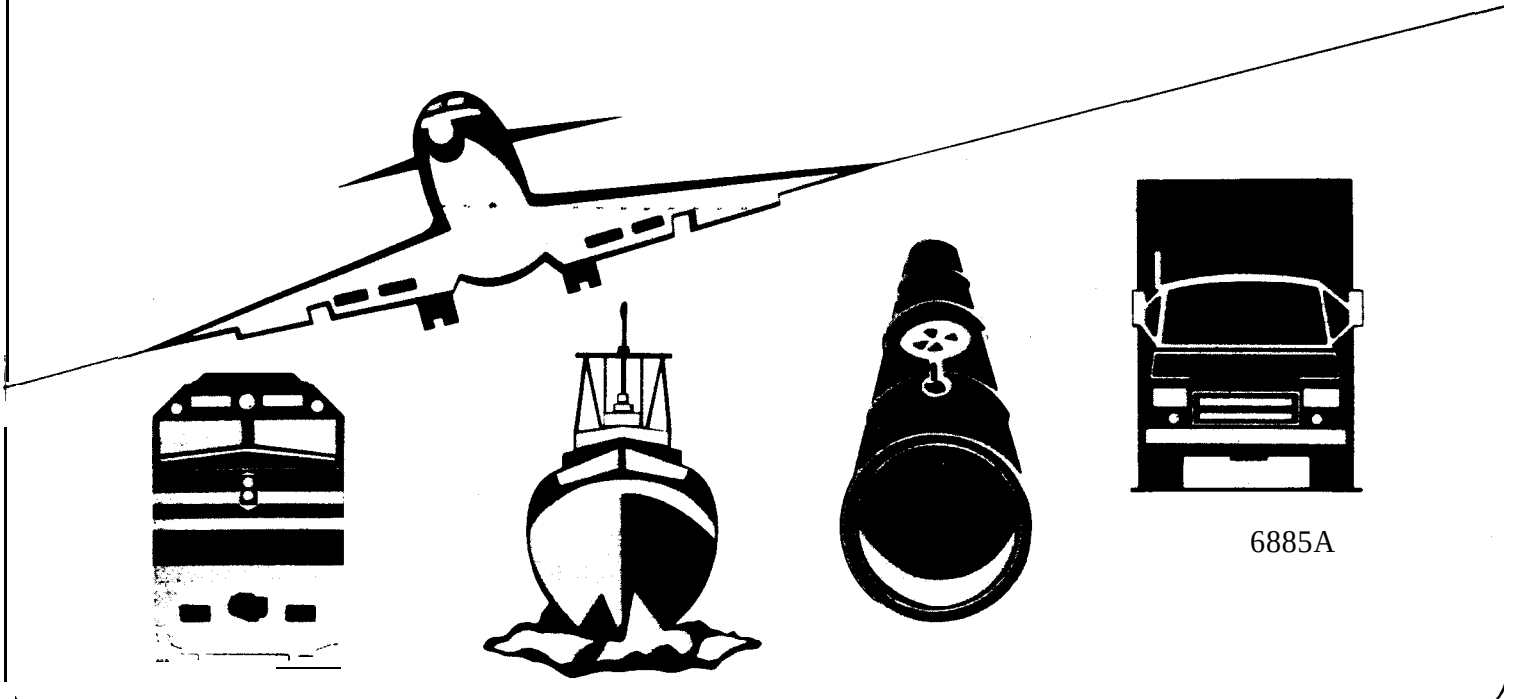
PB98-916401
NTSB/MAR-98/01

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

MARINE ACCIDENT REPORT

ALLISION OF THE LIBERIAN FREIGHTER *BRIGHT FIELD* WITH THE POYDRAS STREET WHARF, RIVERWALK MARKETPLACE, AND NEW ORLEANS HILTON HOTEL IN NEW ORLEANS, LOUISIANA DECEMBER 14, 1996



6885A

U S GOVERNMENT PRINTING OFFICE 1989 O—942-865

Abstract: On December 14, 1996, the fully loaded Liberian bulk carrier *Bright Field* temporarily lost propulsion power as the vessel was navigating outbound in the Lower Mississippi River at New Orleans, Louisiana. The vessel struck a wharf adjacent to a populated commercial area that included a shopping mall, a condominium parking garage, and a hotel. No fatalities resulted from the accident, and no one aboard the *Bright Field* was injured; however, 4 serious injuries and 58 minor injuries were sustained during evacuations of shore facilities, a gaming vessel, and an excursion vessel located near the impact area. Total property damages to the *Bright Field* and to shoreside facilities were estimated at about $20 million.

The safety issues discussed in this report are the adequacy of the ship's main engine and automation systems, the adequacy of emergency preparedness and evacuation plans of vessels moored in the Poydras Street wharf area, and the adequacy of port risk assessment for activities within the Port of New Orleans. This report also addresses three other issues: the actions of the pilot and crew during the emergency, the lack of effective communication (as it relates to the actions of the pilot and crew aboard the *Bright Field* on the day of the accident), and the delay in administering toxicological tests to the vessel crew.

As a result of its investigation, the National Transportation Safety Board issued recommendations to the U.S. Coast Guard, the U.S. Army Corps of Engineers, the State of Louisiana, the Board of Commissioners of the Port of New Orleans, International RiverCenter, Clearsky Shipping Company, New Orleans Paddlewheels, Inc., the New Orleans Baton Rouge Steamship Pilots Association, the Crescent River Port Pilots Association, and Associated Federal Pilots and Docking Masters of Louisiana, Inc.

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

Information about available publications may be obtained by contacting:

National Transportation Safety Board
Public Inquiries Section, RE-51
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594
(202) 314-6551

Safety Board publications may be purchased, by individual copy or by subscription, from:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
(703) 605-6000

ALLISION OF THE LIBERIAN FREIGHTER *BRIGHT FIELD* WITH THE POYDRAS STREET WHARF, RIVERWALK MARKETPLACE, AND NEW ORLEANS HILTON HOTEL IN NEW ORLEANS, LOUISIANA DECEMBER 14, 1996

MARINE ACCIDENT REPORT

Adopted: January 13, 1998
Notation 6885A

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C. 20594

this page intentionally left blank

CONTENTS

this page intentionally left blank

EXECUTIVE SUMMARY

Shortly after 1400 on December 14, 1996, the fully loaded Liberian bulk carrier *Bright Field* temporarily lost propulsion power as the vessel was navigating outbound in the Lower Mississippi River at New Orleans, Louisiana. The vessel struck a wharf adjacent to a populated commercial area that included a shopping mall, a condominium parking garage, and a hotel. No fatalities resulted from the accident, and no one aboard the *Bright Field* was injured; however, 4 serious injuries and 58 minor injuries were sustained during evacuations of shore facilities, a gaming vessel, and an excursion vessel located near the impact area. Total property damages to the *Bright Field* and to shoreside facilities were estimated at about $20 million.

The National Transportation Safety Board determines that the probable cause of this accident was the failure of Clearsky Shipping Company to adequately manage and oversee the maintenance of the engineering plant aboard the *Bright Field*, with the result that the vessel temporarily lost power while navigating a high-risk area of the Mississippi River. Contributing to the amount of property damage and the number and types of injuries sustained during the accident was the failure of the U.S. Coast Guard, the Board of Commissioners of the Port of New Orleans, and International RiverCenter to adequately assess, manage, or mitigate the risks associated with locating unprotected commercial enterprises in areas vulnerable to vessel strikes.

The major safety issues identified in this investigation are the adequacy of the ship's main engine and automation systems, the adequacy of emergency preparedness and evacuation plans of vessels moored in the Poydras Street wharf area, and the adequacy of port risk assessment for activities within the Port of New Orleans. This report also addresses three other issues: the actions of the pilot and crew during the emergency, the lack of effective communication (as it relates to the actions of the pilot and crew aboard the *Bright Field* on the day of the accident), and the delay in administering toxicological tests to the vessel crew.

As a result of its investigation of this accident, the Safety Board issued safety recommendations to the U.S. Coast Guard, the U.S. Army Corps of Engineers, the State of Louisiana, the Board of Commissioners of the Port of New Orleans, International RiverCenter, Clearsky Shipping Company, New Orleans Paddlewheels, Inc., the New Orleans Baton Rouge Steamship Pilots Association, the Crescent River Port Pilots Association, and Associated Federal Pilots and Docking Masters of Louisiana, Inc.

this page intentionally left blank

INVESTIGATION

Synopsis

Shortly after 1400 on December 14, 1996, the fully loaded Liberian bulk carrier *Bright Field* temporarily lost propulsion power as the vessel was navigating outbound in the Lower Mississippi River at New Orleans, Louisiana. The vessel struck a wharf adjacent to a populated commercial area that included a shopping mall, a condominium parking garage, and a hotel. No fatalities resulted from the accident, and no one aboard the *Bright Field* was injured; however, 4 serious injuries and 58 minor injuries were sustained during evacuations of shore facilities, a gaming vessel, and an excursion vessel located near the impact area. Total property damages to the *Bright Field* and to shoreside facilities were estimated at about $20 million.

Preaccident Events

According to vessel records, on September 2, 1996, the 735-foot, 36,120 gross-ton *Bright Field* completed loading a cargo of coal in Banjarmasin, Indonesia. On September 12, 1996, the vessel departed Indonesia with a 28-member Chinese crew bound for Davant, Louisiana. The estimated date of arrival at Southwest Pass, Louisiana,[1] (the vessel's entrance point to the Mississippi River) was October 26, 1996. Shortly after departure, the ship began to experience problems with its engineering plant, necessitating a 3-day layover in Singapore while repairs were made to the main engine. After the repairs were completed, the *Bright Field* continued its voyage. The trip was interrupted on several occasions by continuing main engine problems.

On November 21, 1996, the *Bright Field* arrived at a bulk coal-handling facility near Davant, Louisiana (mile 55 AHP[2]), where it unloaded its cargo. (See figure 1.) After its holds were prepared to load grain and after waiting for a loading berth, the *Bright Field* arrived at Cargill Terminal, located at mile 140 AHP in Reserve, Louisiana, on December 9, 1996. There the vessel loaded 56,397 metric tons of corn in its seven cargo holds. The vessel left the terminal at 1530 on December 11, 1996.[3] The vessel moved from the terminal area to the lower portion of La Place Anchorage at mile 135 AHP, where it remained at anchor for 2 days while scheduled repairs were made to the main engine's turbocharger and air cooler.

On December 14, 1996, the vessel's agent contacted the New Orleans Baton Rouge Steamship Pilots Association (NOBRA) and requested that a pilot be dispatched to the vessel.[4] The sailing time was set for 1030. The pilot who was dispatched to the *Bright Field* stated that he was called for duty about 0730. He said he was told that the ship was headed to sea, which meant that he would take the ship to a specified location, where he would be replaced by a pilot from the Crescent River Port Pilots Association for the remainder of the trip downriver. The pilot said he expected to be aboard the *Bright Field* for about 3 hours.

The *Bright Field* third mate and chief electrician stated that on the morning of December 14 they completed all predeparture tests for both bridge and engineering, including testing the bridge main engine console lights and alarms. With the successful completion of the tests, the master ordered standby engines at 0943. The pilot boarded the vessel via launch at 1040,

[1]Southwest Pass is the westernmost of the several entrances to the Mississippi River and is the one most often used.

[2]Distances in the Mississippi River are measured in statute miles "above head of passes" (AHP), which is located 20 miles above Southwest Pass.

[3]At the time of departure, the draft of the vessel was 11.96 meters (about 39 feet 4 inches) forward and 12.06 meters (about 39 feet 8 inches) aft.

[4]Louisiana State law requires that a qualified and certified State pilot be on board any vessel in foreign trade navigating the Mississippi River in the State. Although NOBRA, as well as other pilot associations, dispatches pilots, bills and collects pilotage fees, and pays association expenses, including staff and transportation fees, the pilots themselves are self-employed and contract for their services directly with vessel operators.

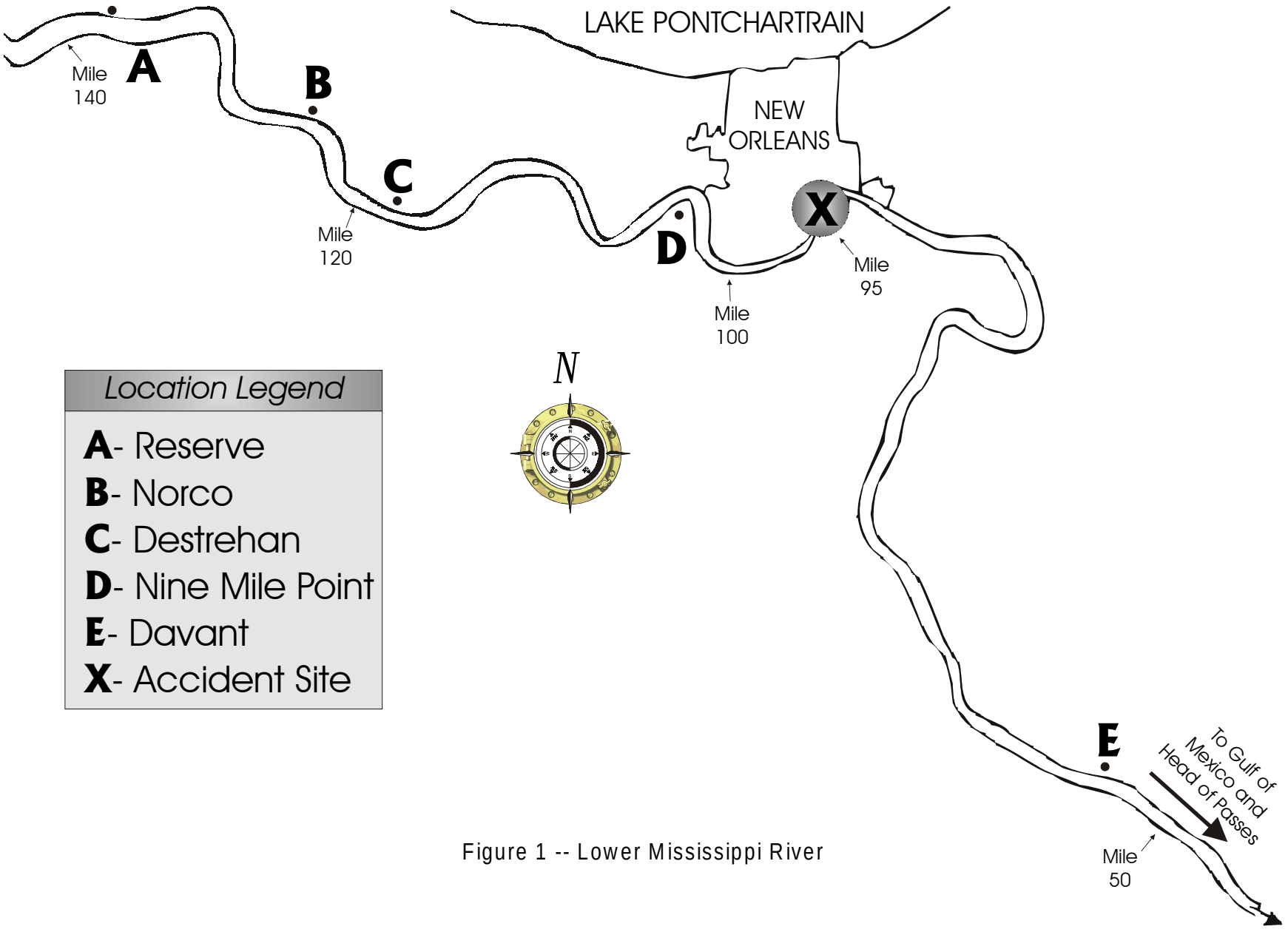


Figure 1 -- Lower Mississippi River

and the third mate escorted him to the wheelhouse, where he was introduced to the master at 1044.

The ship's master spoke what the pilot described as broken, but adequate, English. The pilot said that, to facilitate communication, he spoke slowly and used simple words, and he believed that he and the master understood each other. The master also stated that he was satisfied with their ability to communicate. The pilot said he gave helm orders in English to the helmsman, who repeated them in English before carrying them out. The second mate reported that he also repeated (in English) the pilot's orders and then carried them out. Other than orders and their repetition, the pilot said he had no verbal exchanges with the second mate or the helmsman.

The pilot, who had not previously handled the *Bright Field*, said he asked if the ship's navigational equipment and engine were in good working order. He stated that the master answered with "just a simple 'yes' to both questions." The master stated that he asked the pilot about the operational procedures for departing the anchorage.[5] These were the only items reported as being discussed during the predeparture briefing. The pilot said he then proceeded to acquaint himself with the wheelhouse layout (figure 2) and with the vessel's posted maneuvering information. At the time, the vessel's main engine was being operated from the wheelhouse.

At 1055,[6] the pilot began the normal procedures for getting underway by ordering the first engineering maneuvering bell (dead slow ahead). According to the third mate, he (the third mate) attempted to execute the pilot's order using the wheelhouse engine controls, but the vessel's main engine did not start. He then called the engine control room and told the chief engineer—in Chinese—that the engine did not start. Engine control was transferred to the engine control room. Both the master and the chief engineer stated that their normal practice was to transfer engine control to the engine control room in the event of a nonemergency problem with the propulsion system.

After the engines were started (1055.5, dead slow ahead), engine control was transferred back to the wheelhouse. The pilot ordered stop engine, and the engine was stopped. At 1110, the pilot ordered dead slow ahead. Again, the engine could not be started from the wheelhouse, and again control was transferred to the engine control room, from which the engine was restarted. After the accident, the pilot stated that he had not been advised of the difficulties in starting the engine from the wheelhouse, nor was he informed on those occasions when engine control was transferred to or from the engine control room.

The *Bright Field* departed the La Place anchorage at 1112. Engine maneuvering control was transferred back to the wheelhouse, and the pilot ordered full ahead maneuvering speed (56 rpm) in order to familiarize himself with the ship's responsiveness to rudder and engine orders. He said he determined that the *Bright Field* handled as expected for a fully loaded bulk cargo vessel operating in high-river-stage conditions.[7] At 1134, the pilot ordered sea speed (72 rpm) for better ship handling. The pilot said it was necessary to operate the ship at maximum speed in order to obtain the best maneuverability in that operating environment.

Engine rpm was increased to sea speed using wheelhouse controls. At 1159, as the vessel approached Norco, Louisiana, the pilot ordered the *Bright Field*'s speed reduced to full ahead maneuvering speed (56 rpm). The *Bright Field* remained at full ahead maneuvering speed until it reached the vicinity of Destrehan, Louisiana, when the pilot again ordered sea speed of 72 rpm, resulting in a ground speed (speed of the ship plus speed of the current) of about 16 knots.

About 1300, the pilot ordered the master to send a seaman to stand by the anchors.[8] The

[5]This information typically includes, among other details, the location of assist tugboats and the order in which the two anchors are to be raised.

[6]Times are taken from engine bell logs.

[7]On the day of the accident, the river was at high river stage, measuring 12.5 feet on the Carrollton gauge with an approximate 4 1/2-mph current.

