hatch closure procedures.

The Master of the ANDERSON reported that his vessel and the FITZGERALD had proceeded more or less together across Lake Superior at their normal speeds. Based on weather forecasts and deteriorating northeasterly weather, they both worked up to the lee of the Canadian shore as they proceeded eastward. At 0953 the ANDERSON reported that the vessels were not taking any green water aboard, only spray. At 1152 the ANDERSON again reported that conditions were normal. In eastern Lake Superior on the afternoon of November 10, as the vessels changed course to pass between Michipicoten and Caribou Islands, the wind started hauling around to the south and eventually to the northwest.

At 1520 the Second Mate logged ANDERSON abeam Michipicoten Island West End Light at a distance of 7.7 miles. The seas were beginning to build rapidly from the northwest and the Master changed course to 125°. This new course was "shaped up" to clear Six Fathom Shoal north of Caribou Island and to reach a point 8 miles
off the island. The FITZGERALD was 17 miles ahead and to the right of dead ahead. The FITZGERALD was then observed to open further to the right of ANDERSON's heading. This would have put the FITZGERALD in the vicinity of the Six Fathom Shoals area. The Master of the ANDERSON testified at the Coast Guard inquiry that he had told the Mate on watch that the FITZGERALD was closer to this shoal than he wanted the ANDERSON to be. No plot of the FITZGERALD was maintained.

When the FITZGERALD departed Superior on November 10 her draft was 27 feet, 2 inches forward and 27 feet, 6 inches aft. The Master of the ANDERSON reported 10-15 foot waves experienced above Caribou Island and as high as 25 feet below Caribou as the seas built up from the northwest winds coming across the lake. Steady winds as high as 43 knots were recorded by the ANDERSON at 1520; winds at 58 knots were logged at 1652.

Between 1530 and 1535, or 10 to 15 minutes after the FITZGERALD was observed by the ANDERSON to be in the Six Fathom area, the FITZGERALD advised the ANDERSON of a list, some fence rail damage and the loss of two ballast tank vents. The FITZGERALD advised she was slowing down to permit the ANDERSON to catch up and keep track of her. She also reported that both of her pumps were going. Presumably this meant two 7,000 GPM ballast pumps. It was not until 1610 or 1615 that the FITZGERALD advised her radars were not working and asked the ANDERSON to provide navigational assistance. Note that this does not establish just when the radars became inoperative.
It should be emphasized that minutes after passing Six Fathom Shoal FITZGERALD reported a list, two ballast tank vents had carried away and that two ballast pumps were in use. Capacity of the pumps was 14,000 gallons per minute. Each vent opening in the deck would be eight inches in diameter, so the amount of water entering two eight-inch vents could readily have been handled by the ballast pumps. With the two pumps operating there should have been no list from this source of water, particularly in as short of time as 10 to 15 minutes. Captain Cooper of the ANDERSON testified that "he took that list which seemed to be real fast". Within the time frame involved, such a list can only be readily explained by holing of the vessel's ballast tanks caused by striking Six Fathom Shoals.

It should be noted that there was no report of hatch damage or hatches opening up. Water on the main deck would have resulted in a compressive action, pushing the hatch covers more tightly on their gaskets, rather than lifting them. There was no indication water was entering the holds from topside other than the small amount coming through the two openings. It should be kept in mind that the hatch covers are on coamings raised two feet above the main deck.

Had the water causing the list been entering the cargo hold from topside the amount of water passing aft to the cargo hold suction would have been insufficient to support even one ballast
pump. It is also questionable whether water in the cargo hold
would have resulted in a list since it would not have been
restricted to one side of the vessel. Moreover, if flooding
commenced in the forward part of the vessel and forward trim were
affected, as theorized by the Coast Guard, the suction point,
which is located in the after cargo hold, would have been elevated
and pumping would not have been possible. Yet the vessel had
two pumps going and the Master reported the FITZGERALD was holding
her own at that time, which indicated that water was being pumped and
could not have come through the cargo holds!! The damage then
had to be on the bottom and, since there was no indication of any
structural failure, must have been caused by an external force
such as shoaling.

