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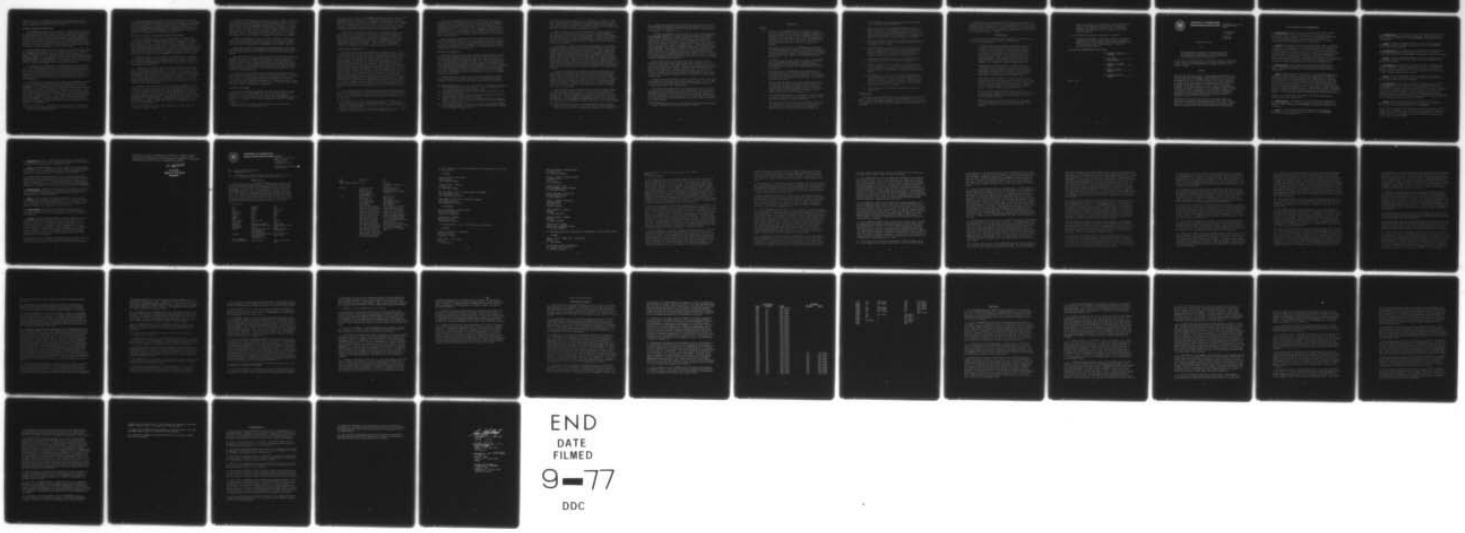

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# DEPARTMENT OF TRANSPORTATION

# COAST GUARD

## MARINE CASUALTY REPORT.

## SS KEYTRADER AND SS BAUNE (NORWEGIAN) COLLISION IN THE MISSISSIPPI RIVER ON 18 JANUARY 1974 WITH LOSS OF LIFE.

12 May 77 | 59p.

U.S. COAST GUARD
MARINE BOARD OF INVESTIGATION REPORT
*AND COMMANDANT'S ACTION*

ACTION BY
NATIONAL TRANSPORTATION SAFETY BOARD

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TECHNICAL REPORT STANDARD TITLE PAGE

| 1. Report No. | 2. Government Accession No. | 3. Recipient's Catalog No. |
|---|---|---|
| USCG/NTSB-MAR-77-1 | | |

| 4. Title and Subtitle - MARINE CASUALTY REPORT: SS KEYTRADER-SS BAUNE Collision and Fire, With Loss of Life, Lower Mississippi River, 18 January 1974 | 5. Report Date: May 12, 1977 |
|---|---|
| | 6. Performing Organization Code |
| 7. Author(s) | 8. Performing Organization Report No. |
| 9. Performing Organization Name and Address<br>National Transportation Safety Board<br>Bureau of Accident Investigation<br>Washington, D.C. 20594; and<br>U.S. Coast Guard<br>Washington, D.C. 20590 | 10. Work Unit No.: 2064 |
| | 11. Contract or Grant No. |
| 12. Sponsoring Agency Name and Address<br>NATIONAL TRANSPORTATION SAFETY BOARD<br>Washington, D. C. 20594 | 13. Type of Report and Period Covered<br>MARINE CASUALTY REPORT<br>18 January 1974 |
| | 14. Sponsoring Agency Code |

15. Supplementary Notes

16. Abstract - About 1401 c.d.t., on 18 January 1974, the inbound Norwegian bulk carrier SS BAUNE and the outbound U.S. tankship SS KEYTRADER collided in the lower Mississippi River. The bow of the BAUNE penetrated about 20 feet into the two forward cargo tanks on the starboard side of the KEYTRADER. Gasoline spilled from the ruptured cargo tanks onto the main decks of both vessels and onto the surrounding water and ignited; the flames were not extinguished for 53 hours. The collision and fire damaged both vessels extensively, killed 6 persons, and injured 3 others; 10 persons are missing.

The National Transportation Safety Board determines that the probable cause of this casualty was the failure of the KEYTRADER's pilot to correctly interpret the BAUNE's movements, which led him to make a port turn to position his ship for an improper starboard-to-starboard passing with the BAUNE.

Contributing to the accident were the operation of both vessels at speeds that did not allow sufficient time to establish a radar trackline, compounded by the inadequate use of the shipboard radar to evaluate a safe passing maneuver; the failure to establish communications; the inadequacy of sound signals under existing environmental conditions; and the failure of the BAUNE to maintain a lookout.

| 17. Key Words | 18. Distribution Statement |
|---|---|
| Abandon ship; collision; collision avoidance; course recorder; firefighting; fog navigation; gasoline fires; hatchcovers; navigation plotting; pilot; radar navigation; Rules of the Road; radiotelephone; sound signals; tankship fires; vessel speed; vessel traffic control. | This document is available to the public through the National Technical Information Service, Springfield, VA 22151. |

| 19. Security Classification (of this report) | 20. Security Classification (of this page) | 21. No. of Pages | 22. Price |
|---|---|---|---|
| UNCLASSIFIED | UNCLASSIFIED | | |

NTSB Form 1765.2 (11/70)

SS KEYTRADER AND SS BAUNE (NORWEIGIAN)
COLLISION IN THE MISSISSIPPI RIVER
ON 18 JANUARY 1974 WITH LOSS OF LIFE

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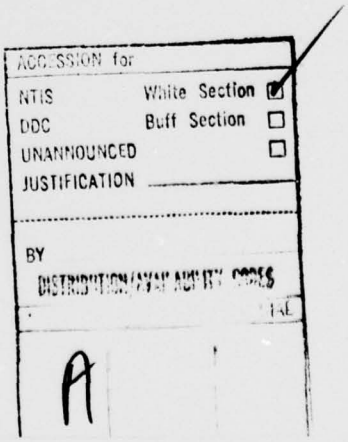

SS KEYTRADER-SS BAUNE
COLLISION AND FIRE
LOWER MISSISSIPPI RIVER
18 JANUARY 1974

ACTION BY THE NATIONAL TRANSPORTATION SAFETY BOARD

This casualty was investigated by a U.S. Coast Guard Marine Board of Investigation, which convened at New Orleans, Louisiana, on 21 January 1974. A representative of the National Transportation Safety Board observed part of the proceedings. The National Transportation Safety Board has considered only those facts in the investigative record which are pertinent to the Safety Board's statutory responsibility to determine the cause or probable cause of the casualty and to make recommendations.

SYNOPSIS

About 1401 c.d.t. on 18 January 1974, the inbound Norwegian bulk carrier SS BAUNE and the outbound U.S. tankship SS KEYTRADER collided in the lower Mississippi River. The bow of the BAUNE penetrated about 20 feet into the two forward cargo tanks on the starboard side of the KEYTRADER. Gasoline spilled from the ruptured tanks onto the main decks of both vessels and onto the surrounding water and ignited; the flames were not extinguished for 53 hours. The collision and fire damaged both vessels extensively, killed 6 persons, and injured 3 others; 10 persons are missing.

The National Transportation Safety Board determines that the probable cause of this casualty was the failure of the KEYTRADER's pilot to correctly interpret the BAUNE's movements, which led him to make a port turn to position his ship for an improper starboard-to-starboard passing with the BAUNE.

Contributing to the accident were the operation of both vessels at speeds that did not allow sufficient time to establish a radar trackline, compounded by the inadequate use of the shipboard radar to evaluate a safe passing maneuver; the failure to establish communications; the inadequacy of sound signals under existing environmental conditions; and the failure of the BAUNE to maintain a lookout.

FACTS

The Casualty

On 17 January 1974, a cargo of gasoline, jet fuel, and furnace oil was loaded onto the SS KEYTRADER and the ship departed a Shell Oil Company terminal at Norco, Louisiana. Crewmen synchronized the deck clock with the engineroom clock and checked the course recorder; all

Navigational gear was tested and found to be working satisfactorily before departing Norco about 1300.1/ A federal pilot supervised the maneuvering of the vessel. During the passage downriver, no plot of targets on either of the ship's two radars was maintained and the radar was not monitored continuously. The pilot alternately scanned the radarscope for about 1 to 2 minutes and then scanned the river from the KEYTRADER's bridge.

About 1830 on 17 January, the KEYTRADER encountered low-lying fog. After hearing on channel 13 VHF that dense fog had reduced the visibility farther downriver, the master and the pilot decided to anchor at 1959 near Michella, approximately mile 13.5 Above Head of Passes (AHP). By 1210 on 18 January, visibility had improved to several miles and the master and pilot decided to get underway. Passing agreements were made over channel 13 VHF with four vessels which were upbound as the KEYTRADER maneuvered from anchorage into the navigation channel.

About 1325, the KEYTRADER was moving downriver at a speed of half ahead; at 1328, the speed was reduced to slow ahead when the pilot observed upbound traffic. At 1345, after clearing traffic near Venice, speed was increased to half ahead. About this time, the pilot broadcasted his position twice on channel 13 VHF and requested that any vessel between the Wilder Flats light and Pilottown answer his call. No one replied to either of these two broadcasts or to a subsequent broadcast, which was made when the KEYTRADER was passing Wilder Flats.

About 1355, the KEYTRADER passed between the anchored M/V TROLL FOREST and the west bank. (See figure 1.) The TROLL FOREST was anchored approximately 1,800 feet below the West Point light, and between 1,200 and 1,500 feet off the west bank. The KEYTRADER passed approximately 300 feet abeam of the TROLL FOREST. About this time, the master and pilot observed--first on radar and then visually--three vessels, which appeared to be in an anchorage area. They determined that two of the vessels were anchored. The SS PYRAMID VENUS was anchored about 1.5 nmi downriver from the West Point light and about 1,650 feet off the west bank. The SS OCEAN PRINCESS was anchored about halfway between the TROLL FOREST and PYRAMID VENUS and closer to the west bank than the PYRAMID VENUS. Further radar and visual observations of the third vessel, the SS BAUNE, which was eastward of the first two vessels, confirmed that it was underway. Just after passing the TROLL FOREST, the KEYTRADER began to alter course several degrees to port to avoid the ships in the anchorage area.

About 1356, the KEYTRADER steadied on a heading of 126° T. As it began crossing the river diagonally, the pilot on the KEYTRADER sounded a two-whistle passing signal; no reply was received. Then the pilot unsuccessfully attempted to contact the BAUNE by radio.

1/ All times are central daylight times, based on a 24-hour clock.

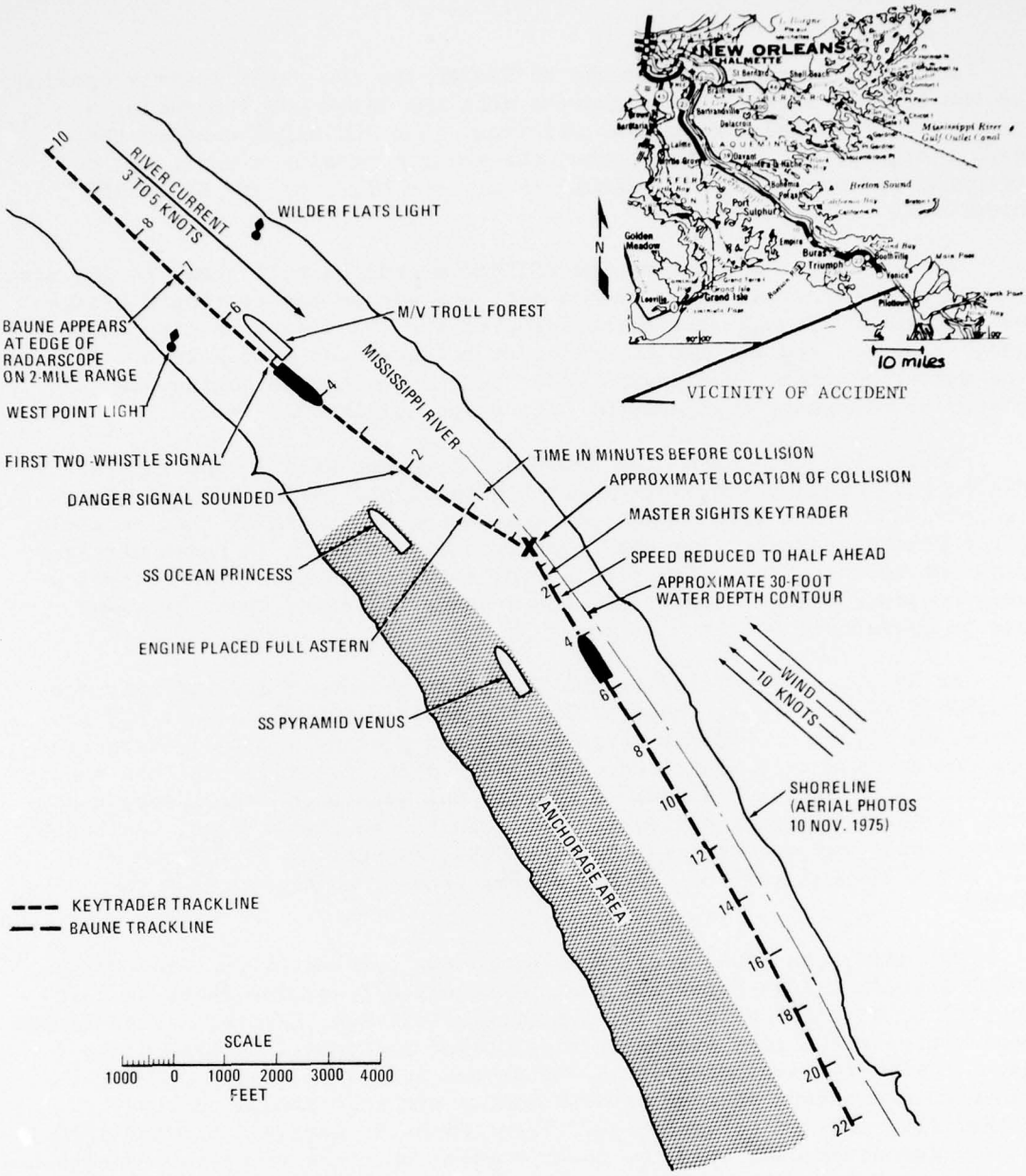


FIGURE 1. PROBABLE TRACKLINES OF KEY TRADER AND BAUNE PRECEDING COLLISION

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About 1358, the pilot on the KEYTRADER saw the BAUNE's masts opening to the BAUNE's starboard and thought that the BAUNE was commencing a turn to its starboard from near midriver. The KEYTRADER sounded the danger signal, followed by another two-whistle passing signal, but no response was heard from the BAUNE. Next, the pilot of the KEYTRADER ordered 20° left rudder.