[8]A Board of Commissioners of the Port of New Orleans ordinance required that all vessels navigating

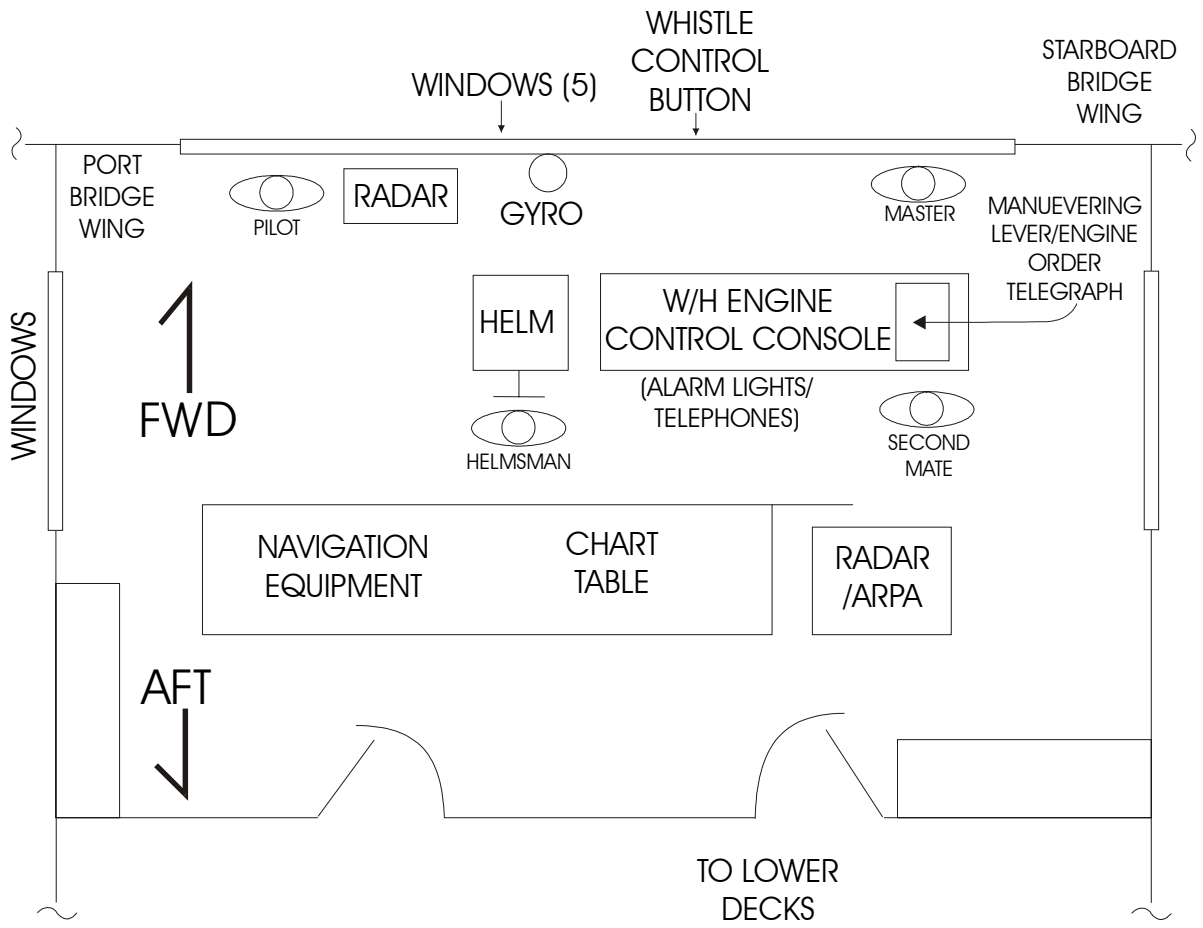


Figure 2 -- *Bright Field* navigation bridge layout

master sent the ship's carpenter, with a handheld radio, to serve as anchor watch.[9] A few miles above Nine Mile Point, the pilot established VHF communications[10] with an inbound tow and inbound ship, both below Nine Mile Point. The vessels agreed to a starboard-to-starboard meeting, and all three vessels met at the point. The pilot of the *Bright Field* said that, because the inbound tow was farther off the bank than anticipated, he maneuvered his ship closer to the left descending bank of the river. The *Bright Field* pilot sounded the danger signal[11] to alert the workers at the Southport barge fleeting facility[12] to the proximity of the *Bright Field*. The *Bright Field* passed the area without incident and continued down the river at sea speed. The master told Safety Board investigators that about this time he became concerned that the pilot might be oversteering the vessel, but he said he did not voice his concerns to the pilot.

About 1350, the pilot made the first radio call to the U.S. Coast Guard Gretna light operator.[13] The Gretna light operator advised the

through the New Orleans Port area maintain an anchor standby of at least one competent seaman, who was to be stationed at the anchor windless and be prepared to drop anchor if necessary.

[9]Serving as anchor watch was a regularly assigned duty of the *Bright Field*'s carpenter.

[10]VHF channel 67 was assigned for routine bridge-to-bridge (navigation/safety) communication in the Lower Mississippi River.

[11]Five or more shorts blasts on the ship's whistle.

[12]A *fleet* in this instance refers to one or more tiers of barges. A fleeting facility is the geographic area along or near a river bank where a barge mooring service is located.

[13]According to 33 *Code of Federal Regulations* (CFR) 161.402(b), "Movements of vessels in vicinity of Algiers Point, New Orleans Harbor," during a high river stage,

Bright Field that the ship was cleared to transit Algiers Point and that a seagoing tow boat was inbound at the Point. The pilot stated that, while the *Bright Field* was transiting under the Crescent City Connection Bridges, he allowed the vessel to acquire a current-induced swing to port to facilitate the upcoming maneuver around Algiers Point.

The Accident

The swing to port as the ship passed under the Crescent City Connection Bridges pointed the vessel toward the left descending bank, the side of the river where the Poydras Street wharf and the Riverwalk Marketplace shopping mall were located and where gaming, excursion, and cruise ships were docked. About 1406, while the *Bright Field* was still transiting under the bridges, power output from the vessel's main engine dropped. At this time, the vessel's automated propulsion control system[14] reported low main engine lubricating oil pressure and main engine trip due to low oil pressure.[15]

The pilot said he noticed that the vessel had gotten quiet and that the engine-induced vessel vibrations had stopped. He said he turned and saw the master and the second mate[16] standing beside the engine order telegraph (on the other side of the bridge from the pilot), looking down at something on the console. He said he asked them if there was a problem, but got no response. He said that he did not ask a second time "because they didn't answer me the first time." He reported that he then looked at the engine rpm indicator and saw that engine rpm had dropped from about 70 to about 30, indicating to him that the vessel had experienced a significant reduction in engine power.

The master and the second mate said that they also noticed that the ship's normal operating vibrations had stopped, and they observed that the main engine rpm indicator showed a drop to about 30 rpm. The master said the pilot "blurted out, 'What has happened?'" and he (the master) thought he had answered the pilot by saying there had been a reduction in main engine power. The master said it was not clear to him why engine rpm had dropped. He said he instructed the second mate "to call the engineroom to inquire about what happened, what's going on. I asked the second mate to demand them to increase speed right away." The second mate said that he carried out the master's order immediately.

The pilot stated that when he realized that the vessel had lost power, he "jumped" out of his chair and called the Governor Nicholls Light operator on VHF channel 67. He said that as he made the call he was looking out the bridge windows and was aware that the vessel was swinging to port and toward the docked ships along the left descending bank. The pilot told the Governor Nicholls light operator that his ship had lost power and that the operator should alert everyone in the harbor.[17]

The pilot said that, after calling the light operator, he ordered hard starboard rudder as the ship continued to swing to port. The helmsman responded to the order by applying hard starboard rudder, but the new rudder setting did nothing to alter the vessel's direction, and the pilot began sounding the danger signal using the ship's forward whistle. He said he wanted to attract the attention of the cruise ships and public along the left descending river bank. The pilot stated that he ordered the master on at least two occasions to have someone stand by the

---

movement of vessels around Algiers Point is controlled by several Coast Guard-operated and maintained traffic lights, including Gretna light at 96.6 miles AHP and Governor Nicholls light at 94.3 AHP.

[14]For the purposes of this report, *automated propulsion control system* and related terms will be used to refer to all main engine control, monitoring, and alarm systems and subsystems.

[15]The main engine was equipped with protection devices that could slow down or stop the main engine depending on the severity of the problem. See the "Main Engine Description" section of this report for information about the engine and its protective devices.

[16]The second mate had come on duty at the noon watch to replace the third mate who had been on duty when the ship left the anchorage.

[17]Information regarding radio transmissions using VHF channel 67 is based on audio recordings made by the tugboat *Lockmaster*, located on the side of the river opposite the Poydras Street wharf. The *Lockmaster* was also able to provide a videotape of radar images of the *Bright Field* as it approached and struck the wharf. The traffic light stations were not equipped to record radio transmissions.

anchors, but he did not hear the master acknowledge the order. The pilot said he recalled the master speaking Chinese on the radio and that the master did not appear to be agitated, but was "very nonchalant."

When the pilot noted that the rpm indicator continued to show a loss of power, he made another call to the Governor Nicholls light operator. He told the operator to warn the cruise ships and gaming and excursion vessels that were moored along the left descending bank. The Gretna light operator advised the pilot that a tugboat 1 mile upriver was coming to his aid.

The chief engineer on duty in the engine control room[18] (figure 3) stated that, immediately before the engine lost power, an audible alarm sounded. He said he then looked at a computer screen in front of him and saw a visual alarm and an indication of a loss of pressure in the lubricating oil system. (See figure 4.) He said he looked at the analog main engine lubricating oil pressure gauge and saw that the system was rapidly "depressurizing" below normal levels. He said he then noticed that the main engine automatic slow down light was on, and he noticed that main engine noise was decreasing. He reported that he also observed that engine rpm had dropped from 72 to between 30 and 35. He said that, as he turned to the electrical switchboard behind him to determine why the No. 2 lubricating oil pump had not started automatically, the pump started. He said that, except for the low rpm, everything seemed to him to be back to normal almost immediately.

According to the chief engineer, he was about to call the bridge when the second mate called him. He said that the second mate asked him why the main engine was slowing down and told him to increase the speed immediately, that they were transiting the bridge at that time. The chief engineer reported that the second mate spoke to him in a normal tone of voice, without repeating his message. The chief engineer said he thought the second mate was concerned about speeding up passage of the vessel beneath the bridges. He said he did not know the nature of the situation on the vessel's bridge.

The chief engineer told the second mate that he did not know the reason for the sudden drop in the No. 1 oil pump pressure, but since the No. 2 pump had already come on line, the pressurization problem was solved. Neither the master nor the second mate attempted to clear the trip condition and restart the engine, and thus restore rpm, from the bridge controls. The chief engineer and the second mate mutually agreed to transfer engine control to the engine control room, and the chief engineer began the process of restoring engine power. He said that engine rpm quickly reached about 52 rpm, after which rpm continued to increase to about 60. According to alarm logs, main engine power was restored to the vessel at 1408, about 2 minutes after the logs indicated that the main engine had tripped.

In postaccident testimony, the master was asked if it had been necessary to transfer engine control from the bridge to the engine control room during the emergency. He said, "Under normal circumstances, speed increase can be done from the engine [control room] more quickly." The master was asked why the engine control room had requested that engine control be shifted from the bridge to the engineroom. He said that it was "because the engineering department [didn't] realize the sense of urgency or [that] there [was] any sense of urgency on the bridge." He said engine control room personnel were not initially notified of the emergency situation but were told later when the allision[19] was unavoidable even if vessel speed were increased.

The pilot stated that at this time he was devoting his attention to sounding the danger signal to alert the moored ships along the left descending bank and the Riverwalk complex and that he was not immediately aware, nor was

[18] At the time of the accident, Coast Guard regulations did not require that engineering spaces be manned during transit of the Mississippi River. Although the *Bright Field* was classed for unattended operation of machinery spaces, company regulations required that the chief engineer and two other engineers be on duty in the engine control room whenever the vessel was entering or leaving a port.

[19] In marine usage, *allision* refers to a moving ship striking a stationary ship or other stationary object.

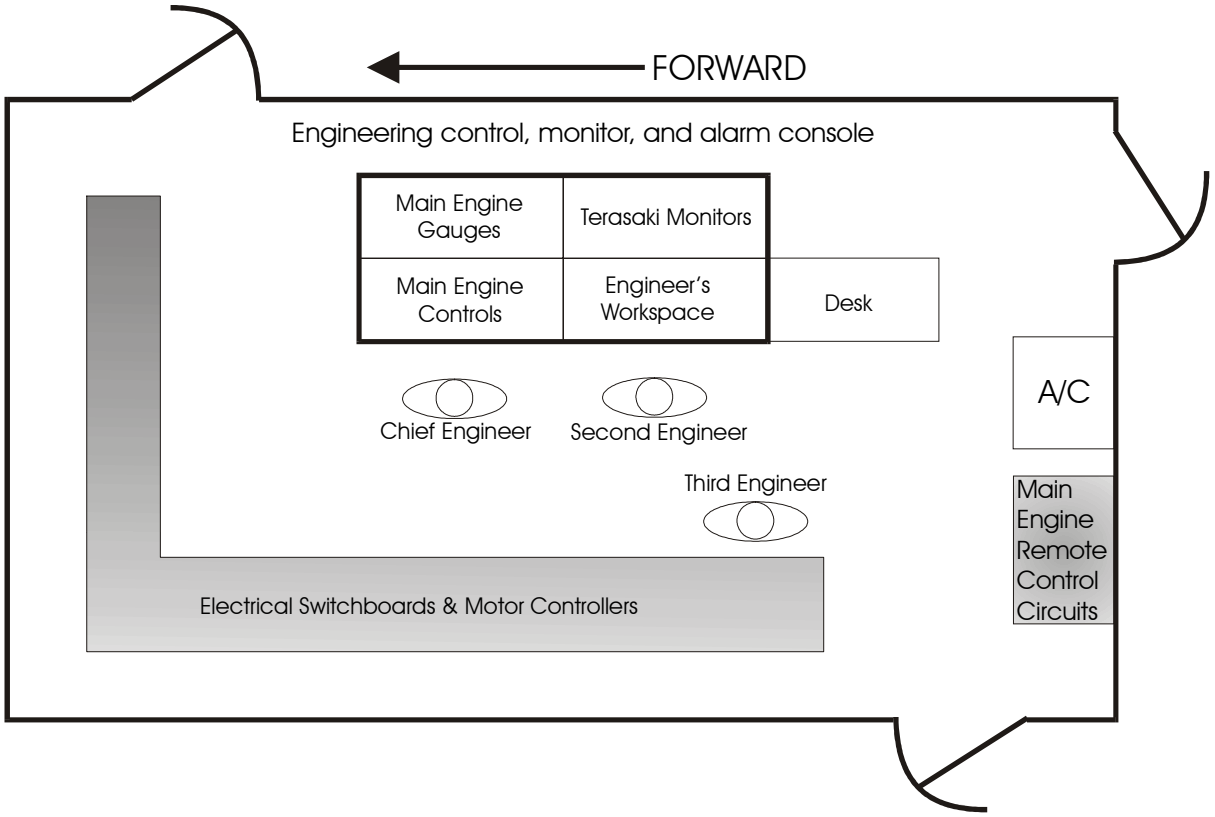


Figure 3 -- *Bright Field* engine control room layout showing reported positions of crewmembers when engine power reduction occurred.

Figure 4 -- Engineering control, monitor, and alarm console

he made aware by the mate or the master, that vessel power had been restored. The pilot said that he was not aware of what, if any, actions the master or the crew were taking to restore power. The master's orders to the second mate and the second mate's conversations with the chief engineer were in Chinese.

The vessel continued to swing to port and toward the left descending bank. The pilot told the master to prepare to drop anchors and ordered the main engine full astern. The vessel's bell logger tape, which continuously captures data and prints it out in 30-second intervals, recorded that the full-astern order was made from the bridge at 1409.5 and answered by the engine control room at 1410.0. The chief engineer stated that he reversed the engine and ran the shaft speed to 20 to 40 (fluctuating) rpm astern.

The pilot stated that, shortly thereafter, he ordered the anchors dropped. The master said the pilot ordered only the port anchor dropped, that he concurred with that order, and that though he did not acknowledge the order to the pilot, he attempted to carry it out. The master said that he attempted to call the carpenter on the forecastle using the handheld radio. The carpenter, who was standing by the anchors, said that he could not hear radio transmissions from the master because the danger signal was still being sounded on the ship's whistle, which was located about 20 feet above his station on the bow. The master said he made repeated unsuccessful attempts to contact the carpenter but did not ask the pilot to suspend the sounding of the danger signal. The pilot stated that he stopped sounding the signal only long enough to make short radio transmissions to the traffic light operators to urge them to call the New Orleans Riverwalk complex and "tell the people to get away from the dock."

The master stated that he rushed out to the port bridge wing and waved his arms to attract the carpenter's attention. When he realized that the carpenter did not see him, the master went back inside the bridge. Once back inside, intermittent communications were established between the master and the carpenter. By the time reliable communication was established, the ship had moved farther toward the wharf, and the master said he believed that dropping the anchor at that time would cause the ship to take a sharp turn to the left and perhaps strike one of the vessels docked there. He said he therefore told the carpenter not to drop the anchor. The master said that after the ship had moved a little farther, he again contacted the carpenter and told him to drop the anchor to keep the ship from striking the docked vessels. The carpenter said he turned the brake wheel to let go of the port anchor and then ran from the bow to avoid being injured in the imminent allision. Postaccident review of an amateur videotape of the allision indicated that the anchor did not drop prior to impact.

According to statements of the pilot and crewmembers, the pilot did not ask either the master or second mate if the vessel's power had been restored or if the anchors had been dropped, and no one volunteered that information. The pilot said he had not felt any engine vibrations, though he expected to. He said, "When that big engine turns, you feel it." The master said the vibrations caused by the engine when it started in reverse while the ship was still moving forward were obvious. No further communications were reported between the pilot and master or the pilot and the second mate before the allision.

Meanwhile, the cruise ship *Enchanted Isle* was docked at the Erato Street wharf on the left descending bank of the river. Passenger embarkation had begun about 1230, and about 200 passengers were on board. Crewmembers aboard the cruise ship did not (and were not required to) monitor VHF channel 67 and therefore did not hear any radio announcement from the traffic light operator regarding the *Bright Field*. They did state that they heard the vessel's danger whistle. The third officer said he was on the bridge as the *Bright Field* passed under the Crescent City Connection Bridges and that he knew the vessel was in trouble when he heard its whistle blow for the fifth time. He stated that he ran out onto the outside deck and saw the *Bright Field* passing his ship on a direct path to the Riverwalk area. The ship's master, who had also heard the *Bright Field*'s whistle, reached the bridge as the *Bright Field* went past. The officers activated the public address system and placed the bridge on standby to close the watertight doors. The third officer said that he and the master called for the forward dock lines

to be tightened to protect against gangway displacement as the *Bright Field* bow wave struck the vessel. They also notified the gangway watchman of a possible river surge and sent two crewmen to watch over the gangway and report any trouble back to the bridge. According to the third officer, the *Bright Field* was clear of the *Enchanted Isle* throughout the accident sequence.

Moored about 150 to 200 feet downriver from the stern of the *Enchanted Isle* was the cruise ship *Nieuw Amsterdam*. The ship had begun embarking passengers about 1330, and an estimated 200 to 300 passengers were on board at the time of the accident. The crew did not (and was not required to) monitor VHF channel 67. The second officer said he was standing behind the port-side radar when his attention was drawn to a ship on the river sounding an emergency alarm. The second officer reported that he could not immediately determine which vessel was sounding the alarm, so he and the chief officer went out to the port side bridge wing (the vessel was docked with its starboard side toward the wharf) and saw the *Bright Field* passing under the Crescent City Connection Bridges. They said they stood and watched the *Bright Field* as it headed toward their ship and the Poydras Street wharf area. They entered the wheelhouse to warn the on-duty third officer.

The *Nieuw Amsterdam*'s on-duty third officer said he also had heard the multiple whistle signals and had watched the *Bright Field* as it passed under the bridges with its bow pointing toward his vessel. He said that the *Bright Field* appeared to be about 1/2 nautical mile away and moving at 8 to 10 knots. Based on his observations of the *Bright Field*'s direction of travel and the whistle sounding, he said, he assumed the vessel was experiencing steering or engine failure. He immediately warned the master, who was in his stateroom directly behind the bridge.

The *Nieuw Amsterdam*'s master instructed the on-duty officer to tell the security officer at the gangway to stop the embarkation of passengers. The on-duty officer was then to place the bridge on standby, close the watertight doors, and activate the public address system. The master instructed the second and third officers to go to the stern of the ship with radios and to evacuate the Lido deck aft, then clear the decks on the port side and monitor the situation. The crew said that after 2 or 3 minutes it was apparent that the *Bright Field* would not strike the *Nieuw Amsterdam*. The master and the on-duty officer followed the progress of the *Bright Field* from the port wing bridge. They assessed the situation and determined that the *Bright Field* would miss the *Nieuw Amsterdam* by approximately 50 meters (164 feet).

The first mate of the gaming vessel *Queen of New Orleans*, which was docked at the Poydras Street wharf with its bow less than 1,000 feet downriver from the stern of the *Nieuw Amsterdam*, had overheard the *Bright Field* pilot's call to the traffic light operator on VHF channel 67 (although the vessel was not required to monitor the frequency) and had immediately begun emergency evacuation of the 637 passengers and crewmembers aboard the vessel.[20] Meanwhile, the excursion vessel C*reole Queen*, which had been docked at the Canal Street wharf downriver from the *Queen of New Orleans*, was in the process of pulling away from the dock with 190 passengers and crew on board. The master said he heard the pilot of the *Bright Field* radio the Governor Nicholls light operator and report, "I've lost everything. The ship is heading toward the passenger vessels." The master said that he returned the vessel to the dock and ordered an emergency evacuation.