Considering that the vessels had only been underway for
a day, that no damage or abnormally severe weather was experienced
up to early afternoon on November 10, that no mention was made of
hatch cover damage or loss, it becomes all too apparent that the
quantity of water needed to sink the FITZGERALD could not have
seeped through the hatch covers.

After the initial damage caused by shoaling, the vessel
labored in heavy quartering seas for over three hours as it
proceeded towards Whitefish Point. Thus, excessive working from
rolling and pitching was inevitable, accompanied by progressive
extension of the initial damage. As the vessel filled up gradually
from the bottom to the point where its buoyancy was marginal, a
large wave or series of heavy waves could have raised the stern, starting the bow's dive, underwater, never to recover. Since the pilothouse was on the bow it would have gone under immediately, leaving no opportunity to alert the crew or radio for help.

The Marine Board indicated that taconite pellets can absorb up to 7 percent moisture. Without explanation this information is "illusive". Under optimum conditions, pellets can contain up to 7 percent moisture, the average amount is less. Not stated is the fact that they contain 3 to 5 percent in the stockpile and when loaded in the cargo holds. Under exposure to moisture they can perhaps absorb 1 or 2 percent more over a period of time. There have been statements by the Coast Guard that the pellet cargo could soak up 2,000 tons of water and leave no telltale moisture in the bottom of the hold.

Hatch covers could have been blown off by the compressed air in the cargo compartments as water entered from the sides or bottom. This is a well-known phenomenon based on experience in vessel sinkings. Or hatch covers could have been sprung from the weight of pellets as the vessel dove to the bottom. These same actions would have sprung or broken hatch clamps. Contrary to the Board's findings, the underwater pictures do not support a conclusion that the hatch clamps were not closed properly.

The Coast Guard indicated that a study would be undertaken to determine whether present system for hatch closures on lake vessels can be improved. The industry is always interested in improved equipment or procedures, so such a study is supported.
If the ineffective hatch closure theory is not plausible, then what is likely to have happened? The Coast Guard quickly dismissed the possibility of shoaling near Caribou Island. The reason given was that an accurate track in that area could not be determined from the ANDERSON officers' testimony. Indeed, there was a lack of preciseness that would have been invaluable in proving or disproving the shoaling theory. The ANDERSON's Master, having no inkling of serious trouble on the FITZGERALD, did not record the position of either vessel. Even though not recorded at the time, this experienced Master nonetheless determined from his observations that the FITZGERALD had passed through the Six Fathom (36 feet) Shoal area near Caribou Island. After the fact, when the FITZGERALD was known to be lost, he did not broadcast the information by radio, but made a "confidential" report to his home office by telephone at the first opportunity. His report was taped by the home office.

The Master of the ANDERSON did not volunteer that information when he first appeared as a witness in the Inquiry but the tape was subsequently offered to the Board by his company because of its pertinency to the hearing.

The result of the hydrographic survey of the Caribou Island shoal waters conducted by Canadian Hydrographic Service, at the request of the Coast Guard Marine Board looking into the FITZGERALD sinking, is described on Pages 86 and 87 of the Report. It should be particularly noted that the survey identifies a shoal less than six fathoms deep more than one mile farther east than
any in the Six Fathom Shoal cluster depicted on the latest navigation charts. This verified shoal was in the track of the FITZGERALD, as observed by the ANDERSON, thus making shoaling even more certain as the start of the fateful events leading to the sinking. This fact should be considered along with the taped report of the ANDERSON's Master.

**Loadline changes** ... In view of the foregoing, and since the Marine Board found there was no structural failure, nor has any experience or data been cited showing that 1969, 1971 or 1973 changes in the Loadline Regulations were improper or unwise, this recommendation should be dismissed.