At 1359:30, the pilot on the KEYTRADER ordered full ahead to increase the rate of turn. At 1400, the master, who was on the starboard bridge wing, returned to the wheelhouse, ordered the third mate to ring the general alarm, and put the engine order telegraph on full astern. Then the master jingled 2/ the engine order telegraph and the engine was placed on emergency full astern. The ships collided at 1401.

Before the collision, the BAUNE had been anchored in the Gulf of Mexico for 7 days while waiting for fog to clear. About 0900 on 18 January, the pilot station advised the master of the BAUNE that he could enter Southwest Pass. The BAUNE got underway at 0940. A radio message was sent to the ship's agent requesting a radar technician to correct a weak heading flasher; otherwise, the message indicated that the radar was in operation.

At 0951, an Associated Branch Bar pilot boarded the BAUNE near the Southwest Pass seabuoy. About 1030, the BAUNE entered the pass and proceeded to Pilottown. Radar targets were not plotted and the radarscope was not continuously monitored. The BAUNE pilot testified that he had difficulty adjusting his eyes to viewing the radarscope after they had been exposed to bright daylight. While in the Southwest Pass, the BAUNE made passing agreements with three dredges via channel 13 VHF and with the M/V AUSTANGER and the M/V RIO BALEN, both of which overtook the BAUNE.

By radio, the Baune's pilot informed the watchtower operated by his pilot association at Pilottown that he expected to arrive there at 1320 to pick up a relief pilot. The watchtower told him that the M/V AUSTANGER would receive the last available river pilot and that the BAUNE would have to wait for another pilot. The master and pilot of the BAUNE decided to continue passage upriver and to exchange pilots underway rather than proceed to anchorage. When the BAUNE entered the Mississippi River, the watchtower told the BAUNE's pilot that the movement of downbound vessels with State pilots was unlikely and that a ship with a Federal pilot aboard was anchored near Michella.

At 1320, the BAUNE reduced speed from full ahead to half ahead near Pilottown to avoid a tankship which was turning in the general anchorage. Speed was further reduced to slow ahead at 1322. Speed was increased to half ahead at 1324, and to full ahead at 1329.

2/ He moved the engine order telegraph away from and back to full astern.

After passing Pilottown, the BAUNE was steering a course of 330° T., which generally paralleled the east bank; crewmen estimated that the BAUNE was about 500 feet off the east bank.

At 1345, the pilotboat M/V CRESPILOT told the pilot on the BAUNE, via channel 13, that the pilotboat would leave Venice shortly and proceed directly to the BAUNE with a relief pilot. After this conversation, the BAUNE's pilot secured his portable radio and placed it in his bag. He then switched the ship's radio from channel 9 to channel 13; no communication was made up to the time of collision although transmissions were heard over the radiotelephone. The BAUNE pilot testified that he was reluctant to routinely broadcast his vessel's position.

About 1358:30, the BAUNE's speed was reduced to half ahead, and about 1359, her course was altered to port until the BAUNE steadied on a heading of 323° T. At this time, the master, who was standing on the port bridge wing, called out to the pilot that a vessel was on the port bow, and it had sounded two blasts of the whistle. The vessel was the KEYTRADER. The pilot scanned the radarscope and ran to the port bridge wing where he saw that the KEYTRADER, whose pilot had ordered 20° left rudder, was attempting a starboard-to-starboard passage. The KEYTRADER was about three ship lengths away, three to four points on the port bow. The BAUNE unsuccessfully attempted to contact the KEYTRADER on channel 13. Next, the BAUNE's pilot ordered hard right rudder. About 1400, the mate on watch ordered full astern. The pilot sounded the danger signal on the ship's whistle. The engine order telegraph was placed full astern and two or more jingles were given. The BAUNE began to swing in response to hard right rudder. The general alarm was sounded just before the collision and a Mayday was broadcast on channel 13 immediately after the collision.

The vessels collided at 1401 near mile 6.2 AHP off the east bank. Momentum carried the vessels toward shallow water where they grounded. The ships' course recorder charts indicated that the ships collided when the KEYTRADER was on a heading of 106° T and the BAUNE was on a heading of 336° T; the ships grounded about 1 minute after the collision. The angle of impact measured between the centerlines of the two vessels was about 50°.

Crewmen aboard the anchored PYRAMID VENUS saw the BAUNE as it passed by, close to the east bank, and estimated the collision occurred from 3 to 4 cables (1,800 to 2,400 feet) and at about 45° off their starboard bow. They had seen the KEYTRADER pass between the anchored TROLL FOREST and the west bank and then alter course. The crewmen stated that at no time was their view of the KEYTRADER and the BAUNE obscured by fog.

Injuries to Persons

| Injuries | Crew | | Passengers | | Other |
|---|---|---|---|---|---|
| | KEYTRADER | BAUNE | KEYTRADER | BAUNE | |
| Fatal | 2 | 2 | 0 | 2 | 0 |
| Missing | 0 | 10 | 0 | 0 | 0 |
| Nonfatal | 0 | 3 | 0 | 0 | 0 |
| None | 35 | 21 | 0 | 1 | |

Damage to Vessels and Cargo Loss

The bow of the BAUNE penetrated the starboard side of the KEYTRADER for about 20 feet near the break of the forecastlehead in way of Nos. 1 and 2 tanks. The ensuing fire enveloped and extensively damaged both vessels. About 840,000 gallons of gasoline cargo on the KEYTRADER were consumed in the fire.

Vessel Information

At the time of the collision, the KEYTRADER, a 529-foot-long, U.S. tankship, was carrying 17,706 long tons (LT) of flammable cargo; its mean draft, at the loaded displacement of about 24,000 LT, was 31 feet 6 inches. Its navigational equipment included a gyrocompass with repeaters on each bridge wing, a course recorder, and two radars. All navigational equipment was operating properly when the ships collided. One radar was a Raytheon Pathfinder with a 16-inch scope and the other radar was a Kelvin Hughes with about an 8-inch scope. The Raytheon Pathfinder was being operated on the 2-mile scale, and the Kelvin Hughes, on the 1 1/2-mile scale.

Maneuvering speeds for the KEYTRADER in restricted waters were:

| Engine order | Rpm | Speed in knots |
|---|---|---|
| Full ahead | 70 | 12.0 |
| Half ahead | 45 | 7.5 |
| Slow ahead | 23 | 3.5 |
| Full astern | 50 | ---- |

At sea, the KEYTRADER made about 15.2 knots at full ahead (83 rpm). The KEYTRADER's stopping distances under full astern were estimated to be over 1.2 nmi from full ahead, less than 0.75 nmi from half ahead, and less than 0.25 nmi from slow ahead.

The BAUNE, a 625-foot-long, Norwegian bulk carrier, was carrying 34,453 LT of bauxite ore; its mean draft, at its loaded displacement of 45,800 LT, was 35 feet 4 1/2 inches. Its navigational equipment included a gyrocompass,

a course recorder, and a Raytheon Pathfinder radar. The radar was fully operational before the collision except for a weak heading flasher. The radar was being operated on the 2-mile scale at the time of the collision.

Maneuvering speeds for the BAUNE in restricted waters were:

| Engine order | Rpm | Speed in knots |
|---|---|---|
| Full ahead | 80 | 10.0 |
| Half ahead | 60 | 7.0 |
| Slow ahead | 32 | 4.5 |
| Dead slow ahead | 20 | ---- |
| Full astern | (Not recorded) | |

The BAUNE has a special rudder control which permits the angle of the rudder to be placed 45° to left or right to facilitate steering when the vessel is maneuvering in restricted waters; this special rudder control was in operation at the time of the casualty. When fully loaded, the stopping distance for the BAUNE, when ordered full astern from half ahead, is estimated to be between 0.5 and 0.75 nmi; under these conditions, the vessel could be stopped within 6 minutes.

Waterway Information

The river stages were measured on the day of the accident at 4.0 feet above mean sea level at Head of Passes and 5.0 feet at mile 29.0 AHP. Since the Mississippi River system of levees is not continued south (downriver) of mile 10.0 AHP, these high water conditions caused the river to overflow its banks and the shoreline was displaced inshore. (Because of the shoreline displacement, positions described by reference to the visual shoreline may not coincide with positions measured from the charted shoreline.) The outflow strength of the river's main current was estimated to be 4.5 knots at the time of the collision; the water temperature was 44° F.

Fog conditions persisted on the lower Mississippi River during January 1974. Many vessels remained at anchor for more than a week while waiting for fog to clear. Because the anchorage area near Pilottown became crowded, some vessels, such as the TROLL FOREST, anchored outside the designated area. Many vessels were also anchored in the Gulf of Mexico near Southwest Pass.

The Associated Branch Bar Pilots, the Crescent River Port Pilots Association, and the New Orleans Steamship Association informally agreed that inbound upriver traffic would be moved first whenever the weather cleared sufficiently for navigation. This would move the vessels more effectively and relieve congestion. The presence of several dredges working near Southwest Pass to restore channel depth was a factor in this agreement to move traffic in only one direction at a time. The Federal pilots in the area, including the KEYTRADER pilot, were not informed of this decision. An Associated Branch Bar Pilot was navigating the BAUNE. No Federal requirements for controlling the movement of vessel traffic were in effect on January 18, 1974.

## Meteorological Information

When the ships collided, the wind was southeasterly about 10 knots, the air temperature was 72° F, and the sky was cloudy. Visibility near the surface of the river was impaired by a layer of dense fog which varied in height from 10 to 30 feet. Visibility above the layer of fog was from 2 to 5 miles; upper hulls and superstructures of large vessels such as the KEYTRADER and BAUNE, were visible within this distance.

## Fire

Gasoline cargo aboard the KEYTRADER ignited as the BAUNE's bow penetrated the KEYTRADER. Burning gasoline spilled from the ruptured cargo tanks onto the water and splashed onto the decks of both vessels. Flames were more than 50 feet high immediately after the collision. The heat from the flames was too intense for the KEYTRADER's crew to approach and fight the fire. The crews of both vessels were forced to take refuge in the vessels' interior spaces.

The KEYTRADER's steam-smothering system was not activated after the collision. Normal shipboard practice kept the individual branch-line valves to each cargo tank closed when more than one type of cargo was aboard. This practice, which is permitted by Federal regulations, prevented cargo contamination that could be caused by a product flow through the steam-smothering branch lines.

The intense heat on the foredeck of the KEYTRADER melted aluminum cargo tank hatchcovers; this allowed fluids in tanks that were not damaged in the collision to be exposed to the fire.

The Coast Guard was not able to mount a substantial firefighting effort until daybreak on 19 January, about 15 hours after the collision. The fires were not extinguished until about 53 hours after the collision because additional foam had to be shipped in. Coast Guard cutters were the only available vessels that could effectively fight the fire; its personnel fought the fire without adequate protective clothing and equipment.

## Radiotelephone Communications

Although both ships had operational bridge-to-bridge radiotelephones, efforts to establish radiotelephone communication on channel 13 VHF between the vessels were unsuccessful. Channel 13 is the legally designated channel for communication of navigation safety information between ships. Use of channel 13 for other than navigational purposes and transmission at power levels higher than necessary added to the already large number of transmissions over channel 13 in the lower Mississippi River at the time of the accident. The Coast Guard further discusses this problem in this report and describes the corrective action which will be taken.

## ANALYSIS

### KEYTRADER and BAUNE Tracklines

The Safety Board constructed probable tracklines for the KEYTRADER and BAUNE (See figure 1.) The tracklines show the approximate locations of both vessels at certain times as they proceeded toward the point of collision. The approximate positions of certain anchored vessels were also determined. Accuracy in determining the tracklines was limited by the readability of the ships' course recorders, the reliability of testimony from the ships' crewmen, and the estimated speed of the river's current. The Safety Board has recommended previously that the Coast Guard require the installation of an automatic recording device to preserve vital navigational information aboard oceangoing ships. 3/

The KEYTRADER's trackline indicates that the ship was moving parallel to and about 1,200 feet from the river's west bank until about 6 minutes before the collision, when it passed abeam of the anchored TROLL FOREST. The KEYTRADER's pilot and master stated that they saw the BAUNE's masts open to the BAUNE's right after the KEYTRADER passed the TROLL FOREST. The master and pilot of the KEYTRADER incorrectly interpreted this opening of the BAUNE's masts as an indication that the BAUNE was turning to the right. In fact, the BAUNE had made no course changes. What the KEYTRADER's master and pilot had seen was normal for two vessels approaching at this angle.

About 2 1/2 minutes before the collision, the KEYTRADER's heading, as indicated by the course recorder, showed that the KEYTRADER began a turn to port. The velocity of the 4.5-knot river current added to the ship's movement, however, and reduced the effect of this turn on the ship's direction.

Because neither pilot reduced propeller speed until about 1 minute before the collision, its effect on the vessels' speeds was small. The Board estimated that at the time of collision the KEYTRADER's speed through the water was 6.5 knots and the BAUNE's speed through the water was 6 knots. Also, at the time of collision, the KEYTRADER was heading at an angle of about 40° to the east bank and the BAUNE's angle was about 11°. Based on the vessels' speeds and drafts, the river depths, and the time between collision and grounding, the Board estimated that the vessels were about 1,600 feet east of the charted Pilottown anchorage when they collided.

The BAUNE's trackline was consistent with a vessel moving parallel with, and close to, the east bank. A vessel attempting to pass on the starboard side of the BAUNE would have risked grounding. The BAUNE pilot would not have expected another pilot to take such a risk. Because 1,600 feet separated the anchored vessels and the BAUNE, an approaching vessel could have

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3/ Marine Casualty Report - "SS C.V. SEA WITCH-SS ESSO BRUSSELS (Belgium); Collision and Fire in New York Harbor on 2 June 1973, With Loss of Life" (USCG/NTSB-MAR-75-6), issued March 2, 1976.

passed to the port of the BAUNE as required by the Inland Rules of the road. 4/ Later in this report, the Coast Guard discusses the application of the Inland Rules of the Road to this accident.