According to the results of Safety Board surveys, patrons and employees of the Riverwalk Marketplace along Poydras Street wharf and the adjacent Julia Street and Canal Street wharves were unaware of the meaning of the warning whistles from the *Bright Field*. Several harbor police officers did recognize the warning whistles and tried to clear the area. While they did so, some marketplace patrons and staff members noticed the *Bright Field* heading toward them, and large numbers began to flee. Many individuals sustained injuries during the evacuation. The harbor police were able to move most of the crowd away from the expected impact area. Many of those in the area

[20]For a detailed discussion of all the vessel evacuations, see the "Survival Aspects" section of this report.

Table 1 -- Injuries Sustained in *Bright Field* Allision[1]

INJURIES	Riverwalk Area	*Queen of New Orleans*	*Creole Queen*	Unknown	**Total**
FATAL	0	0	0	0	**0**
SERIOUS	1	2	1	0	**4**
MINOR	16	10	3	29	**58**
NONE	3	0	0	2	**5**
TOTAL	**20**	**12**	**4**	**31**	**67**

[1]Table based on the injury criteria (49 CFR 830.2) of the International Civil Aviation Organization, which the Safety Board uses in accident reports for all transportation modes.

said that they did not know what was happening, and because they had had so little advance notice of a potential hazard, they did not have the opportunity to obtain information from mall employees or security officers.

About 1411, the port bow of the *Bright Field* struck the Poydras Street wharf at a location between the docked *Nieuw Amsterdam* and *Queen of New Orleans*. (See figure 5.) The vessel struck the wharf at what witnesses said was a 40- to 45-degree angle, went into the wharf up to the end of the forecastle deck (about 50 to 60 feet), and then made a sideways movement. The bow portion of the vessel scraped and collapsed portions of the buildings on the Poydras Street wharf, including a portion of the Riverwalk Marketplace shopping mall, a condominium parking garage, and part of the Hilton Riverside Hotel. The ship came to rest against the wharf with its stern about 200 feet from the stern of the *Nieuw Amsterdam* and its bow about 70 feet from the bow of the *Queen of New Orleans*. (See figure 6.) The pilot ordered the engine stopped, after which several tugboats arrived to hold the ship against the dock. About 3 minutes had elapsed from the time the pilot made his first emergency call to the Coast Guard light operator until the ship struck the wharf.

Injuries

The accident resulted in 4 serious and 58 minor injuries to persons in the Riverwalk area, aboard the *Queen of New Orleans*, or aboard the excursion vessel *Creole Queen*, which was docked near the *Queen of New Orleans*. (See table 1.)

Vessel Damage

After striking the wharf, the bow of the *Bright Field* grated along the concrete and steel wharf structure for a distance of about 600 feet. The allision damaged the port side of the bow. The hull of the vessel sustained two horizontal gashes about 100 feet long that penetrated the port side of the ship and extended down the port side from the fore peak (bow) ballast tank and into the No. 1 cargo hold. Both the breached fore peak tank and the No. 1 cargo hold flooded. A diver found a 100-foot section of the forward hull resting on the river bottom adjacent to the Poydras Street wharf. Total damages to the *Bright Field* were estimated to be about $2 million. (See figure 7.) The vessels that had been docked in the allision area did not sustain significant damage.

Other Damage

The One River Place condominium building, located on the Poydras Street wharf, sustained damage to its valet parking garage. Residents of the building were evacuated because of a loss of power and water. The Riverwalk Marketplace, a mall with 100 stores, 3 restaurants with outdoor seating, and a large wharf walkway, sustained damage to more than 350 feet of its wharf frontage. About 10 percent of the mall shops and restaurants were affected. The New Orleans Hilton Riverside Hotel, part of which was situated on the Poydras Street

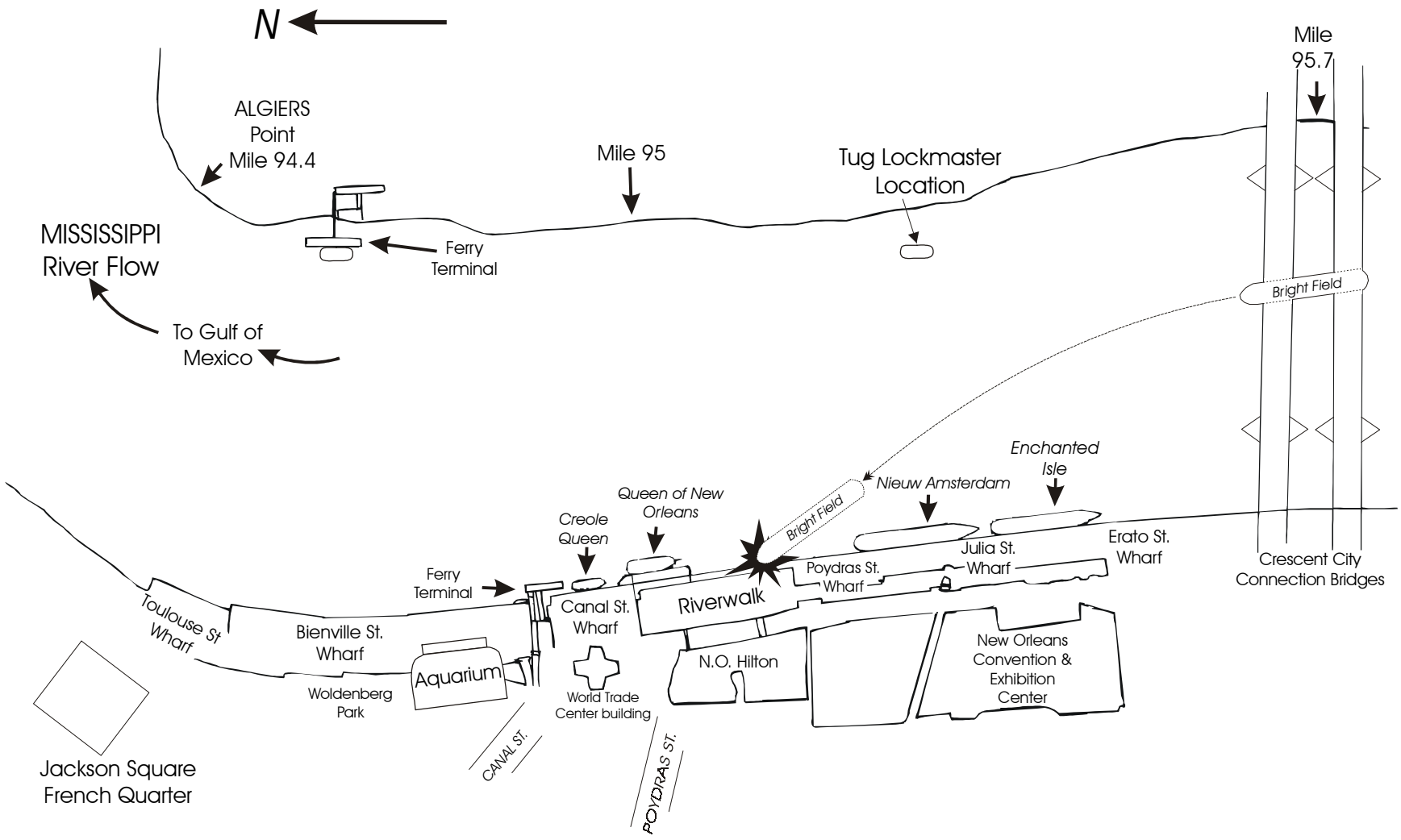


Figure 5 -- Path of Bright Field (not to scale)

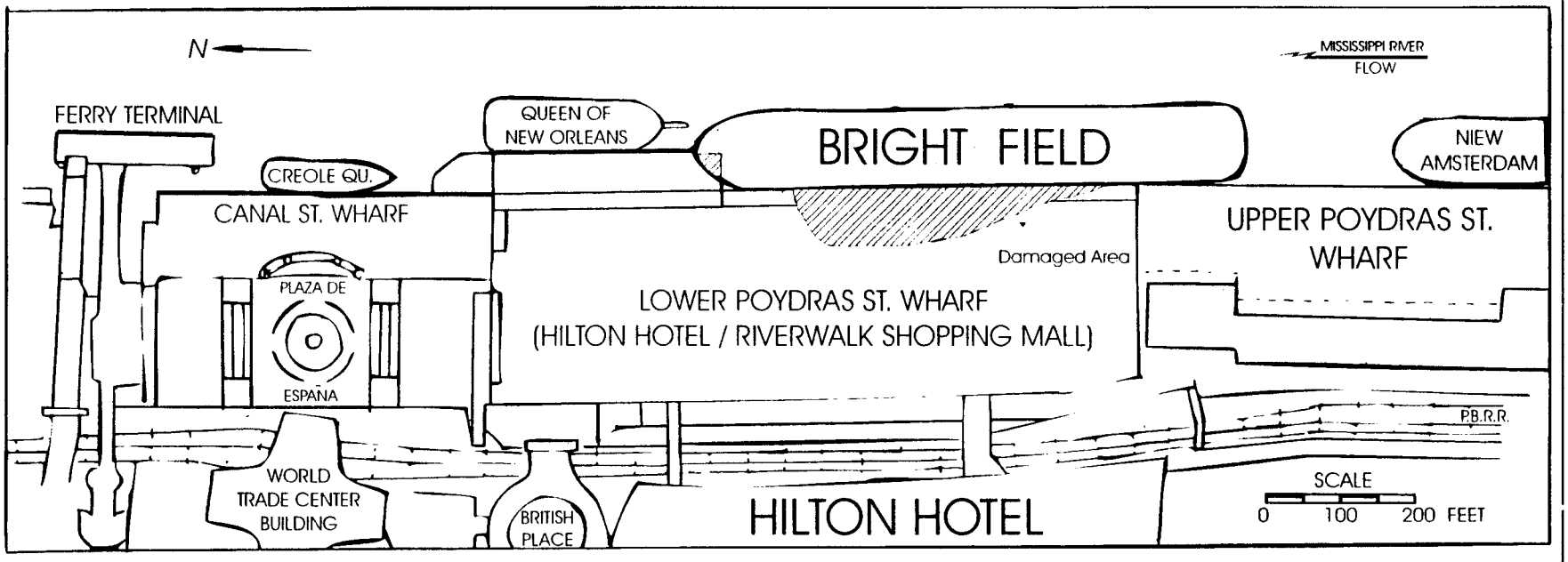


Figure 6 -- Final rest position of *Bright Field*

Figure 7 -- Damaged Bright Field being towed away from Poydras Street wharf en route to repair facility, January 6, 1997

wharf, sustained damage to 40 of its 1,600 rooms. Total damages to all facilities were estimated to be about $18 million. (See figures 8 and 9.)

Crew Information

The Pilot -- The *Bright Field* pilot, age 46, had been a NOBRA pilot for about 17 years. He began his maritime career in 1969 when he started working on the Mississippi River during college summer vacations. He served as a deckhand aboard the *Delta Queen,* a paddlewheel passenger vessel, and as a deckhand and mate aboard other passenger vessels, including the *Mississippi Queen* and the *Natchez.* He also worked for a barge line operating on the Illinois River between St. Louis and Chicago.

In 1975, the pilot graduated from a 2-year program at the National River Academy in Helena, Arkansas. The program consisted of periods of 2 months of classroom instruction followed by 2 months on a river vessel. He obtained his first Coast Guard license, an inland mate's license, in 1975. He was commissioned by the New Orleans Baton Rouge State Pilots Commission as a pilot on January 16, 1980. At the time of the accident, he was a licensed river master and first class pilot. The most recent renewal of his license had been on May 5, 1995.

The pilot said that he had piloted on most of the vessel types transiting the Mississippi River. He said he navigated primarily foreign flag vessels anywhere from the New Orleans general anchorage to Baton Rouge. The majority of these were deep-draft vessels, although he said he occasionally worked a seagoing tug and barge. He said he averaged about 7 vessel assignments per week, totaling between 200 and 300 ships each year. He stated that he had not attended any ship simulator training, and he believed that only one NOBRA pilot had attended such training. He said he had not received any bridge resource management (BRM)[21] training and was, in fact, unfamiliar with the term and the concept.

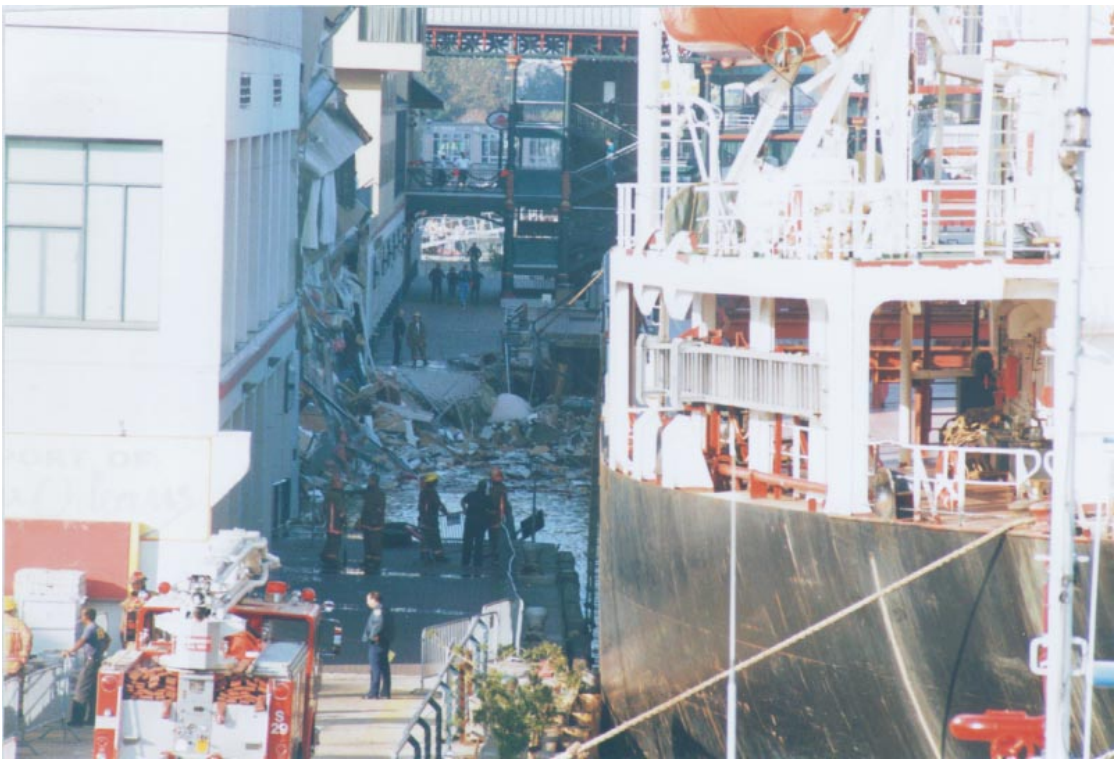
[21]Bridge resource management entails effective use of all available resources to achieve safe operations.

The pilot stated he had been involved in three previous accidents. In 1983, the vessel he was piloting struck a bridge when a crewmember raised a boom too high. The second event occurred when the vessel he was piloting lost steering shortly after he came aboard. The vessel moved hard to starboard and hit a ship launch dock. The third event took place in spring 1996, when the pilot was working on board a vessel that lost rudder control and struck the river bank.

For the 4 days prior to the accident, the pilot said, he had kept essentially the same sleep/wake schedule, arising shortly after daylight, about 0700, and retiring between 2230 and 2300. He reported that he had slept well the night before the accident, did not have any sleep abnormalities, and did not suffer from any illnesses. He said he was not sick and that he had taken no medications on the day of the accident.

The Master -- The *Bright Field* master, age 35, had been in the maritime industry for 14 years. He began as an able seaman before becoming an apprentice officer. He then progressed from third, to second, to first, to chief officer, and then to master. He had been a master for a little more than 1 1/2 years and had served on three different ships. He said he had been master of the *Bright Field* for about 15 weeks at the time of the accident (since August 25, 1996). During his time with the *Bright Field,* he had spent about 3 months at sea and about 1 month in port. He said he had been to New Orleans twice before, in 1983 and 1989; however, this was his first trip as master. He said he had never, on any vessel, experienced a reduction in engine rpm of the kind that occurred just prior to this accident.

The master attended the Dalien Maritime Academy in China for 4 years and graduated in August 1982. His training involved more than 40 deck officer-related courses. It also included computer-based simulator training in ship handling and maneuvering. He said he had received additional simulator training on two occasions at the Qingdao Mariner's Training School. The first occasion involved radar plotting and ship handling to qualify for his radar observer's endorsement. The second involved the handling of large vessels and



Figures 8 and 9 -- Postaccident scenes

occurred after he had passed his master's examination.

The master held a People's Republic of China Marine Certificate of Competency, which certified that he was qualified to be a master of ships of 1,600 gross tons or more. The most recent endorsement of that certificate had been on April 20, 1995. He also held a Republic of Liberia license certifying his competence as a master and radar observer on oceangoing vessels of any gross tonnage. The most recent endorsement of that license had been on October 3, 1996. Both licenses are valid for 5 years.

The master indicated he had received training that emphasized coordination among the bridge team, including the pilot. He said his training covered the duties and responsibilities of each individual and stressed the need to be able to communicate with one another and assist one another in the performance of their duties. He said the training also stressed the integration of the various responsibilities.

The master noted that, since he had held the position of master, he had overruled pilots on four occasions. On this trip he said,

> I…instructed the carpenter not to drop the anchor, which in effect…overruled the pilot, because the pilot [had] instructed [me] to drop the anchor. [I] instructed the carpenter not to drop the anchor because [it] would [cause the *Bright Field* to] swerve towards the passenger ship. That, in effect, is a way of overruling the pilot.

The master said he did not confer with the pilot about the change in the timing of the drop-anchor order because there was "no time."

The master reported that he began to learn English when he entered the maritime academy. He characterized his English language skills as "not bad among Chinese," though he noted that his ability to read the language was better than his ability to speak it. He said he did not have any difficulty understanding the pilot on this trip.

The master stated that he was required to be available 24 hours a day but that his normal schedule involved going to bed at midnight and arising at 0700 each day. He said he had kept this schedule on the night before the allision, arising about 0715 after a complete night's sleep. He reported that he was not suffering from any long-term illnesses and that he was not sick and took no medications on the day of the accident.

The Chief Engineer -- The *Bright Field*'s chief engineer, age 34, began his maritime career in 1979. He studied marine engineering at the Jimei Maritime School, graduating in 1982. He said he had been sailing aboard ships as an engineer since his graduation. He said he had been a chief engineer for 4 years, had been with his current employer for 1 month, and had been chief engineer aboard the *Bright Field* for 3 weeks prior to the allision. He came aboard the *Bright Field* for the first time on November 21, 1996, to replace the vessel's previous chief engineer (see below), who had been relieved of duty upon the vessel's arrival in New Orleans.

The chief engineer stated that he had served on ships with both more and less automated engineering equipment than the *Bright Field* and that he was comfortable with the *Bright Field*'s automation. He also said he had received training on automated ship systems at the Dalien Maritime Academy in 1993 and that the last ship he served on before the *Bright Field* was equipped with a similar system. While aboard the *Bright Field*, he had been underway on short transits on four occasions for a total of 11 hours. During those occasions he said there were no engine casualties or automation problems, although various main engine repairs had been made while the ship was at anchor during the 3 weeks he had been aboard.

The chief engineer held a People's Republic of China Marine Certificate of Competency, which certified that he was qualified as a chief engineer of ships of 3,000 kw (kilowatt, or 4,023 hp) propulsion power or more. The most recent endorsement of that certificate had been on October 27, 1993. He also held a Republic of Liberia license certifying his competence as a chief engineer on motor vessels of any propulsion power. The most recent endorsement

of that license had been on May 23, 1995. Both licenses are valid for 5 years.

The chief engineer reported that his normal work day began at 0800 and ended at 1700. His normal sleep schedule was to go to bed at 2300 and arise at 0700. In the 2 days prior to the allision, the *Bright Field* was at anchor, and the engineer was involved in some repairs. On December 12, the turbocharger was repaired. Work began in the evening and was completed at 0220 the following morning, December 13. The chief engineer said he then went to bed and got up shortly after 1000. That night he went to bed before 2300 and was awakened just after 0600 on December 14 by the air cooler technician, who needed his signature. He said he remained awake, but he did not actually start working for the day until about 0920.

The chief engineer reported that he was not suffering from any long-term illnesses and that he was not sick and had taken no medications on the day of the accident.