To qualify for a reduction in freeboard the Coast Guard has imposed a group of conditions that enhance ships' safety. Only those ships which incorporated certain structural features were eligible to take advantage of the specified draft increases. For example, in 1969, for a 600' ship to gain 5.5 inches of draft it would have to be constructed in compliance with recently upgraded ABS rules; have steel, one-piece, watertight hatch covers - instead of boards and tarpaulins; have steel deckhouses; be proven structurally suitable for the resulting loaded draft in all operating conditions; and have under-deck passages, or tunnels, permitting personnel to move fore and aft in safety.
There has been an implication that a ship receives a loadline assignment precisely calculated in accord with the structural stresses imposed by the deadweight corresponding to the loadline draft. Ignored is the fact that the scantlings used must satisfy a number of criteria, including the impecual - and generally conservative rules of a classification society. The truth is that, in the first instance, a vessel's freeboard is set by its length, depth, deck height or shear pattern, extent and stanchness of superstructures and deckhouses, and the efficacy of a number of fittings such as watertight closures, freeing ports and means of protecting the crew. Then, it must be proven that the structural strength is commensurate with the loads corresponding to that freeboard draft.

In every instance, when a ship seemingly becomes eligible for a freeboard decrease by reason of a subsequent amendment to the loadline regulations, it is necessary to prove to the Coast Guard and the classification society that the vessel's structure measures up to the deeper loading. At this time, furthermore, many details of structure and equipment come under the scrutiny of these regulatory agencies with the result that they are generally - and expensively - upgraded. Thus it may be seen that decreased freeboard or increased draft is not a present lightly bestowed by the Coast Guard, rather, quid pro quo in the form of safety enhancement is demanded for these allegedly perilous inches.
Watertight compartmentation ... Some background may be helpful to counter the thinking that lake vessels have no watertight compartments and are merely one large "bathtub".

Great Lakes vessels are designed by competent naval architects based on criteria developed and published by one of the worldwide classification societies (American Bureau of Shipping and Lloyds Registry on the Great Lakes) and the regulations of the United States or Canadian Coast Guard. Additionally, a proposed design must be submitted and approved by both a classification society and the governmental regulatory authority. The basic strength standard and the loadline assigned a vessel is in accordance with international regulation under joint agreement of the United States and Canadian governments.

Great Lakes vessels are designed with segregated ballast tanks. This means that the ship has tanks designed exclusively for water ballast and it is not necessary to utilize the cargo hold for water ballast when in the light condition. These tanks provide a double shell over the entire bottom of the cargo hold and vertically up the sides to about the loaded water line on most ships. Tunnels under the weather deck have watertight doors and afford watertight integrity several feet above the main deck. However, the envelope extends to the weather deck on some designs. The typical Great Lakes bulk vessel has six to nine ballast tanks on each side. Each tank is divided port and starboard by a watertight center vertical keelson and fore and aft by a watertight bulkhead. Additionally, the ship is divided into complete
watertight compartments by the collision bulkhead forward and the engine room bulkhead aft. Afterpeak tanks are watertight and extend vertically to one deck below the weather deck.

These watertight subdivisions and ballast tanks afford a substantial margin of safety in case the shell of the vessel is penetrated allowing water to flood one or more of these compartments. Damage control can be exercised through the use of a combination of ballast pumps, compressed air applied to the tanks and use of the collision tarps.

A claim has been made that while lake vessels may lack watertight subdivisions between cargo holds, ocean going vessels are required to have watertight bulkheads between cargo spaces. Actually there is no basic requirement for a seagoing cargo ship to have any watertight subdivision beyond the collision bulkhead, machinery space bulkhead(s) and the afterpeak bulkhead. Further subdivision to meet floodability criteria is required only when freeboard less than "Steamer" or Type "B" freeboard is desired.

Since 1970 vessels built under Title XI Mortgage Insurance Procedures are required to have "one compartment" watertight stability. Whether or not required, our members are moving towards improved watertight compartmentation in new construction. Accomplished in that manner, the cost is not prohibitive, as compared to retrofitting.

In a further effort, and in the light of the foregoing, Maritime Administration has recently invited bids on a contract
to consider the practicality of further watertight compartmentation on lake vessels.

Lake shipping safety in general ... A few additional comments will update the status and progress of our safety efforts. At the House Merchant Marine and Fisheries Committee Coast Guard oversight hearings at the Soo on July 16, 1976, I listed a number of steps under consideration by government and industry that would, in my opinion, be a quantum step forward safety-wise.