Incorrect Evaluation of Radar Data

The KEYTRADER and BAUNE were navigating in a confined waterway and had to continually evaluate other vessels' movements, especially while maneuvering near anchorage areas from which vessels might be leaving. Because of the 1,600 feet of clearance between the anchorage area and the BAUNE at the collision site, the two vessels probably would have passed within 600 to 800 feet of each other in a normal passing. Since approaching vessels had to pass close abeam, proper maneuvers just before the passing were the most important to collision avoidance. For this reason, an understanding between the vessels of their intentions for passing was necessary.

About 7 minutes before the collision, the two vessels were about 2 miles apart and would have appeared just at the edge of each other's radarscope. The KEYTRADER's pilot did not detect the BAUNE on his radarscope until 5 minutes before the collision. At that time, the radarscope showed that the BAUNE was slightly east of alignment with the anchored vessels, OCEAN PRINCESS and PYRAMID VENUS. The KEYTRADER pilot testified that he believed that the BAUNE was coming out of the anchorage. The alignment shown on the radarscope may have caused the KEYTRADER's pilot to draw this conclusion.

The low-lying fog contributed to the KEYTRADER pilot's misinterpretation of the BAUNE's movements and the available radar information was not used properly to compensate for the lack of visual navigational information. The pilot made only brief observations of the radarscope and radar data were not plotted to determine the courses and speeds of other vessels. The KEYTRADER's course change from 132° T to 126° T increased the difficulty in interpreting the radar data and would have required greater expertise to plot these data.

The BAUNE's pilot and master were not aware of the KEYTRADER's approach until the collision was unavoidable because the BAUNE pilot's infrequent observations of the radarscope did not insure timely detection of the KEYTRADER. Also, the normal practice of alternately scanning the radarscope and then the river makes it difficult to immediately detect targets on the radarscope because the eyes require time to adjust to the radarscope light after viewing bright daylight. The BAUNE's pilot stated that the differing light levels impaired his vision. Earlier detection of the KEYTRADER would have given the BAUNE's pilot more time to attempt radiotelephone contact with the KEYTRADER. The pilot's participation in the pilots associations' one-way vessel movement agreement may have reduced his attentiveness to the movement of the KEYTRADER.

4/ 33 U.S.C. 154, et seq. The rules must be followed by all vessels that are navigating certain inland waters of the United States, including sections of the Mississippi River.

Recently published Coast Guard regulations 5/require that the person in charge of navigation be required to insure that the danger of each closing visual or radar contact is evaluated, but there are no minimum requirements for the processing of radar data upon which to base an evaluation. The pilots of the KEYTRADER and BAUNE may have considered their scanning of the radarscope adequate. Minimum standards for the processing of radar data must be set by regulation to assure proper evaluation.

The Effect of Vessels' Closing Speed on Radar Effectiveness

Since the closing speed of the vessels was about 17.5 knots, they would have traversed the forward display sectors of each other's radarscope in less than 7 minutes. Passing signals should be exchanged after radar data evaluation and before vessels are too close to avoid a collision. Where vessels must pass relatively close, the passing should not be attempted until a passing agreement has been made. The pilot of the KEYTRADER did not notice the BAUNE until 2 minutes after it appeared at the edge of his radarscope; this left insufficient time to determine reliably the BAUNE's course and speed, particularly since the KEYTRADER's trackline was not straight.

Operation of radar on a larger range scale makes earlier target detection possible. However, use of a larger range scale increases the number of targets that require evaluation and decreases the accuracy of target data. The increased workload for proper target evaluation could exceed the radar observer's capabilities.

A reduction in the ships' speeds would have provided the pilots more time to observe the radarscope without reducing the accuracy of the radar data. If the BAUNE had been navigating continuously at half ahead and the KEYTRADER had been navigating at slow ahead, their closing speed would have been reduced to 10.5 knots. The vessels would have appeared in the forward sector of each other's radarscope for about 11.4 minutes. If proficient radar observers had maintained a constant radar watch on each ship, this additional time would have assured timely detection and accuracy in evaluating the other ship's movements.

Because a speed of 2.5 knots over the ground for the BAUNE at half ahead may have been considered insufficient to justify weighing anchor and a speed of 3.5 knots through the water for the KEYTRADER at slow ahead may have been considered insufficient for adequate maneuverability, speed reduction may not be a practical means to insure adequate time for plotting and decisionmaking. However, there is no indication that the pilots of the KEYTRADER and the BAUNE adequately considered the effects of speed on vessel maneuverability, forward progress, and radar effectiveness before they decided to get underway. Masters and pilots have no guidelines to use in making such considerations.

5/ Title 33 CFR 164, "Navigation Safety Regulations," Federal Register, Part XII, January 31, 1977.

A vessel's maneuvering characteristics, its cargo, currents, visibility, radar capability, and other traffic, including anchored vessels, are factors that must be considered in choosing a safe (or moderate) speed. The Coast Guard concluded that the KEYTRADER and BAUNE were proceeding at an "immoderate" speed. The record indicates that the BAUNE was passed by two other vessels, which must have been moving at higher speeds. However, in the Board's opinion, if pilots and masters have no guidelines by which they determine a vessel's safe speed while navigating by radar, it is impossible to determine if a vessel's speed is "immoderate" until after an accident.

Recently published Coast Guard regulations 6/ include a checklist of factors that pilots should consider in setting a vessel's speed. However, since the factors do not establish quantifiable speed limits, a vessel's speed will still be determined by the judgment of the vessel's operator.

The checklist probably would not have changed the speed choices that the experienced pilots of the KEYTRADER and the BAUNE made; their decisions were consistent with the speeds selected by other pilots making the same passage.

Quantifiable factors for determining maximum safe speeds should include the time it takes for a competent radar observer to process radar data manually, the density of traffic in the waterway, speed assumptions for meeting vessels, a vessel's stopping distance, and the speed and direction of the current. A vessel equipped with a system that automatically detects approaching vessels and provides collision-avoidance data might be allowed a higher maximum speed because the system significantly reduces the time required to process radar data.

The same factors could also be used to determine when one-way traffic should be mandated under a Vessel Traffic Service (VTS) system. 7/ When the river current is fast, the safe navigation speed might be too slow for inbound vessels to progress against the current and might be too slow to allow outbound vessels adequate maneuverability. Quantifiable speed factors could have indicated whether the 4.5-knot current on the day of the accident made safe, efficient two-way traffic infeasible.

Inaudible Sound Signals

No one on the bridge on the BAUNE heard the first two-whistle signal that was sounded by the KEYTRADER. The two vessels were within 1.5 nmi (9,000 feet) of each other at the time. There was a low-lying fog, a southeasterly wind was blowing about 10 knots, and the KEYTRADER was directly downwind from the BAUNE. Under these environmental conditions, a shadow

6/ Ibid.
7/ The Coast Guard is in the process of establishing a Vessel Traffic Service for the lower Mississippi River.

zone 8/ existed forward of the KEYTRADER in which there was a significantly greater-than-normal reduction in the intensity of sound coming from the KEYTRADER's whistle. Listeners on the BAUNE's bridge would be in the shadow zone until the two ships were within 3,000 feet of each other. The attentiveness of the BAUNE's bridge watch, the noise levels on the bridge, and the strength of the whistle signal had little effect because the environmental conditions essentially prevented the sound from reaching the BAUNE.

The failure to hear whistle signals is not uncommon in marine casualties. Many of these failures may be caused by environmental conditions which distort sound propagation. Since sound signals are required and continue to be the primary means for vessels to communicate their navigational intentions, mariners should be aware of the limitations of sound propagation, and the effectiveness of bridge-to-bridge radiotelephone communication should be improved.9/ Also, in areas of high-density traffic, the unreliability of sound signals increases the need for VTS.

Ineffective Containment of Fire

The BAUNE's bow breached the KEYTRADER's starboard tanks Nos. 1 and 2 and gasoline spilled from the tanks onto the forward decks of both ships and onto the water. The ensuing fire, which consumed 840,000 gallons of gasoline, was so intense that the crews had to seek refuge and could not immediately attempt to extinguish it. Had the fire been limited to gasoline from tanks Nos. 1 and 2, the deck fires would have subsided after a few minutes when the spilled gasoline had burned. Even though the gasoline that was burning on the water would still have been a threat, the deckhouse would have provided some protection from the radiant heat so that the crews either could have begun firefighting or could have abandoned ship in a more orderly manner. However, the aluminum covers, the gaskets, and possibly other fittings on some undamaged tanks were melted by the initial fire, and thereby allowed more sources of fuel for the fire. Each tank that was opened created additional heat that melted covers and fittings in adjacent undamaged tanks, which, in turn, contributed to the fire's volume. Unless tank boundaries are designed to remain intact when not directly involved in a collision, tankship fires will continue to be difficult to extinguish and will cause more damage. This accident shows that fire-consumable gaskets and metals that have low melting points are unsafe for cargo tank containment.

Coast Guard cutters did not have enough foam to effectively fight the fire until 48 hours after the collision; the fires were extinguished 5 hours later. Coast Guard personnel had to fight the fires at close range without the protective clothing and equipment that professional firefighters use in intense fires.

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8/ The shadow zone is created by the upward bending of the sound rays as they propagate into the wind near the water surface. See "Theory and Design of Sound Fog Signals," United States Coast Guard Civil Engineering Report No. CG-250-36, 1963.

9/ The Coast Guard proposes to curtail undisciplined use of channel 13 VHF through enforcement action and a public information program.

The Ports and Waterways Safety Act of 1972 gave the Coast Guard responsibility for promoting the safety of ports, harbors, and waterways. The Safety Board has recommended that the Coast Guard prepare emergency contingency plans for those waterways that carry large quantities of hazardous materials.[10/] The Coast Guard's response to the Safety Board's recommendation and its interpretation of its responsibility under the Act was published in a recent Commandant Instruction.[11/] The Coast Guard's policy is to maintain a firefighting capability adequate to protect Coast Guard facilities only.

Where contingency agreements with local jurisdictions exist, the combined firefighting resources of the Coast Guard and of the local jurisdictions are generally adequate to extinguish marine fires also. However, in areas that are outside the jurisdiction of a municipality and where no contingency agreements exist, Coast Guard firefighting equipment alone is not adequate to fight major marine fires.

Automated Detection System

The Board has previously studied collisions involving radar-equipped ships.[12/] and collisions in navigable waters of the United States [13/] and has discussed pilothouse workload and human limitations in its report on a collision between radar-equipped ships. [14/] These studies concluded that more effective use of marine radar would prevent future casualties and recommended the improvement of training programs for collision avoidance, mandatory routine radar plotting, development of a practical transponder -type identification system between radar-equipped vessels, development of a radar alarm system to provide an audible and visual alert of vessels that are in a hazardous position, and development of and use of collision avoidance systems (CAS).

Manual plotting of radar by properly trained personnel can enhance earlier detection and can reduce the chance of misinterpreting vessel movements. Routine plotting is effective in maintaining proficiency for

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10/ Marine Casualty Report: SS C.V. SEA WITCH - SS ESSO BRUSSELS (Belgium) Collision and Fire in New York Harbor on 2 June 1973, With Loss of Life (USCG/NTSB-MAR-75-6) issued March 2, 1976.

11/ Firefighting Assistance Policy, Commandant Instruction 11320.7, U.S. Coast Guard, 11 May 1976.

12/ "Study of Collisions of Radar-Equipped Merchant Ships and Preventive Recommendations," (NTSB) December 18, 1968.

13/ "Special Study of Collisions Within Navigable Waters of the United States - Consideration of Alternative Preventive Measures" (NTSB-MSS-72-1) issued May 30, 1972.

14/ Marine Casualty Report: "Collision Involving the SS ARIZONA STANDARD and SS OREGON STANDARD at the Entrance to San Francisco Bay on January 18, 1971" (NTSB) 11 August 1971.

those times when radar navigation in poor visibility is necessary. Additional personnel would be required to watch the radarscope and to plot the data. These personnel would provide information about vessel movements to the pilot and master, neither of whom should be involved in processing radar data since it interferes with their supervisory roles.

Manual plotting is a slow process which does not always allow sufficient time to process radar data and to work out a passing agreement. When the number of vessels to be tracked becomes too large or when vessels are changing courses or speeds, manual plotting is an inadequate navigation aid for two-way traffic in restricted visibility. However, a far more hazardous situation exists when the pilot attempts to evaluate radar data without such assistance.

In response to a previous Safety Board recommendation on the subject, the Radio Technical Commission for Marine Service (RTCM) developed a performance specification for a computer-aided CAS.15/ These commercially available systems process radar data, solve for the speeds, courses, and closest points of approach and can determine the results of a trial maneuver. Some CAS's provide automatic target acquisition; others require manual acquisition, but have an alarm to warn when a new target comes within the system's range. Detection of moving vessels is enhanced either by displaying each target in the form of a line or vector, which indicates the vessel's speed and direction, or by digital display of information that identifies closing vessels. Also, an alarm is sounded when a closing vessel is near and its closest point of approach is computed to be within a preset distance.

Future vessel positions are computed by extrapolations based on previous positions. Although a CAS constantly monitors the vessels being tracked when either vessel deviates from its present course and speed, a delay of from 30 seconds to over 2 minutes may occur before the extrapolated positions are accurate; this delay is caused by the need to track the vessels on their new courses for a sufficient time to reestablish steady navigation conditions. CAS processing time does not contribute significantly to the delay; the systems can indicate that a vessel is changing course in 15 to 30 seconds.

When compared to manual processing, CAS can process a greater volume or radar data, display the results in less time, eliminate human error from the radar target plotting routine, and provide a reliable means of detecting all ships whose movements may hazard the navigation of the CAS-equipped ship. In this casualty, CAS would have significantly increased the probability of the KEYTRADER and BAUNE detecting each other and would have indicated that the BAUNE was moving upriver and not out of an anchorage

15/ "Performance Specification for a Computer-Aided Collision Avoidance System for Merchant Ships," Jan. 19, 1977, Radio Technical Commission for Marine Services, Federal Communications Commission, Washington, D.C.

area. Although CAS has navigational capabilities beyond those needed by the KEYTRADER and BAUNE while navigating the Mississippi River, its potential for averting collisions in inland waterways should be considered in evaluating CAS for shipboard use.

The RTCM also developed a specification for a Marine Radar Interrogator Transponder (MRIT)[16/] and the U.S. Maritime Administration (MARAD) is studying MRIT's feasibility. A MRIT consists of a control and display console and a transceiver; both of these interface with marine radar. MRIT provides not only target identity and "clutter-free" target points, but also an alphanumeric display of maneuvering information such as target course, speed, draft, and safe or dangerous cargo. A MRIT-equipped ship could interrogate selectively other MRIT-equipped ships to determine navigation information. For example, using MRIT, a ship could request that all ships ahead report their courses, speeds, and cargo types and, without action by their pilots, automatically receive a response from the interrogated ships. Also, a MRIT-equipped ship could cause an alarm to be sounded on another MRIT-equipped ship if necessary to alert the pilot or to request direct radiotelephone communications.