The Previous Chief Engineer -- The vessel's previous chief engineer had joined the *Bright Field* in April 1996. He left the vessel in New Orleans on November 21, 1996, after being fired for what a company representative said was his failure to comply with company orders about the maintenance and operation of the *Bright Field*'s engineering plant.

Vessel Information

Four vessels were docked near the point at which the *Bright Field* struck the wharf. The *Enchanted Isle* was docked at the Erato Street wharf, and the *Nieuw Amsterdam* was docked at the Julia Street wharf. The gaming vessel *Queen of New Orleans* was docked at the Poydras Street wharf in front of the Hilton Riverside Hotel. The excursion vessel *Creole Queen* was docked at the Canal Street wharf.

Bright Field --The *Bright Field*, a bulk cargo carrier with seven cargo holds, was built in 1988 by Sasebo Heavy Industries Co. Ltd., of Japan. At the time of the accident, the ship was owned by Clearsky Shipping Company, a Liberian corporation, and operated by Cosco H.K. Shipping Company, of Hong Kong. The Liberian-registered vessel was 735 feet long, weighed 68,200 deadweight tons, and had a maximum breadth of 106 feet.

The *Bright Field* was classed[22] by Det Norske Veritas (DNV) for periodically unattended machinery space. When the *Bright Field* was delivered, the original owners elected to have the unattended machinery space endorsement include specifications for preventive maintenance and routine testing of automatic propulsion system components, and the procedures were verified periodically by DNV. The current owner of the vessel elected not to continue the preventive maintenance endorsement of the original class certification.

The vessel was equipped with an IHI Sulzer RTA62 slow-speed, five-cylinder, two-cycle, turbocharged, reversible diesel engine manufactured by Ishikawajima-Harima Heavy Industries (IHI) of Aioi, Japan. The 9,655-brake hp (7,200 kw) engine was directly coupled to a 24-foot-diameter, four-blade, bronze propeller capable of driving the vessel to a speed of 15.5 knots at sea speed.[23] A change from ahead to astern required that the engine be stopped and restarted with shaft rotation in the opposite direction. A high-pressure compressed-air system was used to start the engine in either direction and also to stop its rotation during a change from ahead to astern or vice versa.

The *Bright Field*'s engine was fitted with protective devices (alarms and shut downs), sensors (pressure, temperature, etc.), and automatic control equipment. In support of unattended machinery operation, the vessel was equipped with engine controls located on the bridge.

The *Bright Field* was configured as a conventional bulk carrier with an aft engineering plant and accommodation house. The navigation bridge was fitted with a chart table, navigation equipment, and an automatic

[22]The applicable DNV rules incorporated the International Association of Classification Society's (IACS) unified rules and the *International Convention for the Safety of Life at Sea* (SOLAS), Chapter 11-1, Part E.

[23]Because of the relatively rapid river current on the day of the accident, the *Bright Field* was traveling at an effective speed that exceeded its rated sea speed.

radar plotting aid (ARPA)[24] in its after part. Facing toward the bow, forward of the chart table to starboard of centerline, was the engine control console with engine order telegraph. To the left of the console on the centerline was the helm control console, comprising the helm, gyro compass, and magnetic periscope compass. Forward of the console and suspended from the overhead was a rudder angle indicator and engine order indicator. Below the forward bridge windows was a gyro repeater, radar, VHF marine radio, and manual buttons for the ship's whistles.

Although not required by U.S. or International Maritime Organization regulations, the vessel was equipped with a course recorder. Investigators determined that, at the time of this accident, the unit was inoperative because of leaking graph recording pens. Examination of the course recorder paper determined that the unit had probably been out of service for some time. When in working order, the unit records the ship's gyro heading over time.

The vessel was equipped with an engine telegraph logger that automatically recorded engine telegraph orders (date and time) from the bridge and acknowledgments of the orders from the engine control room. The logger also noted whether the engine was being operated from the control room or wheelhouse. The time units were recorded in hours, minutes, and half minutes. The unit did not record the ship's actual engine rpm.

Automated Propulsion Control System -- The automated propulsion control system aboard the *Bright Field* used components from a number of manufacturers, the primary two being IHI, which provided the main engine control system, and Terasaki, which provided the engineering plant monitoring, alarm, and recording systems. Most remote control functions affecting the operation of the main engine, including the automatic engine trip features, passed through the IHI control system. Dual independent Terasaki computers and monitors received signals from sensing probes on engineering plant equipment and provided a status report, including operating and fault conditions. Conditions falling outside the acceptable operating ranges were alarmed to appropriate watchstanding and engineering personnel. Sasebo Heavy Industries, the ship's builder, assembled and connected the various components of the automated propulsion control system, including the bridge and engineering remote control consoles.

The *Bright Field*'s automated propulsion control system provided for operation of the main engine through use of either electro-pneumatic controls from the wheelhouse or pneumatic controls from the control room. The engine could be controlled from the bridge using a single maneuvering lever, which also acted as an engine telegraph transmitter. Although the bridge controls allowed the *Bright Field* engineroom to be unattended, company policy required that the engine control room be attended during operation in restricted waters such as the Mississippi River. Although each operating location was equipped with certain engine function controls that were not available at the other location, the main engine could be started, stopped, reversed, accelerated, or decelerated from either the wheelhouse or the control room. Both control locations could provide main engine throttle control over the vessel's two speed ranges: maneuvering mode (from dead slow speed of 30 rpm to full speed of 56 rpm) and sea mode (speeds up to the maximum of 72 rpm).

During normal operations, the rate at which the rpm of the *Bright Field*'s main engine could be increased was subject to limitations imposed by two independent components of the automated propulsion control system: an acceleration-limiting program and a scavenging air pressure[25] limiter.

The automatic acceleration-limiting program could be activated when the engine was being operated in wheelhouse control. The program allowed engine rpm to increase only gradually, in accordance with a programmed (variable) acceleration rate. The wheelhouse control operator could activate a switch to

[24] ARPAs are computer-based devices that process radar signals and display selected navigation information.

[25] *Scavenging air* is that air used to evacuate exhaust gasses from the engine's cylinders after combustion.

bypass this program when engine speed needed to be increased quickly. The acceleration-limiting program was automatically bypassed when the engine was being operated from the engine control room.

The scavenging air pressure limiter functioned to reduce main engine exhaust emissions. Overriding the limiter injected more fuel into the engine, thereby increasing engine rpm at a slightly faster rate. The limiter was automatically overridden whenever wheelhouse controls were moved to "crash (emergency) ahead" or "crash astern." Also, a crash maneuvering pushbutton on the engine control room console enabled engineering personnel to override the scavenging air pressure limiter if necessary. According to the second engineer, the crash maneuvering pushbutton was used only on the orders of a bridge officer, and such an order was not given on the day of the accident.

Transfer of engine operating control to or from the wheelhouse and engine control room required communication and coordination between bridge and engine control room personnel. Transfer of propulsion control was physically initiated by the engineer in the control room, who first matched control settings in the control room with those on the bridge, then set a selector switch to the desired mode. Transfer of control was completed when a crewmember in the wheelhouse pressed a button on the bridge to acknowledge the transfer. According to the *Bright Field* chief engineer, the transfer normally required 20 to 30 seconds from the time of the initial decision to make the transfer until the changeover was accomplished. This time was confirmed in postaccident testing.

Audible and visual alarms on the bridge and in the engine control room were designed to activate in the event of the following emergency conditions: start failure (wheelhouse only), emergency manual stop, automatic emergency trip, automatic slowdown, low control air pressure, low starting air pressure, control power failure, telegraph power failure, and automatic failure of wheelhouse controls (auto control failure).

Automatic engine slowdown interrupts and automatic engine trip due to high cooling water temperature could be overridden without the fault having been corrected. The other main engine trips, including trips resulting from low lubricating oil pressure, required that the faults be corrected before engine operation could be resumed.

Engine Lubricating Oil System -- The main engine lubrication oil system circulated 30-weight high-detergent oil from the 14-cubic-meter (about 3,700 gallons) sump located in the main engine foundation. A suction line picked up the oil from the sump and delivered it to two separate oil lines. These oil lines passed the oil through wire mesh basket strainers before delivering it to two (designated as No. 1 and No. 2) high-capacity (180 cubic meters, or 47,550 gallons, per hour) lubricating oil pumps. (See figure 10.) Each pump was capable of boosting the oil pressure to approximately 4 bar.[26] The discharge piping from each pump met at a

Figure 10 -- *Bright Field* No. 1 (left) and No. 2 lubricating oil pumps

[26]One bar is equal to .995 kg/cm^2 or 14.5 psi.

common header, from which the oil passed through an oil cooler and a second filter. In the second filter, the oil was passed through 16 fine-mesh cylindrical strainers. At this point, the system pressure would have dropped by approximately 1/2 to 1 bar. Various oil temperature and pressure sensors monitored the condition of the oil and signaled the status to the automated control system. After being circulated through the engine, the lubricating oil drained back into the crankcase sump, where the cycle began again. A separate lubricating oil purification system drew warm oil from the oil sump, passed it through a centrifugal separator where water and contaminants were removed, and then returned the cleaned oil to the main engine sump.

The chief engineer stated that the standard configuration for maneuvering the *Bright Field* in restricted waters included remote engine control from the wheelhouse, the No. 1 lubricating oil pump running, and the No. 2 lubricating oil pump on standby. If the automated propulsion control system detected main engine lubricating oil pressure below 2.5 bar, it was designed to sound and display an alarm in the engine control room, on the bridge, and in various locations in the accommodation spaces. If the pressure dropped below 2.4 bar, a pressure-activated changeover switch would signal the automated control system to start the standby oil pump. If the pressure dropped below about 2.3 bar, the control system would, after a brief time delay, trip (shut down) the main engine.

Cruise Ships -- The cruise ships at the Julia and Erato Street wharves were normally moored at this location on weekends to disembark and embark passengers and to load supplies. The cruise ship *Enchanted Isle* was owned by Almira Enterprises, Inc., and operated by New Commodore Cruise Lines, Inc. The vessel, built in 1958, was 574 feet long and was 13,681 gross tons. It was powered by a steam turboelectric propulsion system. Maximum capacity was 1,198 persons.

The *Nieuw Amsterdam*, moored at the Julia Street wharf, was owned by Hal Antillen, Inc., and operated by Holland America Line Westours, Inc. The 704-foot, 16,027-gross-ton vessel was built in 1983 and was powered by a direct-drive diesel engine.

Gaming and Excursion Vessels -- The *Queen of New Orleans* was owned by Hilton New Orleans, Inc., and New Orleans Paddlewheels, Inc., in an association known as Queen of New Orleans Joint Venture. The vessel operated from a dock located at the Poydras Street wharf, on the riverfront behind the New Orleans Hilton Riverside Hotel and Riverwalk Marketplace. The vessel conducted eight scheduled 90-minute cruises each day. The vessel left its docking facility at the wharf every 3 hours, beginning each day at 0245 and ending at 2345. Passengers were allowed on board for gambling 45 minutes prior to and 45 minutes after each cruise.

The six-deck, 1,470-gross-ton, 245-foot-long vessel was built in 1993. It was powered by a Sternwheeler Propulsion System paddlewheel. Capacity was 300 crew and 1,500 passengers, for a total capacity of 1,800. The master of the vessel stated that the vessel had four decks accessible to passengers. The first three decks were all gaming areas; the fourth had a forward café and an aft gaming area. On a normal day, about 20 percent of the passengers would be on the first deck. The most crowded deck would be the second deck, with about 40 percent of the passengers. About 30 percent of the passengers would be on the third deck, with only about 10 percent on the fourth deck. At the time of the accident, 637 persons were on board, including 14 marine crew, 96 gaming personnel, 38 security, nongaming, and miscellaneous personnel, and 489 passengers.

The *Queen of New Orleans* master stated that, on the day of the accident, the vessel was not scheduled to leave the dock. Under normal operations, if the river stage is “8 feet and rising,” the vessel remains at the dock. New Orleans Paddlewheels, Inc., has stated that the vessel:

> Does not leave the dock for regularly scheduled cruises during foul weather, including rain, thunderstorms, showers, hail, fog and mist and wind conditions in excess of 12 mph. Additionally, the vessel does not sail during seasonal high river stage when the Governor Nicholl’s

traffic light is in operation.[27] Finally, the *Queen of New Orleans* remains at dock during port closures issued by the Marine Safety Office. When the vessel is dockside, the vessel remains open for business and passengers are permitted to remain on board.

According to the Board of Commissioners of the Port of New Orleans (Dock Board), the provisions of the Dock Board's Emergency Management Checklist and Guidelines were applied to the *Queen of New Orleans* gaming vessel and its shoreside terminal as part of a permit process. The facilities and operations were reviewed by a Dock Board consultant prior to approval of the permit and found to be in compliance with the guidelines.

The 3-deck, 397-gross-ton *Creole Queen*, a 1,000-passenger-capacity paddlewheel excursion vessel, was 190 feet long and 40 feet wide. It normally departed the Canal Street dock for two daily sightseeing trips and one nightly dinner cruise. The overnight mooring location for the vessel was the Poydras Street wharf adjacent to the office of New Orleans Paddlewheels, Inc., the vessel's owner. The berth was destroyed as a result of being struck by the *Bright Field*. After the accident, the overnight mooring location was moved to the Canal Street wharf.

Waterway Information

According to information provided by the U.S. Army Corps of Engineers, the Mississippi River has a Federal project depth of 45 feet from over the bar at Southwest Pass thence to the head of the passes and to mile 233.4 AHP, or about 135 miles above New Orleans. Various areas of the Federal project are under constant maintenance dredging. Southwest Pass has a recommended draft limit of 45 feet.

According to records supplied to the Safety Board by the Corps of Engineers, between 1983 and 1996, mean monthly water temperatures in the Mississippi River ranged from a low of 43.2 °F in January to a high of 83.3 °F in August. Mean water temperature over the period for the month of December was 49.6 °F.

River Stage -- On average, high river stage occurs in April and the low river stage in October. At New Orleans, the extreme difference between high and low stage is 17 feet; the mean difference is about 8 feet. At several places in the lower part of the river, counter currents or eddies often are found near the banks. This occurrence is especially pronounced in the area of Algiers Point.

Records maintained by the Corps of Engineers indicated that the Carrollton gauge at mile 102.8 AHP on December 14, 1996, read 12.5 feet (above a datum at New Orleans) and was falling. Based on this reading, the Corps of Engineers' best estimate of the current below the Crescent City Connection Bridges in the area of the accident on December 14, 1996, was 4.5 mph.

At times of extremely high river stage, the Corps of Engineers has the option of opening the Bonnet Carré Spillway, which, by diverting 1/4 million cubic feet of water per second through the spillway, lowers the river by approximately 4 feet while reducing the speed of the current. According to the Corps of Engineers, the spillway, located about 33 miles above Canal Street, was built in 1932 to protect communities downstream of the spillway from floods, and to lower river stages generally, by discharging floodwaters into Lake Pontchartrain, then into the Gulf of Mexico. According to the Corps of Engineers, under normal operating conditions, opening the spillway is a complex task that requires about 36 hours to complete. Prior to the *Bright Field* allision, the spillway had been opened seven times since its construction, the last time in 1983.[28]

Vessel Traffic Control -- The only operational vessel traffic control system serving

[27]The company has told the Safety Board that since this policy was developed, the traffic lights have been placed in full-time operation; consequently, the policy is now interpreted to refer to those times (high water stage) when the traffic lights are actually controlling river traffic.

[28]During what the Coast Guard termed "unprecedented high waters on the Mississippi River" in early 1997, the Bonnet Carré Spillway was opened for the eighth time on March 17, 1997, to lower the water level and combat strong river currents. The spillway remained open until April 18, 1997.

the Mississippi River in the New Orleans area is a series of traffic lights operated by the Coast Guard. When the river reaches 8 feet on the Carrollton gauge on the rising stage, and until the gauge reads 9 feet on a falling stage, the movement of all tugs with tows and all ships, whether under their own power or in tow (but excluding tugs or towboats without tows or river craft of comparable size and maneuverability operating under their own power) in the vicinity of Algiers Point is governed by the Coast Guard's Governor Nicholls and Gretna traffic lights. The lights are visible throughout the entire width of the river and flash once every second. A green light displayed ahead of a vessel (in the direction of travel) indicates that Algiers Point is clear and the vessel may proceed. A red light displayed ahead of a vessel (in the direction of travel) indicates that Algiers Point is not clear and the vessel is not to proceed.

Port Information[29]

More than 6,000 oceangoing ships and 120,000 barge and tows travel through the Port of New Orleans[30] each year. The port is primarily a general cargo port. The frontage for deep draft vessels within the port limits includes approximately 34 miles along the riverbanks. The city of New Orleans is the major commercial area within the port limits. The Port of New Orleans has more than 28 miles of public and private wharves and related facilities. The public docks can handle as many as 85 ships at a time.

Most of the wharves along the New Orleans waterfront are public facilities under the control of the Dock Board. The Dock Board consists of members selected by the Governor of Louisiana from a list of nominees compiled by 18 business and civic associations. The Dock Board maintains the depths of vessel berths adjacent to its public wharves from the face of the wharf to 100 feet into the river and assigns vessel berths at its public wharves. The Coast Guard is primarily responsible for control of navigation in the river, and the Corps of Engineers is primarily responsible for approving new structures in or on the river.

Subject to the above Federal jurisdictions, the Dock Board regulates activities related to maritime commerce within the Port of New Orleans and administers, controls, and regulates the public wharf facilities in the port. About 3/4 of the wharf frontage is owned by the Dock Board and operated by private operators under occupancy agreements from the board.

Above New Orleans, the Mississippi River is used by oceangoing vessels to Baton Rouge, about 135 miles above Canal Street in New Orleans. The river channel between New Orleans and Baton Rouge for the most part is deep and clear. Facilities on the Mississippi River above New Orleans to Baton Rouge include private and public terminals for handling oil and other products on both sides of the river.

The Erato and Julia Street wharves, adjacent to the Poydras Street wharf, were used for docking cruise ships from the Holland America, Carnival, and New Commodore cruise lines, as well as U.S. Navy ships and, during annual *Mardi Gras*, additional tourist ships, some of which were used as hotels. The wharf area had two passenger terminal buildings, a parking lot, and harbor police facilities. This wharf area was accessible only when cruise ships were at berth and was the only open public area not managed by a commercial tenant. Port of New Orleans Harbor Police officers were detailed to the area and monitored police radios. In the event of an emergency, the harbor police officers provided evacuation direction and assistance in the cruise terminal area. The remainder of the Port of New Orleans public areas were under the control of the renters or lessees.

Dredging -- The Dock Board is responsible for dredging New Orleans Passenger Terminal (passenger/cruise ships) and Riverwalk piers to a distance of 100 feet out from the pier face. On December 11, 1996, maintenance dredging was completed in the Riverwalk Marketplace and New Orleans International Terminal areas. The

[29]Information obtained from United States Coast Pilot 5, from the Dock Board, and from other local and national reference sources.

[30]The Port of New Orleans extends along both sides of the river from mile 80.6 AHP to mile 115 AHP, and encompasses the city of New Orleans, several parishes or the river frontage of those parishes, and a number of smaller communities.

Dock Board specified that the dredging would extend to a 33-foot project depth. The passenger terminal was dredged only to a depth sufficient to accommodate the cruise ships that docked there. At the time of the accident, the depth was sufficient to accommodate the *Enchanted Isle*, which had a draft of 28 feet. The docking area of the *Queen of New Orleans* had not been dredged since 1994 and had been left to silt in to afford the vessel protection from ramming by deep-draft vessels. With the silting, water depth in the docking area was about 15 feet in average river stage conditions. Because of the dredging and the high river stage that existed on December 14, 1996, the river was 45 to 48 feet deep alongside the Poydras Street wharf in the area of the Riverwalk Marketplace at the time of the accident.

The Wharf Area -- According to the Dock Board, the Canal, Poydras, and Julia Street wharves were constructed early in this century. The wharves have been renovated or rebuilt several times since their original construction, but always on the same "footprint." All of the substructure and first level decks of the wharves were designed and built, and are currently owned, by the Dock Board. In 1977, the International RiverCenter (IRC) constructed a cruise ship terminal on the first level of the Upper Poydras Street wharf. The terminal was built in conjunction with the development of the first phase of the Hilton Hotel. In 1983, the IRC completed the riverside expansion of the Hilton Hotel, which was constructed on old warehouse piers on the river side of the levee flood wall. No additional footings or wharf extensions were erected beneath or beyond the original piers at the site of the Riverwalk complex.