Hull monitoring ... First is the development of a hull monitoring system with an appropriate pilothouse readout to interpret hull actions in all-weather situations and to alert the master that trouble is developing. No matter what survival systems are available for the vessel personnel, if they don't know they are in trouble, such as was apparently the case on the FITZGERALD, safety will not prevail. A contract is in process by MARAD to pull available technology together to develop and test such a monitoring system on a lake vessel. Much of the preliminary stress measurement procedures have already been accomplished on lake vessels.

Develop an all-weather capsule ... In my opinion, lifeboats, as we have known them through the years, are obsolescent today. This is not only because of current technology, but also reduced professionalism in today's seamen.
We have recommended a change in Coast Guard regulations to permit development and use of survival equipment other than the traditional life rafts and lifeboats. The changes are still under consideration. There is not much incentive for such investment until the future is clarified.

Since recommending development of a "survival capsule" for shipboard use, interest has been expressed by several firms in this country. And in Norway, government, shipping and classification society authorities have developed a 36-man capsule that can be ejected from a ship's deck. This is especially advantageous where fire or other hazardous cargoes are involved. Our cargoes on the lakes don't fall into this category, so we are more interested in a capsule that can be boarded in all-weather and can float free if the vessel sinks.

**Survival suits** ... On August 11, 1977, after considerable study, the Coast Guard approved two survival suits for shipboard use. This eliminated the liability problem in using lifesaving equipment that does not have Coast Guard approval.

**Improved weather forecasting** ... A number of changes are underway that should result in improved marine weather forecasting for the lakes. Weather buoys, the assignment of marine forecasters, more vessels reporting weather data, looking at the lakes as a weather system for marine purposes and better communications
are under consideration or in process. This, together with improved meteorological training of deck officers, will further enhance safety of lake shipping.

Position keeping on the lakes ... Since it is now almost certain the FITZGERALD grounded on a shoal above Caribou Island, and there is no evidence of structural failure, we must conclude there was a navigation problem, not a design weakness nor a hatch closure deficiency.

What was the navigation problem and how can we minimize it for other vessels?

We know that the FITZGERALD advised the ANDERSON at 1610 to 1615 that his radars were not working and asked for navigation assistance. But we don't really know just when the radars went out nor how. Did both go at the same time from a large wave action? Where was the vessel in relation to the Six Fathom Shoals area above Caribou?

The east side of Caribou Island is relatively low so wave action would have distorted radar signals giving an impression of being farther from the island than actually was the case. The radio beacon at Whitefish Point was not operating. Bearings from this beacon would have indicated the vessel's position east or west from the shoal area. This signal would have been especially critical under the circumstances involved.

Two changes are underway that will improve navigation in the future, one will be especially helpful. As part of the
national navigation plan, Loran-C coverage for the lakes is to be provided by the Coast Guard by 1980. This remarkably accurate position finding system is not affected by visibility, sea return or other weather conditions. It will be the principal means of navigation, complementing radar, and will obsolete radio beacons on the lakes. Consequently, completion of the Loran-C coverage should be expedited.

The other change is a requirement for fathometers on lake vessels. The bottom characteristic of the lakes and the limited bottom information shown on charts will limit the usefulness of this equipment, but it may be of some help in special situations.

And finally, the uncharted shoal less than six fathoms deep over one mile east of Six Fathom Shoal north of Caribou Island will be shown on future navigation charts of eastern Lake Superior.

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Mr. Chairman, the lake shipping industry and its professional naval architect advisors can find NOTHING in the available factors to support the Coast Guard's thesis that the sinking resulted from poor hatch closure procedures. We can't identify one such factor, whereas, such factors do support shoaling as the cause of the sinking.

If we can provide any other information or assistance, please call on us.

Respectfully submitted,

LAKE CARRIERS' ASSOCIATION

Paul E. Trimble
Vice Admiral USCG (Ret.)
President
June 1, 1978

Mr. James B. King
Chairman
and Members of the Board
National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Subject: SS EDMUND FITZGERALD SINKING

Dear Mr. Chairman:

Representing the lake shipping industry, Lake Carriers' Association hereby requests that conclusions reached on May 4 determining probable cause of sinking of the SS EDMUND FITZGERALD be reconsidered.