MRIT could be used in conjunction with CAS to shorten the delay inherent in CAS computation of course changes and could improve the accuracy of CAS input data. MRIT might provide a more reliable and accurate link between ships and VTS systems. Specialized transponders aboard vessels could provide pilots with a reduced-capability MRIT. In contrast, the MRIT is more responsive to resolving the shortcomings that led to this casualty. However, while CAS can determine the movements of ships regardless of their navigational equipment, MRIT is only effective between MRIT-equipped ships.

MARAD is resolving technical problems with MRIT's, which include multipath propagation, side-lobe returns, and low-power inputs. Also, for MRIT to be effective, the system must be adopted internationally to insure frequency and message format compatibility.

The Board believes that there is no apparent reason to delay further a definite policy regarding the use of these systems in marine navigation. The MARAD, the USCG, the RTCM, and industry have served the interest of maritime safety well in their efforts to provide a reliable automated aid for those responsible for vessel navigation. The Board urges that MARAD, as the lead agency in evaluating MRIT and CAS, devise a plan for the future use of these systems.

16/ "Performance Specification for a Marine Radar Interrogator-Transponder System" (RTCM Paper 28-76/EC-186/SC 65-206: TWG-48).

## CONCLUSIONS

### Findings

1. The pilot of the KEYTRADER incorrectly decided to make a port turn to position his ship for an improper starboard-to-starboard passing with the BAUNE. The BAUNE was favoring its starboard side of the channel while proceeding upriver as required by the Inland Rules of the Road. The KEYTRADER was required by the same rules to keep to its starboard side of the channel which would have resulted in a port-to-port passing.

2. Both the pilot and master of the KEYTRADER misinterpreted the BAUNE's movements and thought that the BAUNE was moving out of the anchorage area, which was located to the KEYTRADER's starboard side of the channel. This misinterpretation caused them to believe that a starboard-to-starboard passing was necessary.

3. The BAUNE's pilot and master failed to detect the KEYTRADER until a collision was unavoidable. The BAUNE pilot's participation in a one-way vessel movement agreement may have reduced his attentiveness to the movements of approaching vessels.

4. The radarscopes of the KEYTRADER and the BAUNE were not monitored continuously while the vessels were navigating in a congested waterway in restricted visibility. This increased the risks of not detecting or misinterpreting the movements of approaching vessels.

5. The low-lying fog, which obscured the riverbanks and other low-elevation landmarks, prevented the master and pilot of the KEYTRADER from visually orientating their vessel's movements and the BAUNE's movements to the river's navigational channel, and contributed to the illusion that the BAUNE was moving out of the anchorage area.

6. The KEYTRADER and BAUNE were approaching each other at speeds too fast to allow adequate time to properly evaluate vessel movements by manually processing radar data.

7. The high velocity of the river's current impeded the vessels from operating at slower speeds that would have allowed sufficient time to properly evaluate the movements of approaching vessels by manual processing of radar data.

8. The MV AUSTANGER and the MV BALEN both overtook the BAUNE as that vessel proceeded up the river.

9. There are no specific Coast Guard guidelines to assist masters and pilots in determining consistently a maximum safe speed when vessels are navigating by radar in restricted waters. Because adequate speed guidelines do not exist, the Coast Guard's conclusion that the speeds of the KEYTRADER and BAUNE were "immoderate" is an after-the-fact conclusion.

10. The investigation did not find any evidence that navigational equipment, steering systems, or propulsion systems failed or contributed to the collision.

11. The effectiveness of channel 13 VHF, which is required for bridge-to-bridge communication, is seriously degraded when used by a large number of vessels; undisciplined use of channel 13 and the use of shipboard units with large power outputs contribute to interference of this channel.

12. Environmental conditions prevented the KEYTRADER's sound signal from being heard by the BAUNE's bridge watch.

13. Because of the effect of environmental conditions on sound signal propagation and the operational difficulties with bridge-to-bridge radiotelephone, the KEYTRADER did not have a reliable means of establishing a passing agreement with the BAUNE.

14. The magnitude of the fire on the KEYTRADER increased when aluminum hatchcovers, which secured cargo tanks, melted and allowed the gasoline in tanks that were not damaged by the collision to become involved in the fire. These additional sources of fuel made the fire more difficult to extinguish and increased the extent of damage.

15. The Coast Guard is not adequately equipped to fight major marine fires.

## Probable Cause

The National Transportation Safety Board determines that the probable cause of this casualty was the failure of the KEYTRADER's pilot to correctly interpret the BAUNE's movements, which led him to make a port turn to position his ship for an improper starboard-to-starboard passing with the BAUNE.

Contributing to the accident were the operation of both vessels at speeds that did not allow sufficient time to establish a radar trackline, compounded by the inadequate use of the shipboard radar to evaluate a safe passing maneuver; the failure to establish communications; the inadequacy of sound signals under existing environmental conditions; and the failure of the BAUNE to maintain a lookout.

## RECOMMENDATIONS

As a result of its analysis of this accident, the National Transportation Safety Board made the following recommendations:
-- to the U.S. Coast Guard:

> "Establish guidelines to determine the maximum safe speeds for vessels that are navigating with radar in limited visibility on inland waters and require vessel operators to set the vessel's speed at, or less than, the maximum safe speed. The guidelines should insure adequate time for processing radar data, for evaluating the movement of approaching radar contacts, and for establishing a timely passing agreement. The guidelines should recognize the reduction in processing time achieved by electronic and computer aids. (Class II, Priority Followup) (M-77-1)
>
> "Determine the maximum strength of a current which leads to the mandating of one-way traffic for vessels that are navigating by radar in limited visibility on inland waters, and require the Vessel Traffic Service to mandate one-way traffic when the strength of the current exceeds the maximum strength. (Class II, Priority Followup) (M-77-2)
>
> "Establish minimum standards for manually processing radar data that will assist in evaluating the movements of approaching radar contacts on inland waters, and require vessel operators to insure that radar data is processed in accordance with the standards unless a Collision Avoidance System is in use. (Class II, Priority Followup) (M-77-3)
>
> "Develop and publicize information about deficiencies in the use of sound signals between vessels including the effect of environmental conditions on sound propagation. (Class II, Priority Followup) (M-77-4)
>
> "Prohibit the use of metals with low melting points and of fire-consumable gaskets in both tankcovers and deck piping systems on tankships. (Class II, Priority Followup) (M-77-5)

"Study the adequacy of its capability to fight major marine fires on remote waterways where the local firefighting capability is inadequate, and establish an adequate fire-fighting capability for such areas. (Class II, Priority Followup) (M-77-6)"

-- to the Maritime Administration, Department of Commerce:

"Establish guidelines to provide for the use at the earliest possible date, of Marine Radar Interrogation Transponders (MRIT) and Collision Avoidance Systems (CAS) by vessels that are navigating by radar on inland waters. (Class II, Priority Followup) (M-77-7)"

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ WEBSTER B. TODD, JR.
Chairman

/s/ KAY BAILEY
Vice Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ PHILIP A. HOGUE
Member

/s/ WILLIAM R HALEY
Member

May 12, 1977

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD
WASHINGTON, D.C. 20590
PHONE:

(G-MVI-3/83)

•5943/KEYTRADER
BAUNE
A-5Bd

19 FEB 1976

Commandant's Action

on

The Marine Board of Investigation convened to investigate the circumstances surrounding the collision between the SS KEYTRADER and SS BAUNE (Norwegian) in the Mississippi River on 18 January 1974 with loss of life

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

REMARKS

The causes and contributing causes of this casualty as determined by the Board are concurred with. However, additional emphasis needs to be placed on the failure of the SS KEYTRADER to keep to that side of the fairway or mid-channel which lies on the starboard side of such vessel as required by 33 USC 210. The Board states in conclusion 2a that the SS BAUNE while proceeding upriver past Pilottown was favoring the East Bank, as was "customary" for upbound vessels in that area. Under the Inland Rules of the Road it is more than customary for vessels navigating a narrow channel to "keep to the right." Such practice is a requirement of federal statute and the failure of the SS KEYTRADER to comply with this requirement is considered to have contributed equally with the improper action of the SS KEYTRADER in initiating and attempting a starboard to starboard passing as a primary cause of the collision.

Additionally, the failure of both vessels to effectively analyze and utilize data available from radar equipment as discussed in the Board's conclusion 5 is considered a contributing cause of the casualty. Although this is so, it is cautioned that radar plotting is solely another aid to assist the navigator and it must be properly performed and interpreted.

## ACTION CONCERNING THE RECOMMENDATIONS

1. Recommendation: That a harbor advisory and traffic control system be established to control the movement of vessels transiting the Mississippi from the entrance to the Passes to and including New Orleans Harbor. The purpose of such a system would be in negotiating the Mississippi River both during periods of poor visibility and during periods when one way traffic control may be required.

Action: The informal agreement for vessel traffic control as discussed in the Board's Conclusion 10 is considered ineffective. The system being non-mandatory, nor regulated, nor enforceable offered only a modicum of security to vessels operating in the area. The Coast Guard has plans for the establishment of a vessel traffic service which will encompass the recommended portion of the Mississippi River. A vessel movement reporting system should be in operation by mid Calendar Year 1977. It must be kept in mind, however, that safe navigation can be effected by strict adherence to the Rules of the Road, prudent navigation, and the proper use of all equipment available to navigator such as radar and radiotelephone.

2. Recommendation: That a copy of this report be forwarded to the Federal Communications Commission for their information and action as deemed appropriate concerning the undisciplined and unauthorized use of Channel 13.

Action: The increased use of Channel 13, the bridge-to-bridge radiotelephone frequency, both for authorized and unauthorized transmission is recognized. While the Federal Communications Commission has a general responsibility for proper communications, the responsibility of enforcing the requirements of the Vessel Bridge-to-Bridge Radiotelephone Act rests with the Coast Guard. Coast Guard units in the Eighth District and elsewhere monitor this frequency on a regular basis. Where violations of the Act or its implementing regulations are substantiated, the Coast Guard cites violators and levies monetary penalties. Additionally, a public information program is underway which is designed to increase the awareness of users of Channel 13 to the importance of the frequency and the restrictions of its use.

A copy of this report will be provided to the Federal Communications Commission for their information.

3. Recommendation: That further investigation under the Suspension and Revocation proceedings be initiated in the case of Oscar F. Woods, Jr., License #443060, pilot of the SS KEYTRADER, concerning his part in this casualty.

Action: Further investigation under Suspension and Revocation proceedings was conducted concerning the pilot of the SS KEYTRADER for his part in this casualty.

4. Recommendation: That further investigation under the Suspension and Revocation proceedings be initiated in the case of William M. Taylor, License #385141, the master of the SS KEYTRADER, concerning his part in this casualty.

Action: Further investigation under the Suspension and Revocation proceedings was conducted concerning the master of the SS KEYTRADER for his part in this casualty.

5. Recommendation: That further investigation under the Suspension and Revocation proceedings be initiated in the case of Louis E. Miller, License #417230, pilot of the SS BAUNE, concerning his part in this casualty.

Action: Further investigation under the Suspension and Revocation proceedings was conducted concerning the pilot of the SS BAUNE for his part in this casualty.

6. Recommendation: That further investigation under the administrative penalty procedures be initiated against the master of the SS BAUNE for failure to sound fog signals (33 USC 191), for failure to proceed at a moderate speed in fog (33 USC 192), and for negligence in that he failed to keep a proper lookout (46 USC 1461(d)).

Action: Further investigation under the administrative penalty procedures has been initiated concerning the possible violations of law on the part of the master of the SS BAUNE.

7. Recommendation: That further investigation under the administrative penalty procedures be initiated against the owners/operators of the SS KEYTRADER for failure to sound fog signals (33 USC 191), for failure to proceed at a moderate speed in fog (33 USC 192), for failure to establish a port to port passing agreement (33 USC 203, Rule I), for failure to immediately sound the danger signal and stop when no response to the two whistle passing signal was heard from the SS BAUNE (33 USC 203, Rule III), and for failure to keep to that side of the fairway or mid-channel that lies on the starboard side of the vessel (33 USC 210).

Action: Further investigation under the administrative penalty procedures has been initiated concerning the possible violations of law on the part of the owners/operators of the SS KEYTRADER.

Further investigation under the administrative penalty procedures against the owners of the SS BAUNE has also been initiated for failure to sound fog signals (33 USC 191), for failure to proceed at a moderate speed in fog (33 USC 192), and for negligence in that the SS BAUNE failed to keep a proper lookout (46 USC 1461(d)).

8. Recommendation: That a recording device similar to that installed on commercial aircraft be required on merchant vessels which will preserve vital information subsequent to a shipboard accident.

Action: The primary purpose of a flight recorder is to reconstruct events in the case of a non-survivor crash. Unlike the aircraft accident, very seldom are there vessel casualties that kill everyone immediately concerned or those persons that are witnesses to the accident.

It is agreed that in certain incidents a record of courses and speed changes and certain other operational functions would provide facts which would assist in determining the cause of the casualty. However, the number of incidents where such information would lead to improved vessel safety is not considered sufficient to justify the cost of providing and maintaining the equipment necessary to record and protect the information.

9. Recommendation: Pending the development and availability of the above mentioned recording device, that the installation and effective use of course recorders be required aboard merchant vessels operating on the navigable waters of the United States.

Action: The Coast Guard has under consideration as part of the regulations being developed to implement the Ports and Waterways Safety Act a requirement for course recorder equipment to be installed aboard all U. S. vessels of over 1600 gross tons. A Notice of Proposed Rule-making is expected to be published in the near future.

10. Recommendation: That the use of aluminum and other materials which are destroyed or breached after exposure to high temperatures or flames be discontinued in the construction of cargo tank boundaries and lifeboats.

Action: Although aluminum lifeboats are more susceptible to fire damage than those made of steel, fires of sufficient intensity will render any lifeboat and/or davit design useless regardless of the material construction. The complete survival system design is based on multiplicity of this equipment so that the probability of access to some equipment is good in spite of what may happen to an individual piece of equipment. Additionally, aluminum lifeboats possess other desirable properties such as light weight and corrosion resistance. Overall, aluminum lifeboats are considered equally reliable to those constructed of other materials.

Aluminum cargo tank covers have been permitted on U. S. vessels since the early 1950's. The use of aluminum covers was allowed because it was believed that the lighter covers were less of a human safety hazard and

that while a cargo may be exposed to open flame by a material failure, there would be little or no contribution to a vessel failure. More research of past casualties is being conducted to determine if the premise under which aluminum covers were accepted remains valid.