In the early 1980s, the Louisiana World Exposition (LWE) selected the Upper Poydras Street, Julia Street, and Erato Street wharves as locations for the world's fair's riverfront attractions. The last full year of cargo operations at these wharves was 1981. In the LWE's lease agreement of July 1982, the Dock Board agreed to discontinue cargo operation and assignment of lay-up vessels at the Julia, Poydras and Erato Street wharves between May 1 and November 15, 1984. The Dock Board's lease with the LWE required that the first 15 feet of the wharves be kept unobstructed and inaccessible to the public. Existing structures on the Julia Street, Poydras Street, and Erato Street wharves were significantly modified by construction of facilities for the world's fair, however, the wharf deck profiles were not changed.

In 1986, the Rouse Company developed the Riverwalk mall on portions of the Lower Poydras, Upper Poydras, and Julia Street wharves. The Rouse Company leased the land rights from the IRC and the city of New Orleans. The Rouse Company was required to obtain construction permits for the Riverwalk Marketplace from the city of New Orleans and the New Orleans Levee Board. Rouse was granted a consent agreement from the Dock Board to construct and operate the Riverwalk Marketplace. The Dock Board reviewed the Riverwalk mall plans to determine the extent to which the development might affect Dock Board activities.

The One River Place condominium parking garage was constructed above the lower Poydras Street wharf and above the Riverwalk development. The condominiums were completed in 1989. One River Place was given a lease agreement from the Dock Board to construct and operate the condominiums. One River Place was required to obtain all appropriate city building permits.

In 1993, the Julia Street wharf cruise ship terminal was opened, replacing the original terminal constructed by the IRC. Also in 1993, the Queen of New Orleans Joint Venture widened a part of the Poydras Street wharf by 50 feet and constructed a boarding tower on the wharf to accommodate a riverboat-style gaming vessel. (See figure 11.) The widened wharf and the addition of a boarding tower were permitted by the Army Corps of Engineers, the Dock Board, and the city of New Orleans. No barriers were constructed outboard of these structures.

The construction of wharves extending into the navigable waters of the United States is subject to approval and issuance of a permit by the Corps of Engineers. The Corps of Engineers relies on the Coast Guard for any navigational safety concerns that such constructions may raise.

Federal Jurisdiction -- While the Coast Guard is responsible for promoting the safety of

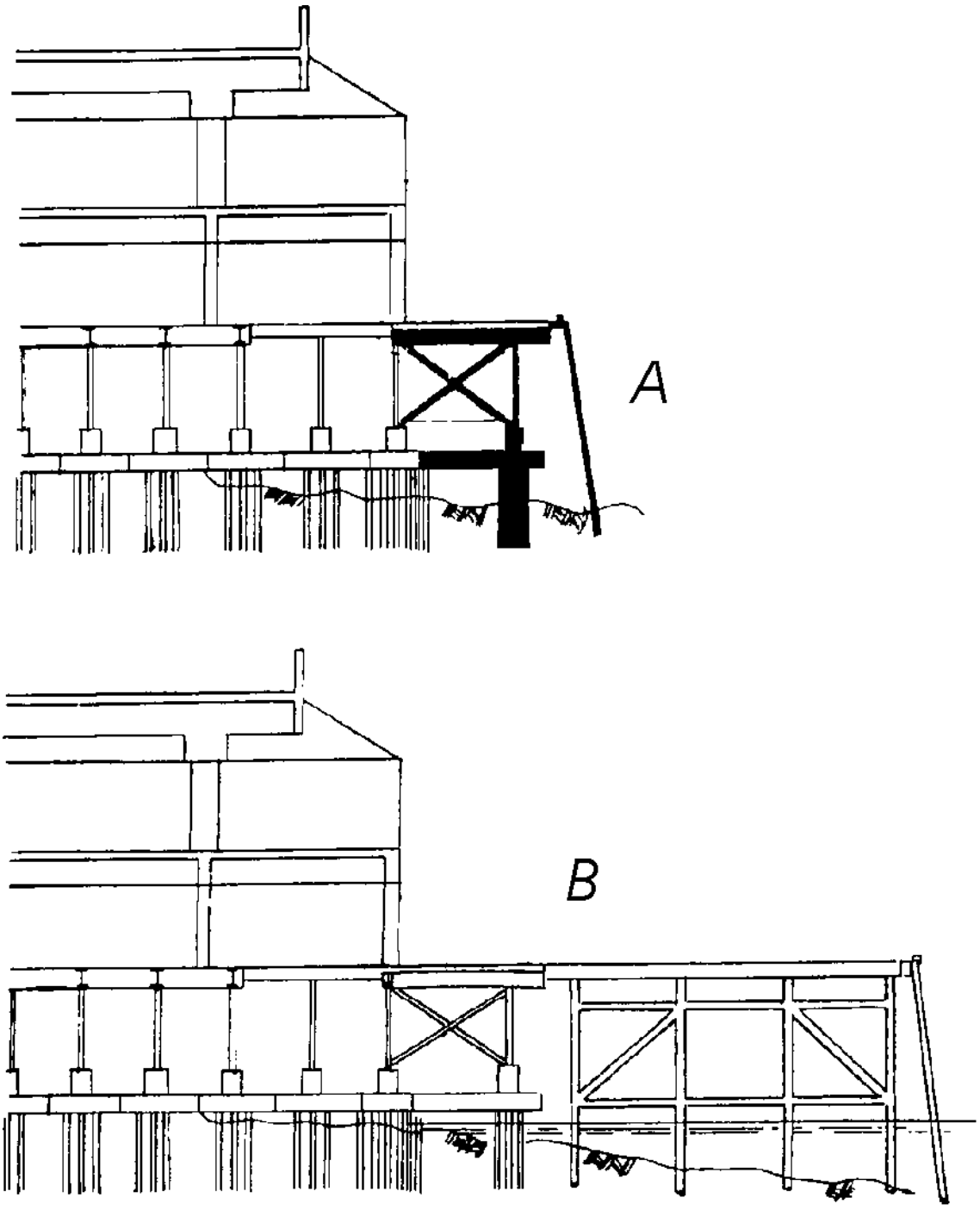


Figure 11 -- (A) Profile of wharf at impact location
(B) Wharf extension to accommodate gaming vessel

life and property on the navigable waters of the United States, the Corps of Engineers has final authority to approve any structure built on or in the navigable waters of the United States, including the Mississippi River. A permit from the Corps of Engineers is required to situate a structure in or on any navigable waterway. Under the *Rivers and Harbors Act of 1899*, the Corps has jurisdiction over the establishment of harbor lines and anchorages and the maintenance of clear passage along navigable waterways. A permit is required to construct piers, wharves, jetties, permanent moorings, permanently moored floating vessels, or any other permanent or semipermanent obstacle or obstruction.

Meteorological Information

At the time of the accident, winds were from the east at 6 knots; clouds were scattered; visibility was 7 miles; the temperature was 70 °F.[31]

Toxicological Information

Postaccident alcohol and drug tests were conducted after this accident on the pilot and nine crewmembers who were on duty at the time of the accident.[32] Testing was ordered for crewmembers assigned to the noon watch. The ship's carpenter, who was acting as anchor watch at the time of the accident, was not assigned to the noon watch and was not tested.

The crew's tests were conducted by a specimen collection and testing company retained by the ship's agent. The breath tests, using a portable testing device taken aboard the ship, began at 2036, 6 hours and 25 minutes after the accident. The last three tests done were those of the helmsman at 2208, the master at 2235, and the chief engineer at 2241. These tests were conducted 7 hours 57 minutes, 8 hours 24 minutes, and 8 hours 30 minutes, respectively, after the accident. The results of all nine tests showed 0.00 percent blood alcohol concentration (BAC).

The same collection and testing company collected urine specimens from the nine crewmembers between 2030 and 2230. The specimens were sent to a Federally approved testing lab in New Orleans and tested for the presence of five categories of illicit drugs specified in Coast Guard and Department of Transportation regulations.[33] The specimens were negative for the five drugs for all the tested crewmembers.

The Safety Board requested a portion of the specimens that remained after the lab completed its testing. Those portions were forwarded to the Center for Human Toxicology (CHT) in Salt Lake City for additional testing. The second testing confirmed that none of the five groups of illicit drugs, nor any other drugs, were present in the specimens. In addition, tests for urine alcohol concentration were negative for all specimens. Traces of caffeine and/or smoking byproducts were the only chemicals found in some specimens.

Urine and breath specimens for postaccident alcohol and drug testing were obtained from the pilot about 1 1/2 hours after the accident (at 1537 and at 1550, respectively). Results showed a BAC of 0.00 percent and were negative for the five groups of illicit drugs tested. Additional testing requested by the Safety Board was conducted on a portion of the urine specimen by CHT. Caffeine was the only drug found in the pilot's specimen.

Coast Guard postaccident drug and alcohol testing regulations (46 CFR Parts 4 and 16 and 33 CFR Part 95) require specimen collection to occur "as soon as practicable following an accident." The chronology of specimen collection in this accident (based on recollections of the individuals involved) is as follows:

1530 Ship's agent learns of accident from the vessel charterer.

[31] As reported from the Naval Air Station, Belle Chase, Louisiana.

[32] The master, second mate, helmsman, bridge lookout, chief engineer, second engineer, third engineer, electrician, and motorman.

[33] The drugs specified in 49 CFR Part 40 are marijuana, cocaine, opiates, amphetamines, and phencyclidine.

1600 Coast Guard investigator on board ship. Pilot not aboard. NOBRA was called to ensure pilot was tested. NOBRA states that testing was in progress. Investigator looks for, but finds no evidence of alcohol or drug impairment among crew.

1630 Ship's agent representative on board. Ship's attorney on board.

1700 Coast Guard Marine Safety Office (MSO) investigator orders ship's attorney to test crew for drugs and alcohol.

1730 Ship's agent general manager on board.

1834 Specimen collection and testing company contacted by general manager when he learns that the Coast Guard was expecting the ship to call the drug testing company.

1955 First of two collectors arrives at scene.

2010 First collector arrives on board ship after difficulty getting past road blocks.

2030 First specimen taken.

2235 Second collector on board.

2245 Breath testing and urine specimen collection complete.

Survival Aspects

Bright Field -- The vessel master said the crew was trained to respond to a particular emergency alarm that is sounded in case of a fire, a pollution incident, or other emergency. The response normally entailed reporting to the main deck. The master stated the most recent fire and boat drill held aboard the *Bright Field*, in accordance with international and Republic of Liberia rules, was on November 17, 1996. He said fire and boat drills included the sounding of the emergency alarm and were normally held weekly.

Enchanted Isle -- The Port of New Orleans Harbor Police arrived at the *Enchanted Isle* gangway a few moments after the *Bright Field* struck the wharf and requested that passenger embarkation be stopped. Embarkation was delayed 4 to 5 minutes as the river surged and the situation was assessed. According to witnesses, the gangway moved up and down briefly with the swells, but no passengers were on it at the time.

Nieuw Amsterdam -- After the *Bright Field* impact, the second officer of the *Nieuw Amsterdam* radioed the bridge that the *Bright Field* had stopped moving and was approximately 50 meters from the stern of the *Nieuw Amsterdam*. He said later he recalled seeing tugboats arrive within moments to keep the *Bright Field* stable against the wharf. He said he reported to the bridge by radio that the *Bright Field* no longer posed a danger to the *Nieuw Amsterdam*, after which he returned to the bridge. Upon receiving the radio call, the third officer and the master assessed the situation and returned the ship to its normal operations.

At the Safety Board's request, the master of the *Nieuw Amsterdam* distributed a questionnaire among the ship's passengers. While the actual number of passengers who received the questionnaire is unknown, 137 of them responded. Their responses are the source of the information that follows.

Numerous passengers who were on the *Nieuw Amsterdam* at the time of the accident observed the *Bright Field* as it passed by the ship before hitting the wharf. These passengers were on the Lido deck, port side. They said they heard the vessel's whistle, then noticed its direction and speed. As the *Bright Field* passed the *Nieuw Amsterdam*, most of the passengers ran aft on the Lido deck, observed the *Bright Field* strike the wharf, and watched the emergency responders arrive.

Several passengers were on the *Nieuw Amsterdam* gangway at the time the *Bright Field* was approaching the Poydras Street wharf. One couple first noticed the *Bright Field* as it passed under the bridge because it was repeatedly sounding its whistle, and they became aware that the vessel was experiencing problems because of the angle of its approach. When they and other passengers were about halfway up the gangway, ship personnel instructed them to turn around, exit the

gangway, and return to the terminal. After the *Bright Field* struck the wharf, cruise terminal employees instructed them to go into the terminal for their own safety.

Another couple was on the dock when they heard the *Bright Field*'s whistle, but they did not understand its significance. They observed harbor police scooters driving past them with lights and sirens on. After the accident, cruise terminal employees directed them to return to the terminal, where they remained until they boarded the *Nieuw Amsterdam* about 1/2 hour later.

Other passengers were in the port terminal when the *Bright Field* struck the wharf. They were instructed to remain against the far side of the terminal and became aware of an emergency when they heard the *Bright Field*'s whistles, observed harbor police officers moving toward the wharf, and saw people begin "streaming" out of the Riverwalk Marketplace. Although most responding passengers recalled that emergency responders arrived quickly, others recalled that some time elapsed before emergency personnel arrived.

Queen of New Orleans -- The first mate on the *Queen of New Orleans* (figure 12) stated that he was monitoring channel 67 when he heard the call from the *Bright Field* pilot to the Governor Nicholls Light operator. He said he immediately notified the master, who was on the aft portion of the main deck. The master stated that, when he approached the stairs to the pilothouse (on the main deck forward), he noted the *Bright Field*'s location and speed. He radioed the first mate and instructed him to immediately inform the deckhands to prepare the gangway for evacuation. The master said that, as he continued up the stairs to the pilothouse, he observed that the *Bright Field* was heading directly toward the Poydras Street wharf. He said he radioed the mate to begin the emergency announcements over the loudspeakers. According to representatives of the vessel's owners, the first mate initiated the first emergency evacuation announcements at 1410:48. The master, entering the pilothouse at the end of the first emergency announcements, rang the general alarm bell at 1411:22. The first mate made several more emergency evacuation announcements, after which the master instructed him to radio security and have them call 911. The master then told the mate to instruct the chief engineer to prepare the engines for getting underway, after which the chief engineer started the engines.

The ship's director of security and surveillance said that he was on the second deck when he heard the announcement instructing the passengers to leave the vessel by the gangway. While moving toward the bow of the vessel, he began instructing gaming personnel to leave the vessel after the passengers. He said that at the bow of the second deck, he was blocked by a crowd of passengers trying to evacuate over the gangway. He said he looked out toward the wharf and saw the *Bright Field* headed toward his vessel. He said he immediately went out a side door, then went around the crowd and began to distribute life jackets and help the passengers off the vessel. He stated that it was not normally his responsibility during an emergency to distribute the life jackets; however, most of the team leaders, who were responsible for distributing life jackets, were assisting passengers in exiting the gangway or were caught behind the crowd trying to evacuate the vessel. In addition, the team leaders were having difficulty reaching the life jackets at the gangway because of the crowd. During emergency drills, the passengers were usually divided into different "refuge areas" and were not all in the gangway area at the same time.

A nonoperating crewmember recalled hearing the announcement to evacuate. As she and the passengers evacuated from all three decks, they merged together on the second deck, where the gangway was located. She said that she did not hear any announcements regarding life jackets. The master said that he had not made such an announcement because the vessel was not scheduled to cruise that day. The employee said that she saw the deckhands obtaining life jackets, but that many passengers were not wearing them because they were running, and the deckhands were telling them to keep moving. The crewmember said she did recall hearing a horn blowing a few times, but she said she heard this all the time on the river. She recalled that "everyone was in a panic" because they did not know what was going on until they went outside and saw the *Bright Field* heading toward their vessel.

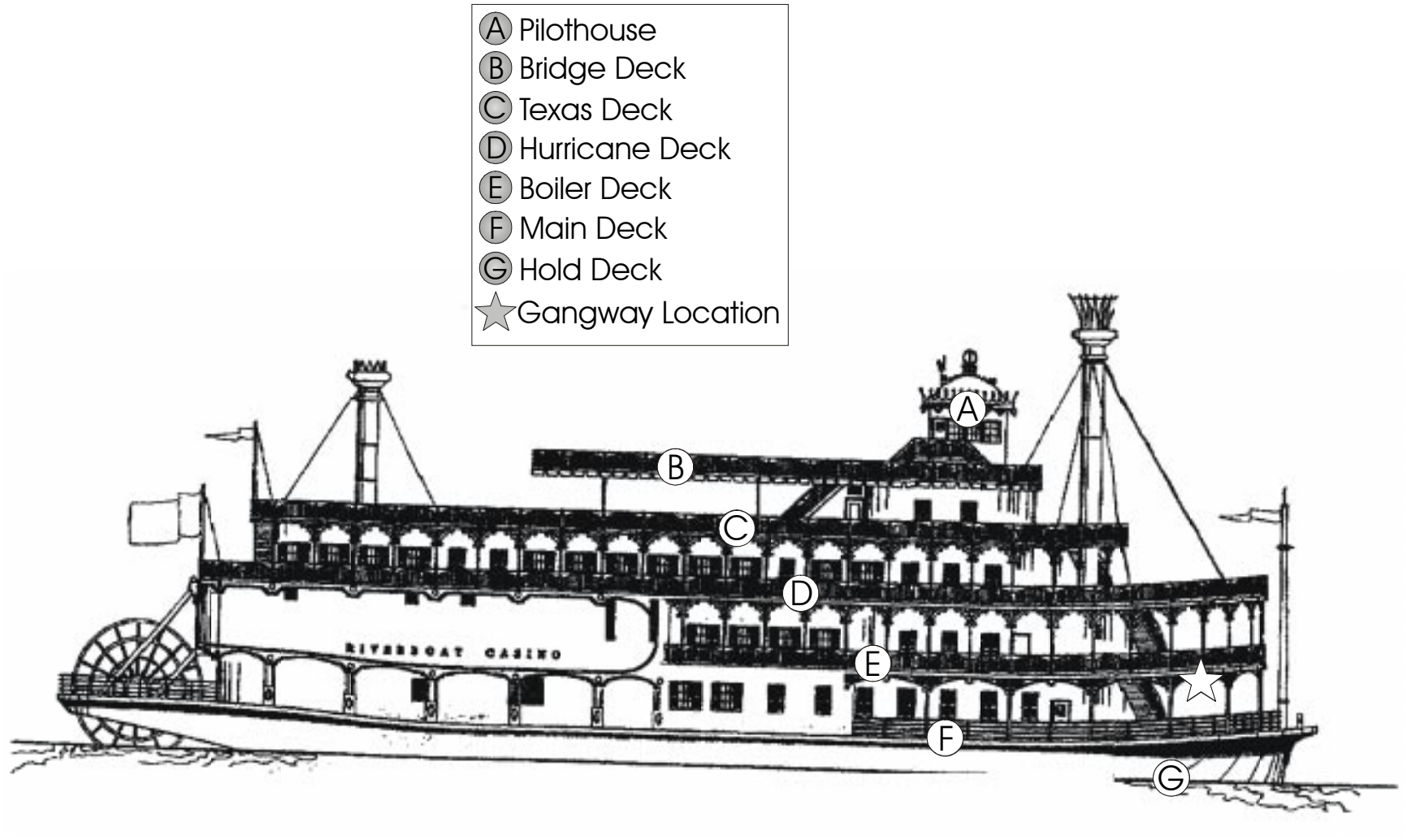


Figure 12 -- New Orleans Paddlewheels, Inc., gaming vessel *Queen of New Orleans*

Another employee, who was on the stern of the second deck, recalled hearing the evacuation announcement, after which he began instructing passengers to proceed to the gangway. As he began moving forward, he said he heard the whistle from the *Bright Field*. He recalled helping one wheelchair-bound passenger out of the casino area, over the gangway, and to the elevators of the hotel. He said he then returned to help clear the casino floor of passengers and moved to the bow of the vessel, where he began distributing life jackets to passengers and assisting those passengers who were panicking.

The only means of egress from the *Queen of New Orleans* during the evacuation was a single gangway from the second deck to a stairway and elevator structure of the Hilton Hotel and the wharf. When the *Bright Field* struck the wharf, the vessel's bow wave caused the *Queen of New Orleans* to rise 4 to 6 feet. A deckhand called the pilothouse and informed the first mate that the gangway was "bouncing," or rising up and down, approximately 2 feet. According to testimony of the master, the gangway plates were "jumping" up and down for about 10 seconds. The master instructed the first mate, who ordered the deckhands to stop the evacuation. After about 10 to 15 seconds of "bouncing," the gangway stabilized again. The evacuation resumed until the gangway again began to bounce. The master again instructed the deckhands to stop the evacuation, raise the gangway, and report to their mooring stations.