Since May 4 the National Oceanographic and Atmospheric Administration has issued a correction to its Lake Superior Chart 14960(LS9) (the navigation chart used by the ANDERSON and included in the Coast Guard Marine Board transcript as Exhibit 30), reflecting data gleaned from a hydrographic survey of the Caribou Island area by Canadian authorities after the FITZGERALD sinking at the request of the Coast Guard Marine Board of Inquiry. The data obtained was included in the Coast Guard Board Report, but not in as visible a form as the recent NOAA chart correction.

For your convenience, the copy of the chart correction attached has the ANDERSON's 1520 position and course inscribed and its radar position of the FITZGERALD in relation thereto. The course and position information came from the Coast Guard Marine Board transcript and Exhibits. See especially Pages 25 and 26 of that Board's report.

After steadying on course 125° True, Captain Cooper of the ANDERSON testified that the FITZGERALD was a little over 16 miles ahead and a point to a point and a half to the right. This puts the FITZGERALD in the 5-1/4 fathom (51-1/2 feet) shoal area shortly after 1520. Ten to fifteen minutes later the FITZGERALD reported damage, a list and two of her pumps in operation. The
sequence of events, the time lapse and the ANDERSON's radar navigation data leave little margin for dispute as to whether the FITZGERALD passed through the shoal area.

The Board was advised that there was no Six Fathom Shoal and thus no shallow spot north of Caribou where a 27-foot draft vessel could touch bottom. The Board should note that instead of a six fathom shoal there is a 5-1/4 fathom shoal, and, further, that it is approximately one mile east of the charted location, thus more directly in the trackline.

The Board was advised further that the maximum vertical movement of the FITZGERALD in the storm conditions experienced the afternoon of November 10 was five feet! This theoretical computation disregards the additional depth caused by both the rolling effect and the bodily movement up and down of the entire vessel in 25-foot seas. In rolling, the outer extremity of the hull, that is, the bilge area, would move vertically much more than the pivot point, i.e., the keel. Since the FITZGERALD reported a list minutes after passing through the shoal area the damage must have been other than in the keel section.

Even accepting staff's theoretical computation of a maximum five foot vertical movement, with the FITZGERALD's draft of over 27' she would have struck bottom in the shoal area. By hand-tape measurements in May, 1976, the minimum actual depth of the shoal was found to be 30'4".

The two vessels had been heading into strong northeasterly winds for seven and one-half hours earlier in the day. It will be noted from Chart LS9, which the staff used in its presentation to the Board, that there is an area of more than fifty miles of open water from the Canadian shore to Michipicoten and Caribou Islands over which that strong northeasterly wind had been blowing during that seven and one-half hour period. Obviously, the result was a set of the sea from northeast to southwest. It is apparent that, while the surface waves were building rapidly out of the northwest after the wind shift, the wind had been blowing from that direction for less than an hour which was not sufficient time to overcome the previously existing underlying set of the sea from the northeast.

With the wind and the surface waves on her starboard quarter as the ANDERSON proceeded between the two islands, Captain Cooper did
not anticipate the south to southwesterly drift of two miles that his vessel experienced on his 125° course to Caribou Island. Thus, instead of passing eight miles off the island as planned, he actually passed six miles off, establishing that the ANDERSON was set two miles southwesterly of her heading and intended course. It is apparent that the FITZGERALD experienced the same contradictory set towards Caribou Island during the low visibility navigation conditions. The unexpected drift, combined with shallower water than shown on the chart extending a mile farther east than shown on the chart, would explain the FITZGERALD's presence in the shallow water, and its shoaling.

Having established beyond a reasonable doubt that shoaling was the most probable start of events that led to the ultimate sinking of the FITZGERALD, then it follows that the Board should re-evaluate its recommendations to the Coast Guard on freeboard requirements, construction standards, heavy weather operating criteria, etc., that are hatch cover related.