O. W. SILER
Admiral, U. S. Coast Guard
Commandant

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

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5943/SS KEYTRADER/SS BAUNE
1 October 1974

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

Subj: SS KEYTRADER, O.N. 267905, SS BAUNE (Norwegian); collision at Mile 6.2 AHP, Mississippi River on 18 January 1974; with loss of life

FINDINGS OF FACT

1. The outbound, loaded U. S. tankship SS KEYTRADER and the inbound, loaded Norwegian bulk carrier SS BAUNE collided at about 1401 CDST, on 18 January 1974, in the lower Mississippi River at approximately Mile 6.2 above Head of Passes (AHP). The bow of the SS BAUNE penetrated the starboard side of the SS KEYTRADER, near the break of the forecastlehead. Gasoline cargo aboard the SS KEYTRADER ignited. Burning gasoline spilled from the ruptured cargo tanks. Both vessels were extensively damaged in the collision and ensuing fire. The U. S. Coast Guard fought and extinguished the fire on both vessels as they lay abreast of each other and aground on the East Bank of the river. Six persons are known dead, and ten persons are missing. Three persons sustained injuries which incapacitated them for a period of over 72 hours.

2. Vessel data:

| | | |
|---|---|---|
| NAME: | KEYTRADER | BAUNE |
| O.N. | 267905 | ---- |
| CLASS: | Tankship | Bulk Carrier |
| GROSS TONS: | 11,476 | 22,311 |
| NET TONS: | 8,020 | 14,105 |
| LENGTH: | 529.4' | 625' |
| BREADTH: | 68.3' | 87' |
| DEPTH: | 37.6' | 46' |
| CARGO SPACES: | 32 Cargo Tanks | 9 Holds |
| YEAR BUILT: | 1954 | 1958 |
| HOME PORT: | Wilmington, Delaware | Oslo, Norway |
| PROPULSION: | Steam Turbine Reduction | Steam Turbine Reduction |
| HORSEPOWER: | 7,700 | 9,900 |
| OWNER: | Keystone Tankship Corp.<br>313 Chestnut St.<br>Philadelphia, Pa. | Skips A/S Baumare<br>Oslo, Norway |
| OPERATOR: | Keystone Shipping Company<br>313 Chestnut St.<br>Philadelphia, Pa. | Torvald Klaveness<br>Oslo, Norway |
| LAST INSPECTION FOR CERTIFICATION: | 28 March 1973 | Solas - 19 September 1972 |

| | | |
|---|---|---|
| PORT: | Savannah, Ga. | N/A |
| CREW | 37 | 36 |
| OTHER PERSON ON BOARD: | 1 Pilot | 1 Pilot<br>3 Persons in addition to the crew |
| MASTER: | William M. Taylor<br>679 Lincoln St.<br>Duxbury, Mass.<br>CG License 385141<br>MMD BK-228811. | Trygve Haavik, 6270<br>Brttvaag, Norway,<br>Licensed Master, Norwegian authority. |
| PILOT: | Oscar F. Woods, Jr.<br>4100 Davey St.<br>New Orleans, La.<br>CG License 443060<br>Issue Number 5-7<br>MMD Z-544550<br>Master of Steam & Motor Vessels of any Gross Tons upon rivers; also Radar Observer; also First Class Pilot of Steam & Motor Vessels of any Gross Tons upon the upper & lower Mississippi River Mile 839.1, U.M.R. & the sea via South or Southwest Pass, Mississippi River Gulf Outlet, between Light 117 & the sea; Ohio River Mile 981.0 to Mile 602.1; Illinois River & Waterway Mile 0.0 to Mile 320.1<br>Member Federal Coast Pilots Association of Louisiana, Inc., for five years. | Louis E. Miller<br>7901 Oak St.<br>New Orleans, La.<br>CG License No. 417230<br>Issue Number 5-5<br>MMD Z-573051<br>First Class Pilot of Steam & Motor Vessels of any Gross Tons on Mississippi River from Huey P. Long Bridge, La., to the sea via South & Southwest Passes, also on Mississippi River Gulf Outlet between Light No. 104 & the Sea Buoy, also Radar Observer.<br>Appointed an Associated Branch Bar Pilot by the State of Louisiana Executive Department on 31 December 1952. |

3. The following is a list of the persons who are known dead as the result of the casualty.

SS BAUNE

Petter Iversen - Chief Steward
Ulterstunet 12A
7000 Trondheim, Norway

George M. Lewis - Deck Boy
35 Musgrove St.
St. Ann's Bay, Jamaica

Mrs. Aase Eggen - Wife of Second Engineer John Eggen
Hans Heyerdahls Vei 24
3155 Aasgaardstrand, Norway

Trond Eggen - Son of Second Engineer John Eggen
Hans Heyerdahls Vei 24
3155 Aasgaardstrand, Norway

SS KEYTRADER

Paul J. Hernandez - Ordinary Seaman
89 South Washington St.
Plainville, Connecticut

Isaiah Glover - Messman
5645 Verbena Road
Jacksonville, Florida

4. The following is a list of the persons who are missing.

SS BAUNE

Leaford G. Hutchinson - Boatswain
10½ Lincoln Road
Kingston 16, Jamaica

Trevor Whyte - Able Seaman
Ocho Rios
St. Ann, Jamaica

Milton Llewellyn - Ordinary Seaman
14 Crescent Hill
St. Ann's Bay, Jamaica

Marcel C. Jackson - Ordinary Seaman
3 Columbus Drive
Priory P.A.
St. Ann, Jamaica

Kempton Greaves - Oiler
83-D Parkingston Field, Pineland
St. Michael, Barbados

Dominus Pottinger - Chief Cook
Banks Mountain, Bomboo,
St. Ann, Jamaica

Easton J. Wilson - Saloon Boy
Carileen Seaview
Tower Isle, P. O.
St. Mary, Jamaica

Rodney Atkinson - Messman
Holetown
St. James, Barbados

Clifton Atkinson - Messman
Holetown
St. James, Barbados

Anthony Hoyte - Messman
School Road, Carrington Village
St. Michael, Barbados

The following persons were hospitalized, incapacitated for more than 72 hours.

SS BAUNE

Edgar G. Scott - Engine Boy - Minor burns
Priory P.A.
St. Ann, Jamaica

Elkins Hinds - Oiler - Minor burns
St. Stephens Hill, Black Rock
St. Michael, Barbados

Anthony A. Thorne - Fireman - Multiple burns, cuts & bruises
Station Hill
St. Michael, Barbados

5. Three members of the Board visited the scene of the accident on 20 January 1974 for orientation and boarding of both vessels, which at that time were aground off the East Bank near Mile 6.1 AHP. Both vessels were lying approximately parallel to each other, bow upstream. The SS BAUNE was ranged on both anchor chains, inshore of the SS KEYTRADER, with the bow approximately abeam of the amidship house of the SS KEYTRADER. Firefighting was still in progress in the stern section and steering engineroom of the SS BAUNE. The forward cargo tanks and forecastle area of the SS KEYTRADER were ablaze, with major firefighting effort by Coast Guard Cutters ACHUSHNET, DEPENDABLE, POINT SAL, POINT SPENCER and CG 53020 in progress. The wheelhouse and engineroom areas of both vessels, and the steering engineroom of the SS KEYTRADER, were examined for orientation as to the layout of installed equipment. The security of the course recorder rolls in use at the time of the collision was verified, and the tracings from both vessels were subsequently delivered to the Board.

6. The wind at the time of collision was southeasterly at about 10 knots. The air and water temperatures were 72 and 44 degrees Fahrenheit, respectively. The sky was cloudy. Visibility near the surface of the river was impaired by a dense layer of fog varying in height from about 10 to 30 feet. Visibility above the layer of fog was restricted to a distance of 2 to 5 miles. Upper hulls and superstructures of larger vessels, such as the SS KEYTRADER and the SS BAUNE, were clearly visible within the distance of restricted visibility. The river stages as indicated by the two gages located nearest the scene were 4.0 feet above Mean Sea Level at Head of Passes, and 5.0 feet above Mean Sea Level at Empire, Mile 29.0 AHP. The Mississippi River system of levees is not continued south of Mile 10.0 AHP. The river below this area overflows its banks during stages of high water, which condition existed on 18 January. The outflow strength of the main Mississippi River current was an estimated four and one-half knots.

7. The SS KEYTRADER is a typically configured tank vessel having a raised forecastlehead, an amidship house, and an afterhouse. The vessel's master, deck officers and radio officer are quartered in the amidship house, from which the vessel is navigated. The afterhouse contains the main machinery and provides accommodations for the other members of the crew. There are eleven main cargo tanks, which are subdivided into thirty-two individual tanks numbered one port and one starboard, and two through eleven, port, center and starboard. The vessel on the day of collision was equipped with customary navigational gear, including steam whistle located on the stack, gyro compass with repeaters

on each bridge wing, bridge-to-bridge radiotelephone, engine order telegraph (electric), telemotor and electric steering, rudder angle indicator, and two radars. All navigational equipment including telemotor, course recorder and both radars was operating properly at time of collision. The accuracy of the gyro compass was checked during passage downriver and no significant error was found.

8. One radar on the SS KEYTRADER, a Raytheon Pathfinder with sixteen inch scope, was installed when the vessel was new in 1954. The other radar, a Kelvin Hughes with approximately eight inch scope, was installed about 1967. The Raytheon Pathfinder was operating on the two mile scale, and the Kelvin Hughes on the one and a half mile scale, at the time of collision. There was no plot being maintained of targets observed on either radar.

9. The SS KEYTRADER is propelled by a single screw. Full speed ahead while steaming at sea in loaded condition is about 15 knots, at 83 R.P.M. Full speed ahead while maneuvering in restricted waters with a pilot aboard, such as on the day of collision, is about 11.5 - 12 knots at 70 R.P.M. Maneuvering speeds at half ahead and slow ahead are approximately 7.5 and 3.5 knots, at 45-48 and 23-25 R.P.M., respectively. Maximum R.P.M. normally produced in response to an order for full astern is approximately 50.

10. The SS KEYTRADER completed loading a cargo of 142,427.21 barrels (17,706.34 tons) of gasoline, jet fuel and furnace oil at Shell Oil Company, Norco, Louisiana, on 17 January 1974. Draft departing Norco that day was 29'08" forward, 33'04" aft, and 31'06" mean. The cargo was consigned to Shell Oil Company, and destined for Searsport, Maine. Cargo tanks one through four (all located forward of the amidship house) contained 49,934.0 barrels (5,649.5 tons) of Shell Regular Gasoline. Tanks five center and six center contained 11,125.0 barrels (1,284.38 tons) of Super Shell Gasoline. Tanks five port and six port contained 5,226.46 barrels (593.46 tons) of Shell Super Regular Gasoline. Tanks five starboard, six starboard and seven across contained 15,818.26 barrels (2028.06 tons) of Jet-A fuel, and the remaining tanks eight through eleven across contained 60,323.49 barrels (8,150.91 tons) of furnace oil. All tanks were loaded to an ullage of approximately four feet, except four port, nine center, and eleven center, which were slack, and four starboard, which was empty.

11. The SS BAUNE is a bulk ore carrier constructed with a raised forecastle-head, an amidship house, and an afterhouse. The vessel's master, deck officers, and radio officer are quartered in the amidship house, from which the vessel is navigated. The afterhouse contains the main machinery and provides accommodations for the remainder of the crew. The vessel has nine cargo holds, which at the time of casualty contained a total of 34,453 long tons of bauxite ore.

The vessel loaded at Port Rhodes, Jamaica, on 8 January 1974 and sailed with a draft of 34'10" forward, 35'11" aft, and 35'04½" mean.

12. The SS BAUNE was fitted with two engine order telegraphs, one located on each outboard, forward corner of the wheelhouse. The vessel was also fitted with bridge-to-bridge radiotelephone, a gyro compass, rudder angle indicator, radar, a steam whistle located on the stack, and an air whistle located above the amidship house on the mainmast. The radar set, a Raytheon Pathfinder, was located approximately 8 to 10 feet to starboard of the helmsman's position. The radar was fully operational during the transit; however, the master had requested by message to the ship's agent that the services of a radar technician were needed to correct a weak heading flasher presentation. All navigational equipment was operating properly. The radar was operating on the two mile range scale at time of collision. There was no plot being maintained of targets observed on the radar. The accuracy of the gyro compass was checked during passage upriver and no significant error was found.

13. The SS BAUNE is propelled by a single screw. Maneuvering speeds in restricted waters with a pilot aboard, such as on the day of collision, are 20 R.P.M. for dead slow ahead, 32 R.P.M. (4.5 knots) for slow ahead, 60 R.P.M. (7 knots for half ahead, and 80 R.P.M. (10 knots) for full ahead. The vessel has two steering systems, electric and hydraulic. The hydraulic steering system was in use at the time of the casualty. There is a special rudder control which permits the angle of the rudder to be placed between 45 degrees left and 45 degrees right to facilitate steering when the vessel is maneuvering in restricted waters. This special rudder angle control feature was in operation at the time of the casualty.

14. The SS KEYTRADER departed Norco, Louisiana, on 17 January 1974. The deck and engineroom clocks had been synchronized, and the course recorder checked. All navigational gear was tested and found satisfactory prior to departure. Federal Pilot Oscar F. Woods, Jr., was in charge of maneuvering the vessel. The voyage downriver that day was uneventful until approximately 1830, when low lying fog was encountered. Communications overheard on Channel 13 indicated that dense fog had reduced the visibility in Southwest Pass. The master and pilot discussed the situation and decided to anchor until the fog cleared. The vessel was turned and anchored at 1959, on 17 January 1974, near the right descending bank at approximately Mile 13.5 AHP.

15. Visibility improved somewhat at approximately 1100 on 18 January 1974. The vessel remained at anchor until after lunch. At 1210 the pilot remarked

to the master they could see several miles and the visibility was not going to get any better. It was decided to get underway. After the anchors were aweigh, the SS KEYTRADER stemmed the current while waiting for northbound vessels to clear the area. Overtaking agreements were exchanged with four vessels over VHF radio on Channel 13, as the SS KEYTRADER held to the right descending or West Bank. The pilot then commenced a turn to the right to head downriver. This maneuver was completed at about 1325, at which time speed was set at half ahead.

16. At about 1325 northbound traffic was observed ahead. At 1328 speed was reduced to slow ahead. Between 1343 and 1355 the vessel proceeded downriver off the West Bank on gyro headings of about 130 to 135 degrees. At 1345 after clearing traffic in the vicinity of Venice, Louisiana, speed was increased to half ahead. At about this time Pilot Woods broadcast his position twice on Channel 13, requesting any vessel between Wilder Flats Light and Pilottown to answer his call. He received no reply. The pilot again broadcast his position indicating he was southbound at Wilder Flats. No reply was received. An ordinary seaman was on the bow as lookout, along with the Chief Mate and Boatswain who were standing by the anchors. The master, pilot, third mate, and able seaman at the helm were on the bridge. Fog signals were not being sounded. The SS KEYTRADER was then approaching the Norwegian MV TROLL FOREST, which was anchored above the Pilottown anchorage, at a distance of approximately 600 yards below West Point Bank Light (Mile 7.7 AHP), and approximately 1200 feet off the West Bank. The SS KEYTRADER passed between the MV TROLL FOREST and the West Bank. Distance from the MV TROLL FOREST, when abeam, was approximately 300 feet.