Upon hearing this announcement, the security director, who said he was not sure what a mooring station was, assumed the instructions were for the operating crew. He said he and a few other crewmembers instructed the passengers to "get back" and "run to the back of the boat." When the crowd became aware that the *Bright Field* was heading toward the *Queen of New Orleans*, people began to run toward the stern of the vessel.

Following this call, the first mate went to the bow of the second deck to assist the crew, who had not yet raised the gangway because it had "restabilized again." Crewmembers continued the evacuation from the gangway at this time. The mate observed a steady flow of passengers evacuating the gangway, which again began "bouncing." At this point, the gangway was rising approximately 1 to 2 feet above its normal position. The mate stopped the evacuation again by stepping in front of the passengers and physically blocking their path from the vessel. After several seconds the gangway again settled, and the evacuation resumed. At this point, the *Bright Field* had stopped moving down the wharf, coming to rest about 70 feet from the bow of the *Queen of New Orleans*. According to the master, between 70 and 80 percent of the passengers had been evacuated. According to New Orleans Paddlewheels, security videotapes from the *Queen of New Orleans* showed that about 90 percent of the passengers had been evacuated when the *Bright Field* stopped moving, about 70 feet from the bow of the *Queen of New Orleans*.

Once all the passengers had left the vessel, the master instructed several deckhands to go to the dock and assist in crowd control and emergency response. Vessel security instructed the remaining gaming personnel to exit the vessel, and only operating crew remained onboard. At the same time, the first mate instructed some deckhands to prepare the lifeboats to launch. Deckhands were also instructed to conduct a search of the vessel to verify that all the passengers had been evacuated. Another deckhand was instructed to search the river for any signs of a person overboard. Three gaming and security personnel were sent to the front of the hotel to direct the emergency responders.

Meanwhile, the master radioed the 24-hour medic and sent him to the dock to provide medical assistance to the injured. A medic, contracted from a local ambulance service, was aboard the *Queen of New Orleans* at all times to provide medical assistance to passengers and crew. The master called 911, and then instructed the first mate to send several deckhands to the *Creole Queen* to offer assistance.

Questionnaires were sent to 74 persons who had been either in or near the Riverwalk Marketplace when the accident occurred or who were among the passengers and crew of the *Queen of New Orleans* or *Creole Queen* at the time of the allision.[34] A total of 12 responses

[34]Injury reports were the only available sources for identifying individuals who may have been on board the

were received from individuals who said they had been aboard the *Queen of New Orleans* when the *Bright Field* struck the wharf. All of them said they had boarded the vessel between 1300 and 1400. Nine of the passengers did not recall receiving any information concerning what to do in the event of an emergency and did not recall observing any safety information placards when they boarded the vessel. Seven of these passengers did not receive a life jacket when evacuating the vessel. Each of these passengers recalled first learning about the emergency when they heard the announcement from the first mate over the public address system.

Almost all of the injuries (generally limited to fractures, abrasions, contusions, lacerations, and back or cervical strains) occurred when the passengers were pushed, shoved, or trampled during the evacuation. One passenger recalled that the crowd was "out of control, stampeding like wild animals, pushing, shoving, and screaming." Another passenger said she saw people running and yelling, trying to get out by the stairwell. "I even saw one man take off running and jump, trying to walk on people's shoulders to get out," she said. She said that "getting to or out of an exit to land was impossible," and that she was not aware of an alternate escape route from the vessel.

Another passenger believed she would never be able to get to the dock and decided to move to the stern of the vessel and "pray for the best." As she began to move aft on the starboard side of the vessel, she said, she heard a man on the dock yelling for her to jump. She replied that she could not jump; however, when she turned and saw the *Bright Field* still heading in the direction of her ship, she climbed over the rail and jumped to the wharf. She sustained pelvic and lower back fractures and was hospitalized for 6 days.

Several passengers commented that the vessel crew also seemed to panic and did not appear to be trained for an emergency of this type. One passenger said she observed some of the crew running to get off the vessel along with the passengers. She said she perceived that there was "no order and no one seemed in charge" during the evacuation.

According to New Orleans Paddlewheels, Inc., the comments of these passengers do not correspond to the surveillance videotape showing the evacuation. Company officials said the passengers may have seen some crewmembers leaving the vessel during the evacuation, along with the passengers; however, these were the crewmembers who were not assigned to assist in the evacuation. The company said crewmembers with evacuation responsibilities remained aboard the *Queen of New Orleans* and provided assistance throughout the evacuation. The company said that its security videotape "clearly shows passengers responding to announcements immediately, orderly, and no one running." The Safety Board has reviewed the tape and did not observe, in the locations of the vessel shown, any of the passengers falling or being "trampled" or knocked down. The videotapes appear to show passengers exiting the vessel in an orderly manner without apparent panic.

Creole Queen -- The master of the *Creole Queen* was monitoring two handheld radios, a company radio with two channels and another radio tuned to VHF channel 67. The main radio in the wheelhouse also monitored channel 67. The master stated that, at approximately 1400, he instructed the deckhands to remove the lines for the vessel's second cruise. As the deckhands let go of the lines and the master began using the bow thruster to move the vessel away from the dock, he heard the call from the *Bright Field* pilot to the Governor Nicholls Light operator.

As the master began to maneuver the vessel back to the dock, he radioed his first mate and instructed him to go starboard on the main deck, look upriver, and report his observations. The first mate reported back, "he's headed straight for the Riverwalk." The master instructed the first mate to "put the gangway down and begin an evacuation."

Queen of New Orleans or the *Creole Queen* at the time of the accident or who may have been inside or near the Riverwalk Marketplace when the *Bright Field* struck. Crewmembers of the two ships were identified through company documents. Other than crewmembers, the only individuals who received Safety Board questionnaires were those who had reported being injured during or subsequent to the accident sequence.

The first mate and a deckhand had gone to the gate on the deck of the *Creole Queen* to open it for the gangway. The first mate climbed ashore and began to lower the gangway while other deckhands tied up the vessel. Once the vessel was secure, the gangway was positioned for the passengers to begin evacuating. The first mate said he positioned himself on the dock side of the gangway as the deckhands, on the vessel side of the gangway, helped the passengers evacuate.

At this time, the master began making emergency evacuation announcements to the passengers. He recalled announcing,

> Ladies and gentlemen, this is the captain. Please exit the boat using the gangway. Please do not panic. Please exit the boat using the same entrance as when you boarded. This is an emergency. Please exit immediately.

The passengers began evacuating, and the master rang the general alarm bell. Meanwhile, the master could hear the *Bright Field*'s whistle getting closer, but his view of the vessel was obstructed by the *Queen of New Orleans*.

The first mate observed that the *Bright Field*'s bow wave caused the *Queen of New Orleans* to rise up "as if it were out on the ocean and hit by a wave." He said he called to the deckhands to stop the evacuation of the passengers. The master said he used the public address system to caution the passengers to "watch the gangway." The master estimated that at that time half of the passengers had evacuated the *Creole Queen* and were waiting on the dock. The bow wave and undertow from the *Bright Field* pulled the *Creole Queen* away from the dock, and the gangway began to slip aft along the deck. The deckhands stopped the evacuation; however, three passengers were still on the gangway at the time. As the boat rose up, it "was sucked out" away from the wharf, and the gangway dropped off the *Creole Queen* and down toward the water. The three passengers on the gangway fell into the river between the ship and the wharf.

The deckhand and some passengers who were on the dock began to crank up and reposition the gangway so that the evacuation could be continued. Meanwhile, a passenger on the main deck threw a life buoy and a child-size life jacket to the three passengers in the water. The first mate, from the dock, told the passenger where to find an adult life jacket, and the passenger then threw an adult jacket into the water. The first mate then instructed a crewmember on board to retrieve the ladder from the rescue boat on board and to place it over the side of the *Creole Queen*. Two of the passengers in the water climbed the ladder and entered the vessel. The third passenger, a 61-year-old man, suffered a hip injury when he fell into the water, and he was unable to climb over the railing and into the vessel. The first mate climbed onto the vessel from the dock and assisted the crewmember in easing the passenger into a Stokes Basket. They then pushed the basket from the vessel over to the dock. While this was underway, the master was attempting to reposition the vessel to the fallen gangway. As he was maneuvering the vessel, he continued to make emergency announcements to the passengers until the gangway was re-positioned and the evacuation could be resumed.

Once the evacuation was complete, the master requested, via the company radio to the *Queen of New Orleans*'s first mate, that the 24-hour medic be dispatched to assist some of the injured *Creole Queen* passengers. The mate on the *Queen of New Orleans* told him that the medic was already assisting the injured from the *Queen of New Orleans*. The master later told the Safety Board that one of the problems he encountered during the accident was the length of time it took for emergency medical technicians to arrive on scene. He recalled that after he made this complaint to another person after the accident, he was informed that the delay in ambulances responding to the dock where the *Creole Queen* was moored was due to damage done by the *Bright Field* to the normal emergency response access route to the wharf.

Three respondents to the Safety Board questionnaire were individuals who said they had been on the *Creole Queen* at the time of the accident.[35] One passenger recalled boarding the

[35]Questionnaires were sent only to the three *Creole Queen* passengers who had reported being injured in the accident. All three individuals responded.

vessel at 1310 and receiving information concerning emergency procedures. He stated that, about 1315, the first mate announced that, if the passengers were required to immediately evacuate the vessel, they should follow the instructions announced over the public address system. This passenger considered those instructions of great value because the evacuation was not a typical situation; it involved little time to don life preservers, form groups, or disembark to the pier or lifeboats. He observed placards posted on the salon and observation decks that provided emergency information regarding the location of life jackets and the procedures for donning them.

A couple, a 61-year-old man and 59-year-old woman, both sustained injuries when they fell into the water when the gangway collapsed. They said they boarded the *Creole Queen* about 1350, and they did not recall receiving any information about what to do in the event of an emergency, nor did they observe any placards that provided this information. The female passenger recalled the master announcing they were returning to the dock to disembark, and the male passenger recalled six to eight repeated calls for "abandon ship." They observed people on the Riverwalk running toward the Spanish Plaza. The male passenger recalled that passengers were confused when they heard "abandon ship"; they were unsure whether to jump into the water or remain on board, and the crew was shouting, "get the life preservers, where are the life preservers?" He recalled that it seemed "like a continuous shouting match" while the crew was attempting to find life jackets and the three passengers remained in the water.

Riverwalk Marketplace -- In a letter to the Safety Board, a couple said they were in a café on the second level of the marketplace when they heard the *Bright Field*'s whistles. The husband got up from the table and went to the window to see what was happening on the river. When he had almost reached the window, the *Bright Field* struck the wharf, then broke through the window of the cafe. Patrons seated near the window "ran screaming and running out of the café." The man and his wife said they heard a waitress yelling "get out" twice as they ran to the restaurant doors. They turned around and watched the ceiling and floor above crash down and fold over the entire room, as the *Bright Field* continued to crash through the cafe. They immediately left the area to evacuate the mall.

As they attempted to go up to another level, "the only route out of the mall [away from the direction of the river]," they ran into a "bottleneck," a large crowd attempting to use the escalators to reach the higher floors to evacuate. As they were climbing up the "down" escalator, they said, they feared a gas explosion because they smelled gas. When they made it up to another mall level, many mall customers on the upper floors were still shopping, unaware of the accident. At this time, the couple noticed that they had not yet heard any alarms or public address announcements, even though it had been several minutes since the vessel struck the cafe. They encountered security guards who did not allow them to use emergency exits to evacuate. They said they believed they were "strictly on our own. The mall management apparently had made no disaster plans for its merchants and customers; if such plans existed, they were a complete failure."

The Safety Board received responses from 15 individuals who said they were either patrons or employees of the Riverwalk Marketplace when the accident occurred. One patron recalled that she was on the first level of the Riverwalk Marketplace, alongside the wharf, when she heard the *Bright Field*'s whistle sounding. She believed that the noise was "normal river noise" and did not take notice. She then heard people begin screaming "run," and "get out." She said she turned around and saw the *Bright Field* coming into the wharf area. She said that, when she turned to run out of the store, she was knocked down by the crowd. She tried several times to get up, and was repeatedly knocked down. After the wharf was struck, a security guard came to assist her, and he helped her out of the store and over to a triage area. She was taken to the hospital and admitted for blunt abdominal trauma.

A family was shopping in a mall grocery store at the time of the accident. They said they heard the *Bright Field*'s whistles but did not know the whistles were a warning signal. They thought that a vessel was arriving, so they went to the glass window on the wharf to watch the

Bright Field approaching the dock. They said they did not know that they were in danger until they realized the vessel was not docking but was actually striking the wharf. They said the store clerk did not appear to be aware of what the ship's warning whistles meant and did not know that the store should be evacuated.

As the vessel struck the wharf, the family turned to flee the store. As the customers were running, the store was collapsing behind them and the roof began falling in. As the collapsing walls shifted furniture, the doorway became blocked, and they could not escape until the falling ceiling shattered the front glass display window. When they attempted to leave the mall, by going up to the third floor, they could not go up the escalators because there were too many people exiting the same way. One of the family members hit the stop button on the "down" escalator, and they went up to the third floor via that escalator. They said that when they left the front of the Riverwalk Marketplace, they were not given instructions on which way to evacuate. Not until they were leaving the marketplace did they see a police officer, and they did not observe any other emergency responders. Overall, the family recalled that there appeared to be a lack of preparedness for an emergency evacuation and that crowding was a problem in finding an exit away from the damaged wharf.

Another couple was in a restaurant on the wharf when they saw other people screaming and running out of the mall. They did not hear an emergency whistle from the *Bright Field* or general mall emergency announcements; they did hear a fire alarm ringing after the *Bright Field* struck the mall shops. The couple were injured when they were knocked down and "trampled" by shoppers who were fleeing the mall. The couple recalled the activities of the mall personnel relating to visitor safety as "poor," both during and after the accident. They recalled that the police and Coast Guard arrived immediately, and that the fire department arrived about 10 minutes later.

Riverwalk Marketplace has provided videotapes to the Safety Board which company officials say "show the mall being evacuated within a matter of minutes with virtually no significant personal injuries suffered by any of the persons evacuated." The Safety Board viewed the tapes, which showed various locations in the mall during the allision sequence. The tapes were recorded by security cameras using a loop system that recorded frames from all camera locations on a single tape. Continuous footage from a single location was not available, and the frames from the tape loop were made at intervals of about 4 seconds. These videotapes do not appear to show patrons being "trampled" or knocked down during the evacuation.

In addition to providing videotapes to the Safety Board, Riverwalk Marketplace also has stated that public safety officers did block certain emergency exits in accordance with protocol and the evacuation plans and procedures. "To allow individuals to exit freely from any exit they chose might have placed them in greater peril," the company said. As for the smell of gas reported by the patrons, the company said that a member of the Marketplace engineering department was on the wharf just prior to the accident, saw that the allision was inevitable, and immediately shut off all utility service to the mall, including natural gas, to prevent an explosion. The company said that fire alarms did not sound prior to the allision because of the absence of any alert or warning prior to impact. The security central monitoring station printouts showed the fire alarms sounding at 1411:42 and 1414:11.

Hilton Riverside Hotel -- When the *Bright Field* struck the Hilton Riverside Hotel, the public safety dispatcher received several 52 F (fire) activation alarms, and housekeeping called to inform the dispatcher that a vessel had struck the riverside hotel. The dispatcher notified the local fire and police agencies and called the Director and Assistant Director of Public Safety and Security. The hotel Emergency Disaster Procedures Plan was put into effect and the hotel emergency response team was notified. The security supervisor on duty received a call that a possible fire emergency had occurred in the riverboat casino; when he arrived in the hotel lobby, he "discovered that a panic crowd was running away from the area." He instructed officers to calm the crowd down and clear the lobby. He attempted to use the radio to communicate with other officers, but when the vessel struck the

building, it knocked out the power and, therefore, communication capabilities. So he instructed the officers in the lobby to assist him in evacuating guests from the riverside building.

Meanwhile, a security officer who was returning to his post from lunch was in the Riverwalk parking lot when he was met by a large crowd that informed him that a freighter had hit the Riverwalk and many people by the stairs in the rear lot were injured. He ran to the location and observed people "falling down the stairs and bleeding." He attempted to stop the people from running but to no avail. He found a person with a cellular phone and called 911 to report the emergency. He then assisted the injured until the emergency medical services arrived. He was then assigned to assist with traffic control.

Another security officer, who was in front of the hotel, heard a call from another officer that a possible fire emergency had occurred on the riverboat casino. He ran, along with other officers, to the area and observed that a large ship with heavy damage to the front section was "docked" near the casino riverboat and that a section of the Riverwalk mall and the hotel had collapsed. They attempted to radio the security supervisor on duty, but all communications had been lost due to a power failure in the riverside hotel building. So, the officers proceeded to the damaged area of the hotel to evacuate everyone from the building. They encountered the emergency response team on the fifth floor as they were responding to a report of a trapped female guest.

This emergency response team consisted of the security, maintenance, and engineering departments. When the *Bright Field* struck the hotel, the maintenance person on duty was headed to the first floor when the building began to shake violently. The engineering supervisor was in the carpenter shop when he was notified by the dispatcher that a vessel had struck the building. He, the housekeeping supervisor, and the maintenance person on duty, along with hotel security officers, conducted a floor-by-floor search of the hotel. A housekeeper informed them that a female guest was trapped in her room. They attempted to open the front door to the room; however, it was blocked by collapsed ceiling damage from the freighter's allision. They had to use a claw hammer to break in the hallway wall to reach the guest. The team was able to open a large hole in the wall of the fifth floor, and the trapped guest was evacuated from her room by 1425. According to the emergency response team, the guest stated that "there was no one else in room 5085 and that she did not think that she was injured." Meanwhile, other members of the emergency response team completed the evacuation search by 1418, when the New Orleans Fire and Police Departments arrived at the hotel. Another intensive search of the hotel was conducted by separate groups of local response agencies and the hotel emergency response team.

At 1435, the Director of Security arrived at the hotel, and set up a command post with the fire, police, and harbor police inside of Kabby's restaurant. A printout of the occupied guest suites was delivered, and all departments verified the number and locations of their employees. Once this information was collected, a third search of the building was conducted. No other guests were found trapped in their rooms. According to Hilton Riverside Hotel, no employees of the hotel were injured during the *Bright Field* allision. The riverside building was completely evacuated. The engineering department had notified the security director that the team secured all utility lines, including gas and electrical lines, and placed the building on the back-up generator; power and communications were restored once this generator was hooked up to the repeater.

Emergency Response

Port of New Orleans Harbor Police -- Harbor police officers were the first responders on scene. They initiated rescue efforts immediately, ordered emergency units, and broadcast a description of the incident via police radio. The harbor police were responsible for immediate scene stabilization, traffic control, pedestrian control, and support for the New Orleans Fire Department. A triage center was established at a Riverwalk Marketplace security post, and emergency medical services units were staged near the rear apron roadway. The Medical Center of Louisiana's Charity and University campuses were notified of the incident and designated as the primary treatment facilities. The director of public safety and

security for the Port of New Orleans authorized the request for additional enforcement and rescue assistance from several surrounding parish police and sheriff's departments and from the Louisiana State police. For the first 48 hours after the accident, all available harbor police officers and six recruits were called in to provide security in both interior and perimeter areas of the Poydras, Julia, and Canal Street wharf area.

Coast Guard Group New Orleans -- The on-duty officer at Coast Guard MSO New Orleans was notified of the accident at 1420 by the Gretna traffic light operator. The initial report indicated possible persons in the water and significant damage to the *Bright Field* and Poydras Street wharf buildings, resulting in other casualties. At 1421, the MSO on-duty officer designated Coast Guard Group New Orleans as the search and rescue mission coordinator. Group New Orleans requested an immediate search and rescue response detachment from Coast Guard Station New Orleans to search for possible persons in the water.

At 1422, the Mississippi River was closed at mile 96 AHP in the vicinity of the accident. At 1430, a Coast Guard helicopter was dispatched by the search and rescue coordinator to pick up a rescue swimmer and report to the scene of the accident. The MSO on-duty officer notified both the captain of the port (COTP) and the chief of port operations of the accident. At 1435, the MSO notified the office of the commander of the Eighth Coast Guard District.

The MSO chief of port operations immediately went to the scene. After consulting with the incident commander, he assessed the damage and began searching for leaking fuel or other dangerous conditions. He observed that the ship was not secured to the wharf, and he directed crewmembers and firefighters to attach bow mooring lines.