In further support of our request for reconsideration, it will be helpful if the Board will review the following points in an effort to correct impressions that may have been gained from incorrect information furnished during the open hearings:

1) Alleged buckling of No. 1 hatch cover. The Coast Guard investigation report states on Page 55 ... "A few pieces of debris were found which were identified as hatch covers. One of these was folded to a right angle and another was protruding from the No. 6 hatch opening." Attached herewith are reproductions of Coast Guard photographs (Enclosure (3) of the pieces to which the report is believed to have reference. Note that the buckled hatch cover clearly resulted from an internal upward force rather than an external downward force.

The Board was advised that an examination of photographs disclosed No. 1 hatch cover to be buckled in the cargo hold, that the buckling was caused by an external force such as hydrostatic pressure, and that No. 2 hatch coaming was buckled inward. (If there is such photographic evidence, it should be submitted to the Board to support those assertions.)

This was the only argument advanced to support the "theory" that water entered the cargo holds through failure of the hatch covers under hydrostatic pressure.

See also Pages 4 and 5 of the attached letter to NTSB dated September 16, 1977 (Enclosure (2).
2) Hatch cover involvement in the 1966 MORRELL sinking. A statement was made that hatch covers played a part in the DANIEL J. MORRELL sinking in 1966. Here is a direct quote from the conclusion of the Marine Board in that case:

"Item 16. There was evidence of violation of 46 CFR 97.15-20 in that although the hatch covers were in place, tarpaulins, gaskets or similar devices were not used to insure watertightness of the hatches prior to entering Lake Huron on 28 November 1966 in the face of adverse weather. However, there is no evidence that this violation either caused or contributed to the cause of the casualty." Underlining supplied.

It should be noted that the MORRELL had the old type sliding steel or telescopic hatch covers, not the modern one-piece covers that have been used safely now for almost 40 years without mishap! The FITZGERALD had the newer one-piece hatch covers, so comparison with the MORRELL is not pertinent.

3) Hatch cover experience. In over 37 years experience with the one-piece hatch cover such as used on the FITZGERALD, no failures have been reported, nor has watery cargo been experienced.

4) Design strength of hatch covers. The one-piece hatch covers are designed to withstand 250 lbs. per sq. ft. pressure. This translates to a four-foot head. Keep in mind that the hatch covers are on coamings two feet above the main deck, so the total head allowance would be six feet above that deck.

Staff advised that the head resulting from waves washing over the FITZGERALD's deck during the storm the afternoon of November 10 was 12 feet! There is absolutely no evidence or experience to support that contention unless the vessel's cargo hold was filled with water because of external damage, such as from shoaling.

5) Hose testing of cargo hatches. A staff member reported that he had a hose test made on the cargo hatches during a trip on the HOMER, a sister ship of the FITZGERALD. Reportedly drips of water were observed passing through the gasket into the cargo hold during the test.

Water pressure in the deck hoses on the HOMER is over 100 lbs. per sq. inch. This would be equivalent to a head of
230 feet! Even in such an unrealistic test directed at the gasket, not as a hydrostatic pressure on the hatch cover, only a few drops of water went through the gasket. That should be pretty convincing that the hatch cover gaskets will withstand the impact of an occasional wave breaking over the main deck.

6) Construction standards - lake vs. ocean. On March 23rd it was represented that ocean vessels are designed with fifty percent greater strength than lake vessels for the reason that lake vessels are always near shore where shelter is available if heavy weather is encountered. There was discussion of the relationship of strength standards to wave lengths to be experienced but this was never placed in context to offset the initial erroneous contention.

The fact is that the strength standards for both ocean and lake vessels are based on wave lengths to be encountered and bear no relation to distance from shelter. It can be stated that lake vessels are just as strong as ocean vessels in relation to the wave induced stresses each is to be subjected to. As staff noted correctly, lake vessels have high stability characteristics compared to ocean vessels.

7) Freeboard considerations. Contrary to the statement that the FITZGERALD was fully loaded, the fact is that she was not loaded even to her winter loadline, which is over 12 inches less than her midsummer loadline. She was actually loaded 500 tons, or five inches, less than the loadline to which she then was entitled.