17. The Mississippi River in the area below Wilders Flat Light is approximately 1300 yards wide and has a slight bend to the right. Pilottown anchorage is an area approximately 5.2 miles in length along the right descending bank or west side of the river. The east limit of the anchorage area at the upstream end starts at a point approximately 1,600 feet from the east bank at Mile 6.7 above Head of Passes and extends downstream generally parallel to and 1,600 feet from the east bank line to a point directly opposite Old Quarantine Station Light at Mile 3.7 above Head of Passes; thence to a point 1,600 feet directly opposite Pilottown Wingdam Light at Mile 1.5 above Head of Passes, which is the downstream limit of the anchorage area. The area is marked by large signs, "Pilottown Anchorage," located on the right descending bank at the lower and upper limits.

18. The master and the pilot on the SS KEYTRADER observed, first on radar and then visually, three vessels in the general anchorage. The vessels appeared to be in line. It was ascertained that the first vessel, the SS OCEAN PRINCESS,

and the second vessel, the SS PYRAMID VENUS, were at anchor and would be passed well clear. The third vessel, the SS BAUNE, did not appear to be anchored. That vessel was more to the eastward than the two vessels anchored ahead, on a heading which appeared to be ten to fifteen degrees to starboard of those two vessels. Furthermore, no anchor ball was visible. Movement of the SS BAUNE, and the fact that she was indeed underway, was confirmed by observation of the radar. At about 1355 the SS KEYTRADER began to alter course several degrees to the left, from a gyro heading of 132. At about 1356, when the SS BAUNE was at a distance of about 1.25 miles and bearing approximately 1½ points on the starboard bow, a two-whistle passing signal was sounded by the SS KEYTRADER. No whistle reply was heard. The pilot attempted to establish radio contact on Channel 13 with the SS BAUNE; no reply was received. At about 1356 the SS KEYTRADER steadied on a heading of 126 and continued to diagonally cross the river. At that time the SS BAUNE was proceeding upriver at full speed, nearly parallel and close to the East Bank.

19. At about 1358, when the vessels were approximately three-quarters mile distant, the SS BAUNE was observed to be swinging to the right. To the pilot of the SS KEYTRADER, the swing of the SS BAUNE appeared to be a wide sweeping one which commenced near mid-river. The SS KEYTRADER sounded the danger signal, followed by a two-whistle passing signal. The master stepped out to the starboard bridge wing to listen for an answering whistle signal. He heard none. The pilot, who was in the wheelhouse, ordered twenty degrees left rudder and at 1359½ ordered full ahead. At 1400, the master returned to the wheelhouse, ordered the Third Mate to ring the general alarm, and simultaneously put the engine order telegraph on full astern. The master jingled the engine order telegraph. The engine was placed on emergency full astern.

20. The master, after ringing full astern on the telegraph, blew the danger signal on the ship's whistle. The rudder returned amidships as the helmsman released and ducked behind the wheel. Collision occurred at about 1401, at which time the pilot ordered full ahead. Engineroom personnel began to respond to this order, but their space began to fill with smoke. The general alarm bells were ringing. It was decided to kill the boiler fires and leave the engineroom. The fire pump, however, had been started.

21. During the final moments before collision, the master returned to the bridge wing and yelled to the people on the bow, ordering them to leave. The Chief Mate and the Boatswain responded to the master's orders. They escaped by running aft. The ordinary seaman, Hernandez, did not respond to the master's orders in sufficient time to escape. He started to run only a few seconds before collision. The force of impact threw him to the deck of the forecastle-head, where he died as the gasoline cargo burst into flame.

22. The angle of impact, in relation to the starboard sides of the vessels, was about 57 degrees. The bow of the SS BAUNE entered the starboard side of the SS KEYTRADER, for a distance of about twenty feet, near the break of the forecastlehead in way of Number 1 and Number 2 tanks. Speed of the SS KEYTRADER at moment of collision was estimated at four knots by the master. The pilot of the SS KEYTRADER, who was observing the radar at the moment of collision, gave varying estimates from 400 to 700 feet as the distance the vessels collided off the East Bank.

23. Persistent fog conditions plagued the lower Mississippi River and the Passes during the month of January 1974. Many vessels were forced to remain at anchor for extended periods while waiting for the fog to clear. The general anchorage near Pilottown became congested. One vessel, the MV TROLL FOREST, was anchored above the designated anchorage. Numerous vessels were also anchored in the Gulf of Mexico off Southwest Pass. The SS BAUNE was one of those, and had been at anchor for seven days while waiting for the weather to clear sufficiently for getting underway and entering the Pass.

24. To most effectively move the vessels and relieve the congestion whenever the weather cleared sufficiently for navigation, it was informally agreed upon by the Associated Branch Pilots, the Crescent River Port Pilots Association and the New Orleans Steamship Association that northbound traffic would be moved first. The presence of several dredges working in the vicinity of Southwest Pass to restore channel depth was a factor in this arrangement to move traffic one way at a time. The Federal Pilots, including Pilot Oscar F. Woods, Jr., were not informed of this decision.

25. At about 0900 on 18 January, the master of the SS BAUNE was advised from the pilot station to prepare to enter. The vessel hove anchors at 0940 and proceeded toward Southwest Pass Entrance Buoy (LL #169). A radio message was sent to the ship's agent, in Baton Rouge, Louisiana, requesting the services of a radar technician. The message indicated that the radar was in operation, but the intensity of the heading flasher was either weak or non-existent.

26. Pilot Louis E. Miller boarded the SS BAUNE at 0951 in the vicinity of Southwest Pass Seabuoy. The vessel entered the Pass at about 1030 and proceeded at various speeds without incident until 1035, when it arrived at a shoal spot off Old Pilot Station (Mile 19 below Head of Passes). The vessel slowed somewhat but otherwise experienced no difficulty. While in Southwest Pass the SS BAUNE exchanged passing agreements on Channel 13 with three dredges. Agreements were also exchanged with the merchant vessels MV AUSTANGER and MV RIO BALEN, which overtook the SS BAUNE.

27. Pilot Miller called the watchtower at Pilottown, and gave his estimated time of arrival there as 1320. He was informed that the MV AUSTANGER would receive the last available river pilot. The MV RIO BALEN and the SS BAUNE would have to wait the arrival of pilots who were being driven from New Orleans to board the pilotboat at Venice. The pilot and the master of the SS BAUNE discussed the delay and decided to continue upriver and exchange pilots underway rather than proceed to anchorage. When the SS BAUNE entered the Mississippi River the pilot was informed, by the man stationed in the watchtower, that movement of downbound vessels with State pilots was unlikely, because all pilots upon departing ships at New Orleans were being driven back to Venice to assist in moving ships northward. The SS BAUNE's pilot was also informed that a ship with a Federal pilot aboard was anchored in the vicinity of Michella, Louisiana. The identification of that vessel and it's intended direction upon getting underway was not mentioned.

28. The SS BAUNE's speed was reduced from full ahead to half ahead at 1320 in the vicinity of Pilottown to clear the tankship SS ESSO NICARAGUA, which was maneuvering to turn around in the general anchorage area. At 1322 speed was reduced to slow ahead. At 1324 speed was increased to half ahead, and at 1329 to full ahead.

29. The SS BAUNE continued upriver, steering a course of 330 degrees gyro. Personnel aboard the vessel estimated the distance off the East Bank to be about 500 feet. There was no bow lookout. Fog signals were not being sounded. At about 1345, Pilot Miller spoke with the MV CRES-PILOT on Channel 13 and was informed that the pilotboat would get underway from Venice shortly to come directly to the SS BAUNE. At the conclusion of this conversation, the pilot secured his portable radio and placed it in his bag. He then switched the ship's radio from Channel 9 to Channel 13. No communications were initiated on Channel 13 from that time to the time of collision, although transmissions were heard over the radiotelephone.

30. Speed of the SS BAUNE was reduced to half ahead at about 1358½. At about 1359 course was altered to the left, with the vessel steadying on 323 degrees gyro. At this time the master was standing on the port bridge wing. The pilot was to the right of the helmsman in the vicinity of the radar set, which he had just viewed. Suddenly, the master called out to the pilot that there was a vessel on the port bow, which had sounded two blasts of the whistle. The pilot looked ahead and through the wheelhouse window could see a portion of the SS KEYTRADER. He ran to the port bridge wing exclaiming to the effect that such a passing proposal was "impossible". The SS KEYTRADER was about three ship lengths away, three to four points on the port bow, and thought to be in a

crossing situation. The pilot then ran back into the wheelhouse and attempted to make radio contact with the SS KEYTRADER on Channel 13. This effort was unsuccessful. He put down the phone and ordered hard right rudder. The mate on watch ordered full astern, over the telephone. This order was given at about 1400. The pilot as his next course of action ran to the whistle button and blew the danger signal. The telegraph was placed full astern, and two or more jingles given. The general alarm was sounded. The SS BAUNE commenced to swing in response to hard right rudder, but at about 1401 the collision occurred. A MAYDAY on Channel 13 was broadcast by the pilot before he and others were forced from the bridge by the heat of the fire.

31. Personnel on large vessels, anchored and underway in close proximity to the collision, visually observed the SS KEYTRADER and the SS BAUNE as they approached each other and collided. Personnel aboard the SS PYRAMID VENUS, which was anchored approximately 1650 feet off the West Bank and within one-third mile of the collision site, observed the SS BAUNE as it passed by, close to the East Bank. The distance between the anchored SS PYRAMID VENUS and the SS BAUNE when they were abeam of each other was approximately 1000 feet. The SS KEYTRADER was observed to pass between the anchored SS TROLL FOREST and the West Bank, and then alter course to the left. At no time, in the viewing of the SS KEYTRADER and the SS BAUNE, was either of those vessels obliterated by patches of fog.

32. The two vessels collided at or about Mile 6.24 AHP, near the East Bank. Momentum carried both vessels towards shallow water where they grounded. They came to rest, side by side and heading upriver with the SS BAUNE to starboard of the SS KEYTRADER, at or near Mile 6.08 AHP.

33. Gasoline cargo aboard the SS KEYTRADER ignited as the bow of the SS BAUNE entered the vessel. Flames at that time exceeded 50 feet in height. The brake linings for the wildcats on the SS BAUNE were destroyed by fire, allowing anchors and chain to drop into the river. Burning gasoline spilled from the ruptured cargo tanks and was carried alongside both vessels by the current.

34. On the bridge of the SS KEYTRADER, the heat became intense immediately after impact. Personnel on the bridge made their way to the catwalk leading to the afterhouse. Flames progressed towards them as they proceeded aft. Some but not all of the afterhouse doors were then closed to prevent flames and smoke from entering. The engineroom filled with dense smoke, and personnel on watch abandoned the space. Prior to abandoning the engineroom the main plant was secured, and the fire pump placed on the line. Ship's personnel congregated in the crew's messroom on the second deck level, port side. High flames surrounded the stern. The crew became quite concerned over their safety, and considered the possibility of seeking safer refuge in the reefer boxes. But

then as the heading of the vessel changed, the smoke and flames cleared the port side.

35. Two persons, Norris Ira Sapp, the radio officer and Isaiah Glover, a messman, donned life preservers and jumped into the river from the stern of the vessel. Norris Sapp was rescued by a passing helicopter. The burned body of Isaiah Glover, in his life preserver, was recovered by a helicopter.

36. The crew proceeded to launch Number 4 lifeboat. When it was waterborne, the master gave instructions to keep the boat alongside while he searched the vessel for other surviving crewmembers. He searched the after staterooms and recreation spaces. Not locating anyone he returned to the boatdeck where he saw Carl Wilson, able seaman. Wilson was a large framed person who had difficulty but successfully negotiated the embarkation ladder to the lifeboat. The lifeboat, with the master in charge, cast off and some fifteen minutes later was recovered by the pilotboat JUDGE PEREZ.

37. To escape the flames, bridge personnel aboard the SS BAUNE made their way down through the amidship house to the starboard access tunnel beneath the main deck. This tunnel is used by the crew in making their way from one end of the vessel to the other in rough weather at sea. They entered the after deckhouse and closed several doors leading to the main deck. The master proceeded towards the boatdeck, found the after part of the vessel in flames, and decided there was no way to escape from the stern. The master, pilot and crewmembers returned to the starboard tunnel. They made their way forward, closing the tunnel door leading to the forecastlehead. They returned to the amidship deckhouse, closed watertight doors, and attempted to put out fires on the bridge and in the radio room. A sudden flash and increase in flame intensity forced them to the main deck level. The fire around the deckhouse subsided and the master and pilot went on deck. The master made an unsuccessful attempt to attract the attention of persons in the lifeboat of the SS KEYTRADER, which he observed through the flames between the two vessels. He observed that the starboard side was clear of flames, and advised the pilot and other crewmembers that this was a good opportunity to swim to shore. The master jumped into the river and swam to a log, which drifted to shore. He was later picked up by a helicopter.

38. Pilot Miller heard helicopters to the port side of the vessel and elected not to jump from the starboard side. One of the helicopters landed in the water. He observed two men jump over the side and swim towards the helicopter. He thought this would be a good way for him to escape, but the helicopter drifted away in the smoke and fog. Crewmembers on the afterhouse were launching the port lifeboat, one of the two aboard the SS BAUNE. Pilot Miller jumped into

the water and swam aft to the boat, which was partially submerged due to it's aluminum hull being holed by fire. Crewmembers assisted him into the boat, which was still suspended from the forward fall. A short time later a Chevron Oil Company crewboat, the BENNIE JOYCE from Venice, Louisiana, came alongside and rescued eleven persons in the lifeboat. The crewboat took the survivors to Venice, Louisiana, for medical attention.

39. The remains of Mrs. Aase Eggen and her son, Trond Eggen, family of the second assistant engineer, John Eggen, were recovered on the poop deck of the SS BAUNE. The remains of the Chief Steward, Petter Iverson, were also found on the stern. All three persons died of "total body burns". The body of George Lewis, deck boy, was recovered from the Mississippi River on 18 January 1974. Cause of his death is listed as asphyxiation due to drowning.

40. The ten missing persons of the SS BAUNE were observed by fellow crewmembers to be aboard at various times during the day of the accident. The method by which these persons left the SS BAUNE after the mishap was not determined.