At 1445, the MSO emergency response team arrived and boarded the vessel, and the Coast Guard on-duty officer also dispatched fire and hazardous materials teams to the scene. At 1447, the helicopter was on scene and searching the river for persons in the water. At 1550, two Coast Guard infrared search teams were dispatched to help search for persons in the debris of the collapsed Poydras Street wharf. At 1750, the Coast Guard received an update that no fatalities had been confirmed and that 100 injuries had been reported. All search and rescue activities were terminated at 1000 on December 16, 1996.

Louisiana Office of Emergency Preparedness -- About 1500, the Louisiana Office of Emergency Preparedness responded to the *Bright Field* accident, dispatching the assistant director and the chief of operations to the scene to offer State support and assistance. At approximately 1630, a request was made for light sets for possible night operations. The Louisiana Army National Guard provided lights later that evening.

Police Departments -- The New Orleans Police Department assisted the harbor police in stabilizing the scene, controlling traffic and pedestrians, and supporting the New Orleans Fire Department in this accident. The initial call was received at 1414 to assist the Harbor Police Department with "unknown trouble...large crowd of people running inside...possible building cave in."

New Orleans Fire Department -- The initial call to the fire department dispatcher was received at 1413. The initial response was a first-alarm response. When the incident escalated into a three-alarm response, more than 40 units and 110 people responded. The fire department established an incident command system to oversee operations, evacuate the affected areas, remove the injured persons, triage and treat the injured, search for and rescue trapped persons, control natural gas leaks and utilities, and make arrangements for perimeter security through the New Orleans Police Department, the Coast Guard, and the Port of New Orleans Harbor Police.

New Orleans Department of Health and Emergency Medical Services -- The New Orleans Health Department, Emergency Medical Services Division, assessed injuries, treated and transported the injured to local hospitals, and coordinated additional treatment and transportation with area private providers. The initial call was received at 1414 by the Levee Board police dispatcher, and the first

emergency medical services responder arrived on scene at 1417.

Emergency Preparedness

Riverwalk Marketplace -- According to Riverwalk Marketplace figures, approximately 13,500 persons visit the mall daily. The Riverwalk Marketplace had a mall emergency/catastrophe plan in place that included emergency procedures and maps indicating the locations of sprinkler systems and zones, fire extinguishers and standpipes, smoke detectors, chemical and hazardous materials storage, main entrance feeders and disconnects, gas shutdowns, water mains, and primary and secondary emergency exits. Each emergency exit from the Riverwalk Marketplace was marked by a lighted sign with the words "Emergency Exit" in white letters on a red background.

The emergency procedures instructed mall employees to first call the local fire department in the event of an emergency, and then follow up with calls to the management office. A command post, if necessary, was to be designated, and the emergency manager was to determine, along with fire department officials, whether to evacuate the mall.

The "Emergency Organization Guidelines" in the *Mall Security Plan* manual listed procedures for security officers on duty at the time of an emergency. This manual provided a separate emergency evacuation plan for each level of the marketplace and specified duties and responsibilities for security officers, dispatchers, and public safety supervisors during an emergency evacuation.

In documents provided to the Safety Board on November 13, 1997, the Riverwalk Marketplace stated that the Riverwalk policy "is, and always has been," that the senior manager on duty at the time of any event is responsible for determining whether to evacuate the mall, or certain portions of the mall. In the absence of the management, the senior security supervisor on duty has the authority to call for an evacuation of all or part of the mall, depending on the circumstances. The decision to evacuate is based upon an evaluation of the safety threat posed to patrons and employees in the mall. The company said that, once the decision to evacuate is made, evacuation is commenced prior to the arrival of firefighters or police on the scene. Notification of the fire or police departments, as necessary, is made instantaneously and coincidentally with the decision to evacuate the mall.

The company said that, for an emergency involving a vessel striking the wharf, specific emergency instructions were based on the severity of the allision. Immediate procedures were to contact the harbor police, identify the damage to the wharf as major or minor, immediately report the accident to a supervisor, determine if city services were needed, and begin safety measures.

New Orleans Hilton Riverside Hotel -- The employee manual of the New Orleans Hilton Riverside Hotel details the procedures to be followed during a fire or other emergency. Included in the manual are the duties and responsibilities of the hotel emergency response team; the hotel management; the security department; and the engineering, front desk, bellstaff, catering, and housekeeping personnel.

The emergency directions include notification of the fire department, establishment of a command center, detailing of evacuation procedures, and notification of Hilton Hotel headquarters management. Sample emergency announcement messages are provided, as are crisis communication guidelines for on-duty management personnel.

The decision whether to evacuate the hotel is to be made by the senior manager on duty prior to the arrival of fire or police officials. The decision is to be based on the threat of injury to hotel guests and employees, the extent of the emergency, and the need to remain in control of the evacuation while fire or police officials assess the emergency. The New Orleans Hilton Riverside Hotel did not have a section in the emergency procedures or evacuation plan manual that covered a vessel striking the wharf.

Queen of New Orleans -- The *Queen of New Orleans Emergency Evacuation Procedures in Moored Conditions* manual provided instructions for evacuation routes, including alternates, in the event of an

emergency. Each deck had a different escape route for a specific number of passengers, based on the number of persons permitted on that deck and the space available for the exits. All primary and alternate deck exit routes led to the gangway located at the bow of the second deck. This 12-foot-wide gangway led to a stairway and elevator structure, then into the New Orleans Hilton Riverside Hotel, or down to the wharf. The master stated that the time was insufficient during the *Bright Field* accident to use the procedures outlined in the manual.

The *Safety and Vessel Operation Manual* for the *Queen of New Orleans* provided safety information for the operating crew and other personnel working on the vessel. It included details concerning the evacuation of the vessel, a description of the sounding of the alarm bells, and an explanation of each alarm. It also described the responsibilities of each crewmember and specified the refuge area, muster area, and designated team leader for each position. According to the manual, the nonoperating crew were responsible for mustering passengers, warning passengers, directing them to refuge areas, assisting them with life jackets, keeping order in the stairways and passageways, and generally controlling the movement of passengers and maintaining their safety.

Safety Briefings -- Based on company documents and the master's statements, the *Queen of New Orleans* broadcast a vessel safety videotape on two 27-inch television monitors in the Hilton Hotel lobby and on one 27-inch monitor on the boarding structure ramp. The monitors in the hotel lobby were positioned just below the ceiling on the wall adjoining the wall through which a door led to the boarding ramp. The monitor screens were visible to persons passing through the door to the ramp if they looked up and to the right. The boarding ramp monitor was centered overhead at a point about halfway up the ramp. The safety videotape played continuously on the monitors and demonstrated the donning of a life jacket and the dangers of the river.

Before each cruise, a safety announcement informed the passengers of the appearance and locations of the boxes containing life jackets. According to the master, an oral announcement about life jackets was not made prior to the *Bright Field* accident because the vessel was not scheduled to leave the dock. He stated that the vessel is "an extension of the dock when we're not underway."

In responding to Safety Board questionnaires, a number of passengers on board the *Queen of New Orleans* on the day of the accident, some of whom had been on the vessel several times before, did not recall ever having noticed the video monitors.

Signage -- The *Queen of New Orleans* had emergency, safety, and life jacket signs posted in various locations throughout the vessel. According to the master's testimony, the vessel had overhead signage, including lighted overhead exit signs at every exit door, directing passengers to the exits of the vessel. The master stated that he did not recall any signage near the floor at designated exits that provided exit instructions. He said signs were posted throughout the vessel advising passengers which level they were on and how to get to other levels.

The information placards were covered with thin, clear laminate and attached to the light-colored bulkheads. An emergency evacuation placard and casino station bill were posted on the first and second decks, and three station bills and an emergency evacuation placard were posted on the hold deck. Life jacket placards were found on the inside of the cover of all life jacket boxes. The placards displayed instructions for donning life jackets, along with a photo displaying a properly donned life jacket. An emergency evacuation placard and station bill were posted on the fourth deck; a station bill and emergency evacuation placards were posted on the third deck. According to 46 CFR 199.80 (8)(c), vessel emergency instructions "must be posted in each passenger cabin and in spaces occupied by persons other than crew, and must be conspicuously displayed at each muster station."

Emergency Egress -- The *Safety and Vessel Operation Manual* described both "dry" and "wet" evacuations. The wet evacuation involved putting passengers into the water with life jackets and other emergency equipment. Dry evacuations involved assisting passengers to

embarkation areas where they would disembark via an emergency evacuation ramp/slide. The location of this ramp/slide was not shown on the vessel diagram in the manual, and no other reference to the equipment was made. According to company documents, at the time the vessel was under construction, the owners experimented with the slide, but they were not satisfied with its safety and performance; therefore, the slide was not incorporated into the vessel design. According to the company, three portable emergency gangways were maintained aboard the vessel at all times and were designed to be used in the event the main gangway became inoperable.

Drills -- According to the company, fire drills for the *Queen of New Orleans* operating crewmembers were held twice per week, one per crew, with active participation mandatory. At least weekly, each marine crew participated in rescue boat drills in which the rescue boat davit and motor were tested and the boat was lowered into the water. To facilitate documentation and management of the drills, a safety team leader was designated for each area of the vessel. The safety team leader assisted the master with coordination and control of the drills. First aid and CPR training were required for all security supervisors, mates, masters, engineers, and lead deckhands.

According to the master, the deckhands participated in fire and emergency drills, and the evacuation drills were incorporated into the safety and security meetings. Detailed minutes of the safety meetings were not kept, although a brief description was included on special safety and fire drill forms. During these meetings, deckhands were instructed in the handling of the flow of passengers through the vessel during an emergency. The master stated that the passengers "have to get out of the casino themselves or walk out themselves, and then we can direct them to the exit of the vessel." Security crew were instructed to assist in the evacuation procedures as well. The master said that passengers were not involved in the weekly drills, so the crew had not practiced physically moving passengers.

According to the master, the gaming staff did not take part in the regularly scheduled evacuation training. Instead, the safety team leaders participated in the drills. Two safety team leaders were assigned on each level of the casino except on the fourth and first levels, where there were few passengers and where one team leader was assigned. The security staff was involved with the safety meetings, as were supervisory gaming employees. These supervisors were instructed to inform the remaining gaming staff about the content of the meetings. According to the master, no formal procedure existed for verifying that this information was being relayed to gaming employees. The master said he had randomly checked gaming employees to verify that they knew of the nearest safety equipment, knew which exits to use, and knew how to don a life jacket.

Creole Queen -- The *Creole Queen* operations manual covered emergency evacuations, emergency egress, and firefighting procedures. The station bill section of the manual required that a life jacket demonstration be given before each cruise. The station bill also included instructions regarding the sounding of the vessel's whistle and ringing of the general alarm for emergency situations such as fire, abandon ship, man overboard, and dismissal from drills. The station bill also included a description of the duties and responsibilities of each crewmember during each of these emergencies.

Inspections, Tests, and Research

Several days after the accident, Safety Board investigators boarded a fully loaded vessel that was similar to the *Bright Field* in size, displacement, and power. During a transit downriver in high water conditions similar to those on the day of the accident, the pilot did not use full speed to maneuver the ship.

Safety Board investigators boarded the *Bright Field* shortly after the accident to examine shipboard systems. Because the *Bright Field* was still alongside the damaged wharf at this time and could not be moved, its direct-drive engine could not be started during initial tests and inspections. After conducting a general survey of the engineering plant, Safety Board investigators focused their efforts on the engineering systems most closely associated with the ship's propulsion plant and related

control systems. These systems included the steering gear, the main engine and associated main engine auxiliary subsystems, the automated propulsion control system, and the maintenance and management infrastructure for the vessel's engineering plant.

Steering Gear -- The *Bright Field*'s electro-hydraulic steering gear consisted of a tiller, two rams, four cylinders, two electric hydraulic pumps, and an electro-hydraulic control system. During the investigation, the steering unit was inspected externally and was operationally tested by timing the rudder movements in accordance with SOLAS '74 steering performance standards. The *Bright Field*'s steering system functioned normally.

Main Engine—General -- Because the main engine could not be started and run during initial inspections, the initial survey of the condition of the engine was based on visual inspection, testimony of crewmembers, and review of maintenance and operating documentation. Visual inspection of the main engine revealed nothing unusual. The second engineer stated that the engine's exhaust gas temperatures ran abnormally high and that, as a result, the crew had had to replace pistons and cylinder liners several times since July 1996. His maintenance records confirmed this fact. The repairs to the air turbocharger and air cooler made during the vessel's New Orleans port call were an effort by the vessel owners to correct the problem. The engineering crew stated that the main engine operated normally during the trip downriver on the day of the accident; however, a review of the Terasaki alarm printout for the early part of the voyage indicated that the main engine was experiencing cylinder jacket water cooling alarms due to low jacket water cooling pump pressure. The tape also recorded alarms indicating main engine lubricating oil purifier malfunction and high second filter pressure differential. A more detailed review of engineering reports, including information received late in the investigation from civil litigation depositions, is contained in appendix B. From at least January 1996, the *Bright Field*'s main engine experienced continued problems with component failures.

Main Engine Lubricating Oil Sump -- According to engineering drawings, the engine's normal lubricating oil sump level was 14 cubic meters (about 3,699 gallons) when oil pumps and machinery were off. With pumps and all mechanical equipment running, the oil level in the sump should drop to about 10.3 cubic meters (about 2,721 gallons). The design plans indicated that the low-oil-level alarm should be set to activate at 8.16 cubic meters (about 2,156 gallons). With both lubricating oil pumps and other machinery off, the oil level for the *Bright Field*'s main engine lubricating oil sump was measured by Safety Board investigators at 10.75 cubic meters (about 2,840 gallons). Safety Board investigators examined the main engine sump and found that, with pumps and mechanical equipment running, the *Bright Field* gauge read 8.1 cubic meters (about 2,140 gallons). Investigators tested the *Bright Field* low-oil-level alarm and found that it activated at about 7.25 cubic meters (about 1,915 gallons). The chief engineer's log book recorded that, upon the *Bright Field*'s arrival at New Orleans on November 21, 1996, the main engine oil sump level was 7.5 cubic meters, with the engine running. At about the time of the allision on December 14, 1996, the Terasaki monitoring system recorded a main engine low sump oil level alarm.

Main Engine Lubricating Oil Pumps/Motors -- According to testimony of the engineers, both No. 1 and No. 2 (electrically driven) oil pumps were operating at the time of the allision, and they had not been altered in any way since the accident. The No. 1 oil pump was noisy and exhibited a periodic rumbling sound, as if the pump were cavitating.[36] Lubricating oil temperature was approximately 56 °C (about 132 °F). Mean discharge pressure was about 2.8 bar, however, both suction and discharge gauges were oscillating wildly, making it difficult to obtain a reliable reading. When pump No. 2 was stopped, the system pressure dropped to about 2.3 bar. Pump No. 2 was tested and operated satisfactorily.

[36] The pump *cavitates* when numerous vapor bubbles form in the oil. Subsequent collapsing of the bubbles can produce a distinctive rumbling sound in a piping system.

Investigators opened and examined both oil pump basket strainers and found them intact and clear. The No. 1 oil pump was restarted, but it continued to produce only about 2.3 bar. The pump was examined for possible suction-side air leaks, but all flanges, seals, and joints appeared to be intact. The pump was taken to a marine engineering repair facility for disassembly, inspection, and testing. Other than minor wear, no significant defects were found, and all clearances were within manufacturer's specifications. The pump was reassembled and reinstalled in the *Bright Field*.

During additional testing witnessed by Safety Board investigators about 2 weeks later, the No. 1 oil pump was again examined, started, and found to be running quietly. Suction pressure was -0.3 bar, and discharge pressure was about 4 bar by local gauges. The pump pressure relief valve was found to be operating in accordance with the manufacture's specifications. The following day, investigators reexamined the oil pumps and found high noise levels associated with both pumps, including the "cavitation-like" sound. No obvious leaks were found in the flanges and openings on the suction-side piping, and both pumps generated rated (4 bar) pressure. Close inspection of the No. 2 oil pump discharge stop check valve revealed that the stem was jammed in the valve yoke, and the valve would not manually close and seat. The "check" feature of the valve appeared to function correctly when subjected to back pressure. Both oil pumps evidenced noticeable vibration and noise for the remainder of the vessel's stay in New Orleans, and the cause of the abnormal operation could not be determined with certainty.

Main Engine Lubricating Oil System Second Filter/Strainer -- The second filter/strainer was designed for working pressure of about 4 bar and a working oil temperature of 45 °C (about 113 °F). The filter was equipped with two pressure switches. One switch monitored differential pressure across the filter and activated an automatic backwash system (to clean the strainer) if the pressure differential reached a certain level. The other switch was designed to activate an alarm in the event of a differential pressure drop across the filter greater than 0.9 bar.

On December 17, 1996, Safety Board investigators recorded second filter/strainer inlet and outlet pressures of 3.4 and 2.4 bar, respectively, with the lubricating system still running in the same condition, including an oil temperature of 56 °C, as at the time of the accident. A high-differential-pressure alarm did not sound. Safety Board investigators determined that the differential pressure alarm had been set at 1.3 bar.

Safety Board investigators opened and examined the second filter and found that the installation was consistent with design drawings. No visible debris buildup or blockage was found. The filter was cleaned, reassembled, and tested with new oil. The differential pressure was found to be approximately 0.7 bar. The filter manufacturer recommends that the second filter/strainer be opened and cleaned every 6 months. No record was found in the second engineer's maintenance log to indicate that the filter had been cleaned between late July and December 1996.

Main Engine Lubricating Oil Purifier -- The *Bright Field* third engineer told the Safety Board that the lubricating oil purifier was supposed to run continuously (whether or not the engine was running), drawing oil from the engine oil sump, removing water and sediment from it by centrifugal action, and then returning the cleaned oil to the sump. Because the purifier functioned with warm oil only, an auxiliary boiler was needed to heat the oil when the engine was not running. The *Bright Field* chief engineer, in a December 9, 1996, letter to the vessel owner, stated that the purifier had not been used because the auxiliary boiler had been inoperative. At some point during the vessel's stay in New Orleans, and prior to the accident, the auxiliary boiler was repaired, and the lubricating oil purifier was restarted.

On January 3, 1997, Safety Board investigators were present when the oil purifier was stopped, cleaned, and restarted. On January 6, 1997, the purifier began to alarm due to loss of water seal. When the purifier was opened and examined on January 10, 1997, investigators found heavy contamination from an asphalt-like substance.

Automatic Main Engine Lubricating Oil Trip Function -- According to statements from the chief engineer and other engineering crewmembers, the normal practice for the *Bright Field* while operating in restricted waters was to have the No. 1 lubricating oil pump running and the No. 2 pump on automatic standby and that the vessel was operating in this configuration on the day of the accident. On January 4, 1997, Safety Board investigators tested the oil pump automatic changeover feature by reducing the lubricating oil pressure sensed by the device. During these tests, the pressure switch failed to activate the standby pump. While investigators were conducting tests of other system components, *Bright Field* engineering crewmembers examined and further tested the pressure switch. When Safety Board investigators retested the pump changeover feature a few days later, the switch functioned and started the standby pump automatically. The original pressure switch was removed from the vessel for laboratory testing. Test conclusions were that, "the contact resistance is abnormally high," and could, under certain conditions, "cause a problem; i.e., giving erroneous …or faulty readings."

Alarms, Indicators, and Recorders -- Safety Board investigators examined wheelhouse and control room engineering alarm lights and found that the wheelhouse automatic slow-down alarm light was burned out. In tests of the wheelhouse and control room audible and visual alarms using the manufacture's test plan, the system worked as designed.

The Terasaki monitoring and alarm system was designed to record and print out alarm conditions and propulsion control system events that were activated by the automated system. Manual actions taken by the operating crew were displayed on video monitors in the engine control room, but no printed record was made of those actions. The alarm log printout for the day of the accident showed engine trip due to low oil pressure at 1406. The printout did not indicate automatic starting of the No. 2 lubricating oil pump.

Investigators compared lubricating oil pressure readings displayed on local analog gauges with those recorded by the Terasaki system. While the analog gauges displayed the same readings, the monitoring and alarm system recorded pressures that were higher than the gauge readings by about 0.3 bar.