Moreover, it is enlightening to note that the ANDERSON, an older vessel, also loaded with taconite pellets, had over a foot less freeboard than the FITZGERALD and experienced the same weather with no hull damage nor hatch cover problems, though her hatch covers were identical to those on the FITZGERALD. The ANDERSON's first mate went into the cargo holds during the storm to check on water entering through the cargo hatches as a precaution and observed none. The staff's contention that the height of the waves exceeded the capability of hatch covers thus is entirely without foundation.

8) Comparative loadline regulations - ocean vs. lake. Both regulations are based on international loadline conventions. They are based on the same principles insofar as structure and degree of tightness are concerned, adjusted to the wave conditions in which vessels will be operated. Strength requirement for materials from which the vessels are constructed are the same for both lake and ocean service.
9) Damage from vents reported carried away. The Board should note that the FITZGERALD reported "two vents lost or damaged" (Page 26 of the Coast Guard Marine Board Report). That Report provides no basis for assuming that the reported list stemmed from that damage nor that pumps were being operated because of water entering the hull through those vents. Instead, the pumping must have been related to the list reported the same time as the vents damage.

Moreover, experts do not agree that topside damage to or carrying away of two ballast tank vents could have resulted in tank or tunnel damage described on March 23rd. Considering the relative strength of the spar deck, the spar deck stringer, lower decks and the steel in the 8-inch vent pipe, the potential damage described by staff would have been virtually impossible. And most importantly, as correctly stated by staff, water in ballast tanks and tunnel would not have sunk the vessel.

Finally, the Board's attention is invited to Pages 15-18 of Enclosure (2) relating to safety programs for lake vessels. Endorsement of any or all the items by the Board could be very helpful. Lake vessels now are equipped with survival suits, but the Board might like to see electronic "beepers" authorized to enhance their safety potential. This will require a change in FCC regulations to permit such use on the lakes, as well as Coast Guard approval.

The Board might also consider recommending that commercial vessels be equipped with an alerting signal for a state of readiness between normal operating conditions and the other extreme, ABANDON SHIP. This would alert vessel personnel to unusual situations, heavy weather, hull damage or other conditions when donning survival suits, or other appropriate action, would be advisable. There is no provision at present for such signal.

If further information is desired we will be most pleased to cooperate.

Sincerely,

Paul E. Trimble
Vice Admiral USCG (Ret.)
President

Encs. (1) Chartlet
(2) 9/16/77 letter (see page 4, Item 1)
(3) Photographs (2)
GL2-40

Coast Guard Investigation,

EDMUND FITZGERALD Sinking
MARINE BOARD OF INVESTIGATION

OF SINKING OF THE SS EDMUND FITZGERALD

ON LAKE SUPERIOR 10 NOVEMBER 1975

The bulk freighter EDMUND FITZGERALD, owned by the Northwestern Mutual Life Insurance Company of Milwaukee, Wisconsin, and on long-term lease to the Oglebay Norton Company, Cleveland, Ohio, sank on November 10, 1975. She was lost on the east end of Lake Superior off Crisp Point nearly on the International Boundary Line with her entire crew of twenty-nine men and a cargo of taconite ore.

The United States Coast Guard Marine Board of Investigation convened on November 18, 1975. It was held in the auditorium on the 31st floor of the Federal Office Building, 1240 East Ninth Street, Cleveland, Ohio. The Board was composed of Rear Admiral Winfred W. Barrow (Chairman), Captain Adam S. Zabinski (member), Captain James A. Wilson (member), and Commander C. S. Loosmore (recorder). The hearings adjourned on December 13, 1975.

It should be stressed that the purpose of the inquiry was not to fix criminal or civil liabilities. Rather, it was called to determine the cause of the casualty, to the extent possible, to permit the taking of appropriate measures for future promotion of safety of life and property at sea.

The transcript of the investigation and related items were made available to the Center for Archival Collections, Bowling Green State University, for microfilming through the authority and forethought of Captain James A. Wilson, United States Coast Guard. His intent is to insure the availability of the document for future generations of scholars involved in Great Lakes studies.
CENTER FOR ARCHIVAL COLLECTIONS

MARINE BOARD OF INVESTIGATION OF SINKING OF THE SS EDMUND FITZGERALD ON LAKE SUPERIOR
10 NOVEMBER 1975

END

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