41. Comments on the firefighting procedures followed by both vessels and rescue forces are as follows:

a. Firefighting equipment aboard the SS KEYTRADER was not utilized to control or combat the fire. The intensity of the fire forced the crew to take refuge in the interior of the after deckhouse. The fire pump was started prior to the time personnel abandoned the engineroom; however, no fire hoses were used.

b. The master valve in the steam smothering system of the SS KEYTRADER remained closed after the collision. Normal shipboard practice was to keep the individual branch line valves to each cargo tank closed when the vessel carried more than one cargo, as was the case on 18 January 1974. This practice was followed to prevent cargo contamination caused by flow of product through the steam smothering branch lines.

c. The intense heat on the foredeck of the SS KEYTRADER was sufficient to melt aluminum cargo tank hatch covers, thus allowing cargo in tanks not damaged in the collision to be exposed to the fire.

d. The ruptured cargo tanks on the SS KEYTRADER released a large volume of burning fuel which spread downstream in the strong current. The spread of burning cargo on the water surface enveloped the vessels and even though of relatively short duration was sufficient to ignite combustible material.

e. Fire hoses to a limited extent, and some portable fire extinguishers, were used by crewmembers of the SS BAUNE to combat the fire. The equipment used was ineffective in dealing with the magnitude of the fire situation which existed.

f. The CG-53020 was the first Coast Guard vessel on scene and attempted to extinguish the fire on both vessels. This initial attempt at fire extinguishment by the Coast Guard was ineffective due to intense heat and limited firefighting capability of that small vessel.

g. The Commander, Eighth Coast Guard District designated the Captain of the Port, New Orleans, Louisiana, as On-Scene-Commander. He established a command post at Venice, Louisiana at about 1900, 18 January 1974. The Coast Guard Cutter POINT SPENCER, dispatched from CG GROUP, New Orleans, Louisiana, arrived on scene about 2040 and commenced firefighting operations. The fire at that time was intense. The Coast Guard Cutter POINT SAL assigned to CG GROUP, Grand Isle, Louisiana, arrived at 2345. Both of these vessels fought the fires from alongside the SS KEYTRADER. Their efforts were successful in extinguishing the fire in #4 port cargo tank. At about 0020 on 19 January, after expending all available foam and unable to curtail the spreading of the flames, Coast Guard vessels moved away from the burning ships.

h. The Coast Guard Cutter DEPENDABLE arrived from Panama City, Florida, at about 0230 on 19 January. The vessel loaded an extra supply of foam and began firefighting efforts at daybreak from along the port side of the SS KEYTRADER. The fires in No. 1 through No. 4 port tanks were extinguished by 0926. The Coast Guard Cutter ACHUSHNET arrived from Gulfport, Mississippi, at about 1000 and placed a firefighting party on board about 1250, and with the collective forces extinguished all flames on the SS KEYTRADER at 1740. A reflash and explosion occurred at about 1830, and the forces were withdrawn when foam supplies were depleted at about 2130. Additional foam supplies from industrial and governmental agencies were brought to the scene. At about 1436 on 20 January, the Coast Guard Cutter ACHUSHNET and Coast Guard Cutter DEPENDABLE resumed firefighting operations. By 1900 the fire was extinguished. Miscellaneous fires aboard the SS BAUNE had also been extinguished by that time.

i. Aqueous film forming foam was found to be the most effective type in combating the fire aboard the SS KEYTRADER.

j. The collision occurred in a remote section of the Mississippi River, and the resources of federal, state, and municipal agencies, and private industry were taxed to control the adverse effects of the fire and pollution potential.

k. The Captain of the Port, New Orleans, Louisiana, controlled movement of vessels on the Mississippi River to reduce the risks to the port and to vessels transiting the area. The closest fire boats on the Mississippi River were located at New Orleans (Mile 90 AHP). These resources were not available for use outside the jurisdiction of the New Orleans area during this incident.

42. Comments on the rescue operations are as follows:

a. The rescue of survivors was, in the main, initiated by MAYDAY radiotelephone distress signals sent by nearby vessels on Channel 13, which were relayed to the Coast Guard Light Attendant Station at Venice, Louisiana, and to helicopters which were airborne in the vicinity of the collision. The quick response of the crewboat BENNIE JOYCE upon hearing of the accident and proceeding to the scene was effective in the timely rescue of the eleven survivors of the SS BAUNE who were trapped on the fire damaged and holed port lifeboat.

b. Thirty-five crewmembers of the SS KEYTRADER, adrift in Number 4 lifeboat, were rescued by the pilotboat JUDGE PEREZ which was dispatched from Pilottown, Louisiana, as soon as notice of the casualty was received.

c. The CG-53020, the crewboat BENNIE JOYCE, and several private craft searched downriver to the Head of Passes. The fog and extremely poor visibility near the surface of the river made maneuvering and search by those small vessels especially difficult. Whether any of the missing crew of the SS BAUNE wore lifejackets when they left the vessel is undetermined, but sounds of whistles, such as those attached to life preservers, were heard by persons on a nearby anchored vessel. Airborne helicopters rescued the radio operator of the SS KEYTRADER, and the master and six crewmembers of the SS BAUNE. The remaining three survivors of the SS BAUNE were picked up by small craft. The body of one victim from the SS KEYTRADER was recovered shortly after the mishap. Extensive air and surface searches by both commercial and Coast Guard forces failed to locate additional bodies or survivors in the days following the accident.

d. A watchman is stationed at Pilottown, in a tower approximately thirty feet high, to monitor and respond to VHF radio communications on Channels 9, 13 and 16. The watchman does not normally monitor Channel 16; this is done by the two stations located at South Pass and Southwest Pass. When either of these two stations hear a transmission on Channel 16 intended for the tower, the watchman is contacted on Channel 9 and he in turn responds to the call. Two transceivers are located in the tower; one is a Cristripp one-watt hand

set used on Channel 13 only. The other set is of forty-five watts that is normally set on Channel 9, the pilot's working frequency. Extended conversation, if required, is normally carried out between the tower and a shipboard pilot using Channel 9. The original call is made on Channel 13 and then switched to Channel 9.

e. In addition to radio and lookout duties, the watchman occasionally leaves the tower to inform pilots in the station house of the estimated time of arrival of the vessel to which each is assigned. Prior to the collision the watchman had left the tower to perform this duty. He was absent from the tower for approximately six minutes when informed that a collision had taken place. He returned to the tower, communicated with a nearby anchored vessel, and directed the pilotboat JUDGE PEREZ to the location of the KEYTRADER's lifeboat.

f. The number of transmissions heard over Channel 13 is becoming voluminous for vessels navigating the lower Mississippi River and the Passes. Sometimes there will be simultaneous transmissions, with a strong signal overriding a weaker one. Shipboard personnel as a consequence may experience difficulty in deciphering or staying alert to individual transmissions. Furthermore, there is a problem with overly high output of some transmitting stations. Vessels in sight of one another at times cannot communicate because of transmissions being received from distant stations. Transmissions originating as far away as Mobile, Alabama, are sometimes received. Transmissions originating from vessels and stations in New Orleans Harbor are commonly heard by vessels transiting the lower Mississippi River in the vicinity of Pilottown.

## PREFACE TO THE CONCLUSIONS

### COURSE RECORDER ANALYSES

1. Various reports and testimony established the time of collision as being near 1400 CDST. For the purpose of this report, the last entry in the SS KEYTRADER's engineroom bellbook will be accepted as a valid record reflecting 1401 CDST as the actual time of collision. This entry was made after the pilot gave the order for full ahead as the vessels collided. Also, entries in the SS BAUNE engineroom bellbook support the conclusion that the collision occurred at 1401.

2. The SS KEYTRADER course recorder tracing indicates minute 60 as the time corresponding to the heading of the vessel at moment of collision. In the case of the SS BAUNE, the corresponding course recorder time is minute 64. Using 1401 CDST as the basis for the actual time of collision, it is concluded that the course recorder aboard the SS KEYTRADER was running about one minute slow. All times shown by the tracing need to be corrected accordingly. The course recorder aboard the SS BAUNE was running about three minutes fast, and all times need to be corrected accordingly.

3. An analysis of the course recorder headings as tabulated in paragraph 7 below shows that the SS KEYTRADER from 1337 to 1341 was on headings of 145 to 143. Such headings closely parallel the West Bank of the river immediately above Venice, Louisiana. Between 1343 and 1355, the vessel proceeded on headings of 130 to 135. These headings closely parallel the West Bank of the river immediately below The Jump. The distance travelled during this latter twelve minute period would be about 2.4 miles, which approximates the distance between The Jump and the anchored position of the MV TROLL FOREST. At minute 55, the vessel altered course, from 132, and steadied on a heading of 126 at minute 56. At minute 58½ the vessel commenced swinging left. Close study of the course recorder tracing at this point in time shows a steady rate of swing until the vessel reached a heading of 111 at minute 60. The rate then decreased slightly as the vessel approached a heading of 106 at minute 61. At this time the rate of swing increased rapidly until the vessel steadied on a heading of 098. About one-quarter to one-half minute later the vessel again commenced swinging rapidly to the left towards final heading after collision.

4. From the above analysis and other information available to the Board, it is concluded that the SS KEYTRADER was proceeding downriver along the West Bank below The Jump while on heading of 130 to 135. The vessel, after passing between the West Bank and the anchored MV TROLL FOREST, altered course to the left, steadied on a heading of 126, and proceeded to diagonally cross the river.

At minute 58½, a left swing commenced in response to the pilot's command for twenty degrees left rudder, which was followed by full ahead command at minute 59½. The vessel continued in this swing, but the rate decreased as the rudder came amidships and the engine was put full astern. Collision occurred at minute 61 on a heading near 106, and the swing to left abruptly increased. Shortly thereafter the vessel went aground, steadied momentarily on a heading of 098, and then began its wide and rapid swing to the left before coming to rest on a northerly heading close to the East Bank of the river.

5. An analysis of the course recorder headings as tabulated in paragraph 7 below shows that the SS BAUNE from 1345 to 1358 was on headings of 329 to 330 degrees gyro. At 1359 the vessel was in a course alteration to the left, which terminated at minute 60 on a heading of 323. The vessel steadied momentarily on the 323 heading and then commenced to swing right. By minute 61 the vessel was rapidly swinging past a heading of approximately 336. A reading of the course recorder tracing at this time interval becomes difficult, with respect to precisely correlating headings and time, because the rapidity of the swing was such to produce a nearly horizontal tracing. By minute 62 the heading approximated 010. By minute 62½ the vessel had reached a heading of 017, and abruptly began a swing to the left. This swing continued until the vessel reached a final heading, by course recorder tracing, of about 342 at minute 65.

6. From the above analysis and other information available to the Board, it is concluded that the SS BAUNE from 1345 to 1358 was on a steady course of 329 to 330 degrees gyro as it approached the SS KEYTRADER. At 1358 the pilot directed a course change to the left, and the vessel steadied on a heading of 323 at minute 60. The purpose of that course change was to keep the vessel closely parallel to the East Bank. The vessel remained on the 323 heading for a half minute or so, and then began a rapid swing to the right in response to emergency hard right rudder and full astern. Collision occurred shortly thereafter, at about minute 61, with the SS BAUNE on a heading of approximately 343 degrees gyro. The vessel continued in a rapid swing to the right until it reached a heading of 017, at or near the time of grounding, close to the East Bank. The vessel then swung, in response to river current, to the left towards final heading after collision.

7. Various headings of the SS KEYTRADER and the SS BAUNE on the afternoon of 18 January 1974, as shown by course recorder tracing and engineroom bell-book from each vessel, are tabulated below. The headings have been adjusted to account for differences indicated in paragraph 2 above.

| | SS KEYTRADER | | SS BAUNE | |
|---|---|---|---|---|
| TIME | HEADING | SPEED | HEADING | SPEED |
| 1320 | - | Full astern | | |
| 1321 | 120 | Full astern | | |
| 1322 | 130 | Full ahead | | |
| 1323 | 137 | Full ahead | | |
| 1324 | 142 | Full ahead | | |
| 1325 | 147 | Half ahead | | |
| 1326 | 151 | Half ahead | | |
| 1327 | 157 | Half ahead | | |
| 1328 | 154 | Slow ahead | | |
| 1329 | 152 | Slow ahead | | |
| 1330 | 151 | Slow ahead | | |
| 1331 | 152 | Slow ahead | | |
| 1332 | 152 | Slow ahead | | |
| 1333 | 152 | Slow ahead | | |
| 1334 | 151 | Slow ahead | | |
| 1335 | 152 | Slow ahead | | |
| 1336 | 149 | Slow ahead | | |
| 1337 | 145 | Slow ahead | | |
| 1338 | 145 | Slow ahead | | |
| 1339 | 144 | Slow ahead | | |
| 1340 | 143 | Slow ahead | | |
| 1341 | 143 | Slow ahead | | |
| 1342 | 141 | Slow ahead | | |
| 1343 | 132 | Slow ahead | | |
| 1344 | 131 | Slow ahead | | |
| 1345 | 131 | Half ahead | 329 | Full ahead |
| 1346 | 130 | Half ahead | 329 | Full ahead |
| 1347 | 130 | Half ahead | 329 | Full ahead |
| 1348 | 131 | Half ahead | 329 | Full ahead |
| 1349 | 134 | Half ahead | 329 | Full ahead |
| 1350 | 132 | Half ahead | 330 | Full ahead |
| 1351 | 132 | Half ahead | 329 | Full ahead |
| 1352 | 135 | Half ahead | 328 | Full ahead |
| 1353 | 132 | Half ahead | 330 | Full ahead |
| 1354 | 132 | Half ahead | 329 | Full ahead |
| 1355 | 132 | Half ahead | 329 | Full ahead |
| 1356 | 126 | Half ahead | 329 | Full ahead |

| | | |
|---|---|---|
| 1357 | 126 | Half ahead |
| 1358 | 126 | Half ahead |
| 1358½ | - | - |
| 1359 | 122 | Half ahead |
| 1359½ | 117 | Full ahead |
| 1400 | 111 | Full astern |
| 1400+ | - | - |
| 1401 | 106 | Full ahead |
| 1402 | 098 | - |
| 1402½ | - | - |
| 1403 | 050 (App.) | - |
| 1404 | - | - |
| 1405 | - | - |
| 330 | | Full ahead |
| 330 | | Full ahead |
| 329 | | Half ahead |
| 327 | | Half ahead |
| 324 | | Half ahead |
| 323 | | Stop |
| - | | Full astern |
| 336 (App.) | | - |
| 010 (App.) | | - |
| 017 (App.) | | - |
| 013 (App.) | | - |
| 352 (App.) | | - |
| 342 | | - |

## CONCLUSIONS

1. The SS KEYTRADER and the SS BAUNE collided at 1401 CDST, on 18 January 1974, on the lower Mississippi River at approximately Mile 6.2 AHP, near the East Bank. The direction, momentum and speed of the two vessels after collision was such to cause them to ground on the East Bank. The period of time between collision and grounding, based upon course recorder analysis, was in the order of 1.2 minutes.

a. The SS KEYTRADER until minute 59½ was proceeding at half-speed, or approximately 7.5 knots through the water. The engine was then put full ahead for one-half minute, followed by full astern for one minute prior to collision. A full ahead order was then given, but it is unlikely that the limited response given to this order was sufficient to cause a significant increase in speed after collision. The master of the SS KEYTRADER estimated his speed, through the water, at moment of collision as four knots. Using that speed and 1.2 minutes as basis for calculation, the distance between point of collision and point of grounding would have been in the order of 480 feet. This distance gives support to the testimony of personnel of the SS BAUNE that their vessel was favoring the East Bank, while proceeding upriver past Pilottown.

b. The Board rejects the testimony of the pilot of the SS KEYTRADER in which he indicates that the SS BAUNE made a wide sweeping turn to the right, from near the middle of the river, before colliding. Such testimony is not supported by analysis of the course recorder tracing from the SS BAUNE. The course change made by that vessel, in response to 45 degrees hard right rudder and emergency full astern, was only about 24 degrees and would not have brought the vessel from mid river to point of collision.

2. There are several causative factors which warrant consideration in explaining the events which led to this collision. Five factors predominate in trying to understand how two large vessels, in view of one another, could have collided while being navigated with experienced pilots aboard. Those factors relate (1) to the failure of both vessels to proceed at a speed commensurate with the poor visibility conditions which existed, (2) to lack of communication between the two vessels resulting in failure to establish a passing agreement, (3) to the impropriety of the starboard to starboard passing proposed by the SS KEYTRADER, (4) to the improper action taken by the SS KEYTRADER when no response to the passing proposal was heard and (5) to the failure of the SS BAUNE to maintain a proper lookout. Those five factors, and others, are discussed in the subparagraphs below.

a. The Board concludes that the primary cause of the collision was the action taken by the SS KEYTRADER in initiating and attempting a starboard to starboard passing. The SS BAUNE while proceeding upriver past Pilottown was favoring the East Bank, as was customary for upbound vessels in that area. There was time and ample room available for the vessels to have maneuvered and passed safely port to port.

b. There is evidence of violation of Article 18, Rule I, of the Inland Rules of the Road (33 USC 203 Rule I), and of Article 25 (33 USC 210). The SS KEYTRADER was on a heading of about 128 degrees gyro at the time a two whistle passing signal was first blown for the SS BAUNE. That vessel was then steering a course of 329 degrees gyro and was about one and one-half points on the starboard bow of the SS KEYTRADER. The vessels were in a head to head meeting situation, in which case the starboard to starboard passing proposal was improper. It was the duty of each vessel to pass on the port side of the other. Furthermore, it was the duty of the SS KEYTRADER to keep to that side of the fairway or mid-channel which lies on the starboard side of such vessel. The decision to attempt a starboard to starboard passing was imprudent and caused the SS KEYTRADER to be placed on or near collision course with the SS BAUNE.

c. There is evidence of violation of Article 18, Rule III of the Inland Rules of the Road (33 USC 203 Rule III). A major contributing cause of this casualty was the failure of the master and the pilot of the SS KEYTRADER to take timely and effective action when no reply to the original two blast whistle signal, or response to radio communications, were received from the SS BAUNE. The SS KEYTRADER was aware of the other vessel's presence and movement, and corrective action was required. The two blast whistle signal was sounded by the SS KEYTRADER at approximately 1356, five minutes before the collision. When the SS BAUNE did not promptly answer with two similar blasts or the danger signal, it was the SS KEYTRADER's duty to stop and immediately sound the danger signal.

d. A contributing cause was the failure of the SS BAUNE and the SS KEYTRADER to establish bridge-to-bridge radiotelephone communications. This failure is not fully understood. That the SS KEYTRADER did successfully communicate passing agreements with other vessels on Channel 13 indicates that the radio was operational. The pilot on the SS BAUNE did transmit and receive communications on his portable radio prior to 1345. Upon the conclusion of his conversation with the pilotboat CRES-PILOT, the pilot commenced making preparations to leave the vessel. The preparations, which included securing his portable radio and placing it in his bag, took place in the after part of the wheelhouse. When this portable radio was secured communications were transferred

to the SS BAUNE's radiotelephone, on Channel 13, and the volume control was positioned at a reduced level. Although some conversations or voices were heard they might not have been clearly intelligible because of the reduced volume. Between 1345 and a minute or so before collision, no radio transmissions were made by the SS BAUNE. The pilot attempted to contact the SS KEYTRADER shortly before collision, but whether or not an actual transmission went out is not known. In any event, it was not heard aboard the SS KEYTRADER, or by other vessels in the vicinity. The MAYDAY signal, however, which was transmitted by the SS BAUNE was heard by several vessels.

e. A contributing factor was the restricted visibility, caused by the low lying fog bank, which obscured visibility of targets below the level of the fog bank. Although the masts and superstructures of anchored and approaching vessels were seen for several miles, the condition precluded easy detection of movement of vessels either in relation to each other or to terrestrial objects. The SS KEYTRADER became aware of the presence of the SS BAUNE about five minutes prior to collision, but at first was uncertain as to whether the vessel was at anchor or underway. That question was resolved after movement of the SS BAUNE was observed on radar. Thus, some of the time available for establishing a proper passage was initially lost. The low layer of fog, which precluded visual sighting of the East Bank, complicated an exact determination of the amount of room that would be available between the SS BAUNE and the East Bank for the two whistle passing proposal. Under such conditions it is concluded that the SS KEYTRADER erred in not reducing speed upon sighting the SS BAUNE. Furthermore, the speed of the SS KEYTRADER was excessive for a vessel approaching the Pilottown area, where other vessels could be expected to be maneuvering to exchange pilots or getting underway from anchorage.

f. Aside from the above comments, which deal with prudent seamanship in the navigation of one large vessel with respect to another during reduced visibility, there is evidence of violation of Article 16 of the Inland Rules of the Road (33 USC 192). The speed of the SS KEYTRADER clearly was immoderate for the near zero visibility conditions which prevailed in the fog layer near the river surface. The SS KEYTRADER was proceeding at half speed, or approximately 7.5 knots through the water and 12 knots over the ground. Similarily, the speeds of the SS BAUNE, which were full ahead (10 knots through the water and 5.5 knots over the ground) prior to 1358½ and half ahead (7 knots through the water and 2.5 knots over the ground) between 1358½ and 1400 were immoderate.

g. There is evidence of violation of 46 USC 1461(d). The absence of a bow lookout on the SS BAUNE under prevailing conditions of poor visibility, particularly the low lying fog, precluded timely detection by a person whose

sole duty it would be to sight approaching objects. The failure of the master, the pilot and other personnel on the SS BAUNE to maintain a proper lookout is inexplicable. Their inattention to this, a primary duty of seamen, allowed the SS KEYTRADER to approach within three ship lengths before being sighted. Such negligence aboard the SS BAUNE to detect in a timely manner either the presence or the movement of the SS KEYTRADER until in extremis materially contributed to the collision.

h. A contributing cause of this casualty was the decisions of pilots and masters to get their vessels underway from anchorage and to navigate a congested area in the conditions of fog and restricted visibility as existed on the afternoon of 18 January 1974.

i. There is evidence of violation of Article 15 2(a) of the Inland Rules of the Road (33 USC 191). A contributing cause of this casualty was the failure of each vessel to sound the prescribed fog signals. The fog, although not considered dense above a height of 30 feet, did preclude the detection of smaller vessels below that height. Had fog signals been sounded for the purpose of avoiding collision with smaller vessels obscured by fog, and had the SS KEYTRADER and the SS BAUNE been navigated at moderate speeds commensurate with the low fog layer, it is unlikely that this collision would have occurred.

3. The effectiveness of Channel 13 VHF (bridge-to-bridge) as a means of communication between vessels meeting and passing is diminished by the undisciplined use of this Channel for other than navigational information exchange, and also by the fact that the ships' radios in present use vary in power output to such an extent that the signals far exceed the line of sight limitation needed in actual practice. The rules for the use of Channel 13 restrict the use of power to not exceed 1 watt except under certain limited conditions. This rule does not appear to be followed in actual practice by many users of Channel 13.

4. The high loss of life on the SS BAUNE was due to the sudden envelopment of the stern by the flames of burning gasoline as it flowed downstream in the strong current. The large rupture of cargo tanks in the SS KEYTRADER permitted a large quantity of fuel to pass around and between the vessels exposing flammables on deck and causing the deckhouses to ignite. The missing

persons most probably sought refuge on the stern of the SS BAUNE when fire spread through the interior spaces, and when their retreat was blocked either went overboard into the flaming water or perished on the stern. The fact that no life preservers or victims from the SS BAUNE were located downstream after the fire would support a conclusion that the missing persons were either not wearing life preservers when they went over the side, or that if they were wearing life preservers as evidenced by persons on the nearby vessels hearing whistles, that the jackets were consumed by fire as they drifted downstream with the main body of released cargo. The missing crewmembers of the SS BAUNE are presumed dead.

5. The personnel on both vessels were not maintaining an effective radar watch and plot to detect the presence of moving vessels. Although the pilots of both vessels periodically checked the radar presentation, no marks were made on the scope, even of doubtful vessels, to detect possible moving targets. Had such a watch and plot been maintained, the movement of both the SS KEYTRADER and the SS BAUNE would have been readily apparent in time for those in command to be properly alerted.

6. The aluminum materials used for the hull of the lifeboats of the SS BAUNE and for the cargo tank hatch covers on the SS KEYTRADER failed to effectively withstand exposure to high temperatures of the fire for even a short period of time. Although in the instant case the crew of the SS BAUNE were able to lower the port lifeboat to the water, the large holes resulting from melting of the aluminum hull made the lifeboat an unseaworthy piece of lifesaving equipment. The fact that the crew was unable to disengage the forward fall was fortunate and kept the lifeboat afloat until the rescue vessels came on scene.

7. The successful rescue efforts of the pilotboat JUDGE PEREZ, and crewboat BENNIE JOYCE, and the helicopters from Petroleum Helicopter Incorporated and Chevron Oil Company which were airborne at the time of the casualty were effective in saving personnel of both vessels and are worthy of special recognition. The rescue efforts by these vessels and aircraft was more noteworthy because of the strong river current and low lying fog.

8. The successful efforts by the Coast Guard On-Scene-Commander and Coast Guard units in extinguishing the fires on the SS BAUNE, and in controlling and extinguishing the major fire on the tankship SS KEYTRADER, reflects most favorably on the willingness of such personnel to undertake a hazardous fire-fighting operation without proper clothing and other protective equipment. Such efforts are worthy of special recognition.

9. Although there were no prearranged port disaster control plans covering such an incident in this area of the Mississippi River, the cooperation, coordination and teamwork between governmental agencies and civilian groups effectively minimized the pollution and hazardous consequences of this casualty.

10. The weather conditions with extended periods of poor visibility which existed prior to this casualty caused many vessels to be anchored along the length of the Mississippi River. In addition, many vessels arriving at the seabuoy were forced to anchor while awaiting improved visibility for entrance into the Passes. The informal agreement between the Associated Branch Pilots and the Crescent River Pilots to move traffic in one direction to expedite clearing the congestion at the entrance to the Mississippi River, although noteworthy, was only partly effective since all shipping interests including Federal Pilots and Masters were not informed of the arrangement. The practice of the pilot's tower watch, in monitoring communications to gain intelligence on vessels which may have been underway in the area and relaying this to the pilots on certain vessels, is also noteworthy. These procedures are in effect a form of traffic control and traffic advisory system. However, since they are voluntary and do not cover all vessels, they can be only partly effective. A regulated, systematic traffic control and advisory system is needed on the Mississippi River, especially in view of pilots' decisions to get vessels underway from anchorage and to navigate in conditions of fog and reduced visibility, as was done on the afternoon of 18 January 1974.

11. The availability of course recorder tracings was of major assistance to the Board in analyzing and arriving at an understanding of this casualty. It is noted, however, that presently there is no requirement for vessels to be equipped with course recorder equipment, nor is there a requirement, if so equipped, that it be used.

12. For lack of a permanent record, the Board had to rely upon testimony of witnesses as to the number of whistle signals actually blown by each vessel, and to the extent and nature of communications transmitted or received over bridge-to-bridge radiotelephones. The accurate development of such facts would have been greatly facilitated had there been available a recording device, similar in purpose to that required aboard commercial aircraft, to preserve vital information.

13. The rupture of the cargo tanks aboard the SS KEYTRADER resulted in spillage of gasoline into the Mississippi River. Much of the spillage was consumed by the flames. A portion was dispersed by current action and by

evaporation of the cargo itself. Water pollution is considered to have been minimal. However, this is a violation of 33 USC 1321 (b)3.

14. There is no evidence that any personnel of the Coast Guard or any other government agency caused or contributed to this casualty.

15. There is no evidence of any material failure, that caused or contributed to this casualty.

## RECOMMENDATIONS

1. That a harbor advisory and traffic control system be established to control the movement of vessels transiting the Mississippi from the entrance to the Passes to and including New Orleans Harbor. The purpose of such a system would be in negotiating the Mississippi River both during periods of poor visibility and during periods when one way traffic control may be required.

2. That a copy of this report be forwarded to the Federal Communications Commission for their information and action as deemed appropriate concerning the undisciplined and unauthorized use of Channel 13.

3. That further investigation under the Suspension and Revocation proceedings be initiated in the case of Oscar F. Woods, Jr., License #443060, pilot of the SS KEYTRADER, concerning his part in this casualty.

4. That further investigation under the Suspension and Revocation proceedings be initiated in the case of William M. Taylor, License #385141, the master of the SS KEYTRADER, concerning his part in this casualty.

5. That further investigation under the Suspension and Revocation proceedings be initiated in the case of Louis E. Miller, License #417230, pilot of the SS BAUNE, concerning his part in this casualty.

6. That further investigation under the administrative penalty procedures be initiated against the master of the SS BAUNE for failure to sound fog signals (33 USC 191), for failure to proceed at a moderate speed in fog (33 USC 192), and for negligence in that he failed to keep a proper lookout (46 USC 1461(d)).

7. That further investigation under administrative penalty procedures be initiated against the owners/operators of the SS KEYTRADER for failure to sound fog signals (33 USC 191), for failure to proceed at a moderate speed in fog (33 USC 192), for failure to establish a port to port passing agreement (33 USC 203 Rule I), for failure to immediately sound the danger signal and stop when no response to the two whistle passing signal was heard from the SS BAUNE (33 USC 203 Rule III), and for failure to keep to that side of the fairway or mid-channel that lies on the starboard side of the vessel (33 USC 210).

8. That a recording device similar to that installed on commercial aircraft be required on merchant vessels which will preserve vital information subsequent to a shipboard accident.

9. Pending the development and availability of the above mentioned recording device, that the installation and effective use of course recorders be required aboard merchant vessels operating on the navigable waters of the United States.

10. That the use of aluminum and other materials which are destroyed or breached after exposure to high temperatures or flames be discontinued in the construction of cargo tank boundaries and lifeboats.

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