Remote Engine Control Tests -- On January 5 and 10, 1997, with representatives of IHI, the *Bright Field* engineering and navigation crew, and the Coast Guard in attendance, Safety Board investigators observed testing of the remote engine control using an IHI simulation plan dated December 29, 1996. Control was successfully shifted between the wheelhouse and the control room, and the control room answered all telegraph commands from the wheelhouse. No unexplained anomalies were noted at either control station. Similar tests were later conducted with the vessel underway, and all controls worked as designed. In testimony, neither the chief engineer nor the chief electrician could explain the two engine-starting anomalies experienced by the vessel on December 14 on the downriver voyage. During testing, the problem could not be reproduced.

Preventive Maintenance -- The *Bright Field* was provided with owners' instructions, dated August 28, 1995, that described requirements for periodic (based on engine hours) inspection and repair of the vessel's main engine, auxiliary, and electrical equipment (exclusive of equipment associated with the automated propulsion control system). On October 25, 1995, the owners, concerned about "frequent cylinder liner cracks in the past 1 or 2 years," instituted additional operating policy for the maintenance of the *Bright Field* main engine. Safety Board investigators were unable to find evidence that the vessel's crew(s) complied with the periodic maintenance requirements developed by the owner.

Reports and Recordkeeping -- Engineering personnel on the *Bright Field* maintained several types of records that were reviewed by investigators. The second engineer's daily log book recorded work done on the vessel's machinery. The log was translated by the second engineer each month and sent to the owner with other vessel reports.

The owner received periodic telexes from the master documenting the severity of engineering problems, delays in scheduling resulting from the engineering problems, and

the inability of the engineering crew to make permanent repairs. See appendix B for a detailed chronologies of engineering problems referenced in the monthly engineering reports and in the master's telexes to the *Bright Field*'s owner.

Main Engine Lubricating Oil Testing and Analysis -- The *Bright Field*'s lubricating oils were supplied by British Petroleum (BP) on long-term contract. BP also periodically processed oil samples provided by the owner for test and analysis.

In a January 20, 1996, analysis of a *Bright Field* main engine bearing oil sample, BP found a reduced flash point and recommended corrective action. Analysis by BP of an August 24, 1996, sample showed increased viscosity and reduced flash point. BP oil analysts concluded that the oil was contaminated by fuel oil leaking from the main engine. The report recommended immediately replacing the main engine lubricating oil and correcting the fuel leak. The second engineer stated that he changed the main engine lubricating oil on November 5, 1996, after the main engine alarmed and went into emergency slowdown because of a high density of oil mist in the crankcase. The second engineer stated that he suspected fuel oil contamination of the lubricating oil system.

The engine manufacturer recommended to the *Bright Field*'s owners in November 1996 that the engine oil be tested as soon as possible to check for contamination by water and fuel. The sample was drawn by the chief engineer on November 20, but was not tested by BP until June 1997. BP analysis of the oil indicated elevated water content and viscosity compared with BP's oil specifications and the engine designer's recommended range of acceptable oil properties. The analysis also recorded elevated insolubles due to combustion byproducts entering the lubricating oil.

A December 18, 1996, sample collected by the *Bright Field*'s chief engineer was tested by Saybolt, Inc. The analysis indicated excessive water content and high viscosity when compared to a clean sample of the BP oil. Saybolt reported that the oil sample also contained a significant amount of suspended particulates. Additional analysis of lubricating oil samples collected by Safety Board investigators and analyzed by JET-CARE International, Inc., confirmed elevated viscosity and water content in excess of BP and Sulzer specifications.

Spare Parts and Calibration Tools -- The second engineer's maintenance record and telexes from the master noted that spare parts for the main engine, auxiliary boiler, water maker, and other engineering equipment were either in short supply, of poor quality, or not available at all. According to the records, the lack of readily available spare parts meant that engineering personnel had to reuse worn or damaged parts that could be made serviceable. Calibration tools necessary to set the timing of the main engine fuel pump were missing and could not be located.

Sulzer Inspection -- A representative of New Sulzer Diesel, the designer of the propulsion diesel engine, had inspected the engine shortly after the *Bright Field* arrived at New Orleans in November 1996. He identified several sources of possible lubricating oil contamination and noted the following problems with the main engine:

- Cracked cylinder liners;
- Missing, worn, dirty, carbon-contaminated components, including piston rings;
- Clogged cylinder inlet ports and piston cooling passages;
- Clogged, dirty, damaged components to charge air receiver; water leaks observed;
- Fuel oil pump drain clogged and leaking fuel oil into main engine lubricating oil sump (recommended testing oil as soon as possible);
- Missing main engine turbocharger filters and dirty internals;
- Control air system valves clogged with condensation;
- Worn, loose, misaligned fuel oil pumps and linkages.

Chief Engineer's Assessment -- On December 9, 1996, the new chief engineer corresponded with the *Bright Field*'s owners, confirming the seriousness of engineering problems observed by the Sulzer technician in late November and indicating the status of repairs. He reported the following:

- Scavenging box showed serious accumulation of sludge and carbon with blocked air vents;
- Charge air cooler separation panels polluted, blocked, and rusted;
- Scavenging box nonreturn air valves blocked with sludge;
- Missing, loose, worn piston rings; spare piston rings of low quality;
- High-pressure fuel oil pump residue discharge pipes blocked, leaking fuel oil into lubricating oil sump;
- Cracked, welded cracks in No. 2 cylinder liner; renewed piston head (only 360 hours of operation since this cylinder liner was last pulled);
- No. 5 piston rings replaced;
- Control air system contaminated;
- One Terasaki computer monitor out of commission; second monitor distorted;
- Auxiliary boiler out of commission; fuel oil pump not working and numerous plugged (with debris) tubes from lack of maintenance; main engine's main bearing lubricating oil not being purified;
- Abnormal main engine cylinder cooling;
- Smoke exhaust from main engine dark because of problems with turbocharger and/or charge air cooler;
- Improper main engine fuel oil injection timing;
- Serious noise and vibration from both main engine lubricating oil pumps;
- Numerous auxiliary pumps, engines, and motors not working or working poorly.

Safety Board investigators examined the engineering plant following the accident and determined that the vessel had sailed on December 14, 1996, with the following uncorrected engineering conditions:

- Severe noise and vibration in both main engine lubricating oil pumps;
- Defective Terasaki monitoring equipment;
- High differential pressure across the second filter;
- Poorly calibrated sensors (automated propulsion control system); and
- Main engine lubricating oil quality and quantity that did not meet specifications.

Tests, Reports, and System Calibration -- The chief electrician's log book reflected electrical work completed, tests conducted, problems encountered, and electrical machinery (cranes, winches, motors) used each day. The reports were translated by the chief electrician and included with the vessel's monthly reports. (See appendix B for a record of problems associated with the automated propulsion control system.)

The chief electrician also conducted quarterly testing of engineering safety devices, such as alarms and sensors, and submitted a report on their operation to the owner. The quarterly testing did not evaluate the condition of engineering safety control devices, such as the pressure switch for starting the standby lubricating oil pump. Also excluded were the trip and slowdown set points. The chief electrician stated that neither he nor the chief engineer tested the calibration of the automated propulsion control system set points.

The *Bright Field* was originally delivered with a complete DNV-approved set of automated propulsion control system test procedures for periodically validating the operability of the control system. The *Bright Field*'s engineering crew stated that they were

unaware of any test procedures and did not regularly test or calibrate the system. The engineering crew could not produce a set of automation test procedures. Copies of post-delivery automation test procedures were found in the crew's library.

Technical manuals covering each component of the automated propulsion control system were on board the *Bright Field*. Most of the manuals were found in the staterooms of individual engineering officers.

Computer Simulation -- The Vehicle Performance Division of the Safety Board's Office of Research and Engineering digitized and analyzed data retrieved from a video made by the tugboat *Lockmaster* as the vessel's radar tracked the *Bright Field*. Engineers attempted to compute vessel motion parameters; however, the radar data were of low resolution and did not provide an accurate depiction of the *Bright Field*'s movement. The Safety Board contracted with the Corps of Engineers to perform an engineering computer simulation to determine the path of the *Bright Field* during the accident sequence. The simulation was based on computer modeling of the *Bright Field* and the Mississippi River at the accident site. Because of the limited number of parameters available upon which to base the simulation, the Corps of Engineers simulation results were also inconclusive.

Other Information

Port Risk Analysis and Management—Coast Guard -- The Coast Guard, under the *Ports and Waterways Safety Act of 1972*, was charged by Congress with monitoring, managing, and communicating risk in all U.S. ports and taking actions to maintain risk at an acceptable level. The act empowers Coast Guard COTPs to monitor the risk levels in their port areas and maintain "an acceptable level of risk." The Coast Guard *Marine Safety Manual* defines the elements of waterways risk assessment to be considered by the COTP as vessel properties, waterway properties, cargo properties, and environmental conditions.

General port risk management is the responsibility of the Coast Guard's Office of Marine Safety and Environmental Protection, which is charged with protecting the public, the environment, and United States economic interests by preventing or mitigating the effects of marine accidents and incidents. According to the "Program Principles" section of the Office of Marine Safety and Environmental Protection's *1996 Performance Report*,[37] risk management is the "business" of the office. The report states:

> Preventing low probability-high consequence events, such as major loss of life on passenger vessels, and medium and major oil spills, is a cornerstone of our risk management approach. To improve our decision making, we need to strike a balance, allowing field commanders to employ existing risk analysis tools for routine risk management decisions, while establishing a formal program policy for high level risk analysis projects, such as comprehensive port risk models.

Appendix III of the report, "Risk Management & Risk Analysis," defines risk as "the probability of suffering a degree of harm from one or more hazards." The document quantifies this definition with the formula:

RISK = Probability x Consequence

The document states that the risk equation implies that some risks are greater than others and that risk management involves choices about "how, and to what degree, we will try to reduce the probability and/or consequences of a potentially harmful event." The document states that a complete risk management process includes *risk analysis*, *risk management*, and *risk communication*.

Risk analysis, according to the document, is the process of systematically identifying, estimating, and ranking risks according to their probabilities and consequences. From that ranking of risk, a risk-ranking matrix (figure 13) can be developed. The document states that the

[37]The 1996 report on the office's progress toward goals contained in Commandant Instruction 16000.2 (series), *Business Plan for Marine Safety and Environmental Protection*.

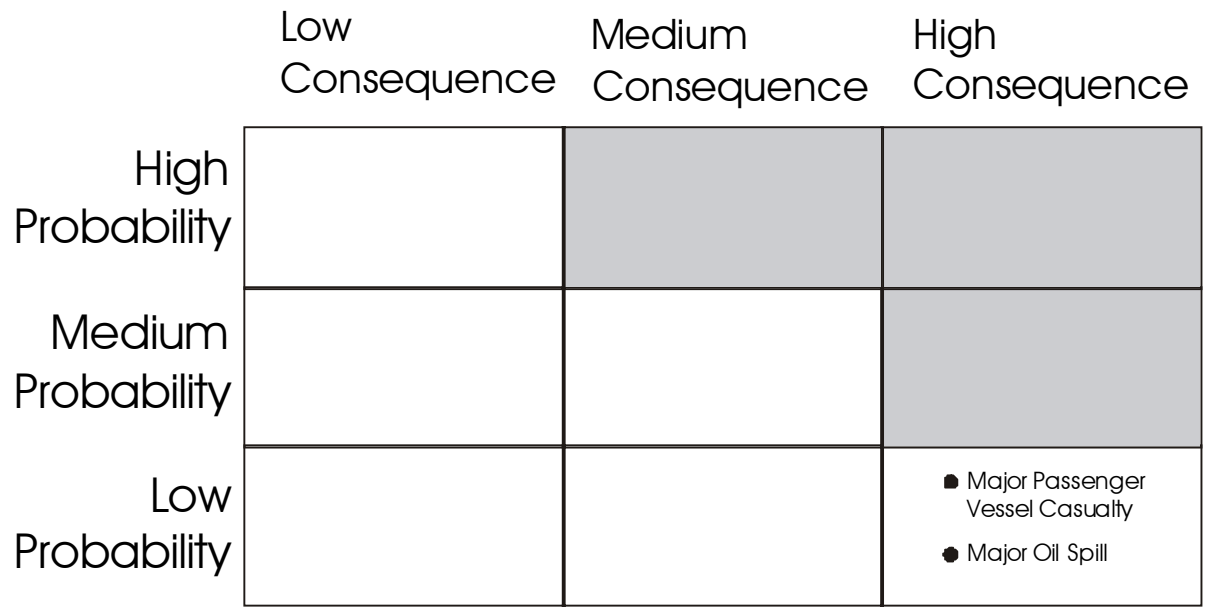


Figure 13 -- Coast Guard risk-ranking

Office of Marine Safety and Environmental Protection's overall risk management strategy using this matrix is to select the higher risks that can be influenced and try to reduce their frequency and/or consequence in order to minimize their contribution to overall risk in the waterway.

Risk management, according to the document, is the systematic selection of options for treating different risks. "Options may include measures aimed at reducing the probability and/or consequences of particular risks, eliminating risks, shifting risks in space and/or time, or tolerating risks."

The document defines *risk communication* as the "continuous, two-way process of communicating with stakeholders[38] about the risks associated with [the] system of concern."

Port Risk Analysis and Management—Other Stakeholders -- During the past 20 years, various stakeholders in the greater New Orleans port area have commissioned numerous risk assessment and reduction studies.

Lower Mississippi River Safety Study -- The objective of this 1981 study by Louisiana State University was to develop recommendations concerning the way in which communications, electronics surveillance, aids to navigation, and traffic management could best be used to enhance river safety and protect the environment. The study identified problems among port and waterway uses, determined traffic patterns and volume in the area, synthesized accident data from the Coast Guard and other sources, identified areas of hazard created by natural and artificial conditions and structures on the river, surveyed those who use the river to ascertain their opinions about river safety and what was needed to improve it, and developed a prototype system to enhance river safety.

Louisiana World Exposition -- Prior to the start of the 1984 world's fair, LWE officials prepared an environmental impact statement that addressed safety concerns associated with marine accidents. An analysis of vessel incidents between January 1973 and September 1981 revealed that only one vessel had struck the Julia Street wharf during that period, with no injuries reported. The Poydras, Julia, and Erato Street wharves were determined to be the areas least associated with vessel strikes.

[38] *Stakeholders* refers to parties of interest, from both public and private sectors, in the Port of New Orleans area.

LWE officials recognized that fair structures and activities could adversely affect safe navigation along the Mississippi River. For example, fair officials were concerned that nighttime illuminations, including fireworks displays, could interfere with the night vision of mariners. To minimize these risks, the LWE requested that the COTP establish a "safety zone," within which the Coast Guard would regulate marine traffic when the fair held special events on the river. The safety zone was established, and mariners received notices from the Coast Guard cautioning them to navigate vessels with extreme care in the vicinity of the world's fair.

The Dock Board refused to allow the berthing of barges and houseboats at the Julia, Erato, and Poydras Street wharves during the fair. The Dock Board rejected the LWE's request to place exhibit pavilions (that would be expected to have large numbers of visitors) on floating barges moored along the river.[39] The Dock Board did permit the mooring of tall ships, oceangoing passenger vessels, large sternwheelers, and visiting foreign warships in the area.

International RiverCenter -- Prior to the expansion of the Hilton Hotel, the IRC was required to obtain construction permits from the city of New Orleans, the Corps of Engineers, and the New Orleans Levee Board. The Dock Board required that the plans be submitted for review and executed a lease with the IRC for the development. The Dock Board reviewed the plans to determine the extent to which the development might interfere with Dock Board activities.

According to the IRC, during the time when the IRC was negotiating a lease with the Dock Board, the Dock Board advised the IRC that vessels had had allisions with wharves within the Port of New Orleans, but that no allisions had occurred at the Lower Poydras Street wharf. The IRC representatives were shown photographs of the allisions at other wharves. These photographs, according to the IRC, "depicted only minimal damage."

An IRC official was not aware of any preconstruction risk assessments that were carried out in connection with the Hilton Hotel expansion in the early 1980s, and the IRC was unable to provide the Safety Board with any other information regarding previously completed risk assessments regarding their properties built on the river side of the levee. The damaged properties, including portions of the Riverwalk Marketplace mall, the condominium parking garage, and the Hilton Hotel are being rebuilt on the same footprint. No physical barriers against accidents involving river traffic have been constructed at this location.

New Orleans Aquarium of the Americas --In 1987, before construction of the Aquarium of the Americas, the Audubon Institute contracted for a risk analysis for construction of the aquarium on the riverfront outboard of the levee. The contractor was asked to assess the safety risk from marine traffic at the site of the proposed Riverfront Park, including aquarium structures and park area. The scope of work included a study of 20 years of Port of New Orleans records documenting damage to waterfront facilities at and near the site of the proposed Riverfront Park, as well as the potential consequences of an allision of a vessel, barge tow, or boat with Port of New Orleans wharves such as the Bienville Street wharf, where the proposed aquarium was to be located.

The report concluded that vessels and tows moving downriver, with the current, have less water moving across the rudder, rendering them less maneuverable and their pilots less able to adjust to emergency situations. This hazard increases with higher river stages, which deliver faster currents. The study concluded that, if an outbound ship or tow were to lose steering, power, or control, or if it were to become slightly out of shape to navigate the bend around Algiers Point, the Bienville Street wharf area would be less likely to be damaged, since the downriver current would probably carry the vessel past this area. Vessel damage would more likely occur in the areas of the Governor Nicholls, Esplanade, or Mandeville Street wharves, which are located in the Algiers Point

[39]Information regarding activities of the Dock Board during the fair was provided by the Dock Board and confirmed by a former Dock Board chief executive officer.

bend of the river, about 3/4 mile below the Bienville Street wharf. According to the report, because Bienville Street wharf is high in the bend, it faced low risk of being struck by an outbound vessel.

A Port of New Orleans review of records for 1967 through 1987 indicated that the Bienville and adjacent Toulouse Street wharves had received no major vessel strikes; however, major vessel strikes had occurred along the wharves at and downriver from Governor Nicholls Street.

Analysis of wharf damage from ship, barge, and tow strikes revealed that such damage rarely penetrated beyond 25 to 50 feet inward of the fender line. The shock from such an accident could be felt for a distance along the wharf; but the impact load was not sufficient to compromise the overall stability of the wharf.

The report concluded that any major structure located 100 feet or more from the edge of the wharf would not be in danger from river marine traffic. The report recommended that the area within 50 to 100 feet of the wharf be considered a buffer zone that, while open to pedestrian traffic, should be free of building structures. The report stated that this buffer zone could be most effectively isolated from the inner wharf area by a motion control joint, installed parallel to the fender line, that would reduce any vibrations from a ship strike.

Gaming Vessel Risks and Background -- In 1991, the Dock Board initiated a series of planning initiatives related to riverboat gaming. These initiatives included commissioning the Coast Guard and the Louisiana State University National Ports and Waterways Institute to conduct a navigation risk assessment. The Dock Board also contracted with a safety consultant to review the safety of Dock Board properties and to develop guidelines for gaming vessel operation. The consultant's study addressed public-safety aspects of riverboat gaming, focusing on fire protection, police response, and emergency medical services. It focused particular attention on ways of ensuring that gaming vessels had adequate access and egress.

The Coast Guard COTP determined that about 350 incidents of steering and power loss were reported annually in the COTP-NOLA zone.[40] The COTP requested that the Dock Board provide a navigational risk assessment in preparation for berthing the riverboat gaming vessels. The Dock Board contracted with the National Ports and Waterways Institute, in cooperation with the George Washington University, to conduct the risk assessment that went beyond the scope of the Coast Guard's request to consider a wide range of safety aspects along the Mississippi River. The assessment incorporated input solicited from waterway users, including local pilots. The study did not address the high-capacity passenger cruise ships that use the Julia or Erato Street wharves as bases of operations.

Phase I of the study, completed in July 1994, concluded that the addition of gaming boats to the Mississippi River increased both the probability of a marine casualty and the potential impact of such a casualty. While the increase in the probability of an incident was comparatively small, the increase in potential injuries and loss of life was large in relation to casualties involving nongaming vessels. The study determined that the increased risk was primarily a function of the operating environment, not of the vessels themselves. The study asserted that restricting the conditions under which gaming vessels may cruise could reduce, but could not eliminate, the risk.

Accident data (figure 14) for the Port of New Orleans from 1983 through 1993 (a total of 166 rammings along the left descending bank between miles 91 and 101 AHP) were analyzed and the results tabulated to identify a mooring area for gaming vessels of "lowest historical allisions on the left bank." The study stated, "It should be noted, however, that no area of the left bank downbound was completely free of allisions during the eleven year period."

The phase I report made the following recommendations:

- Gaming vessels moored on the left descending bank of the Mississippi River

[40]The COTP-NOLA zone extends along the Mississippi River from the Arkansas border to the Gulf of Mexico.

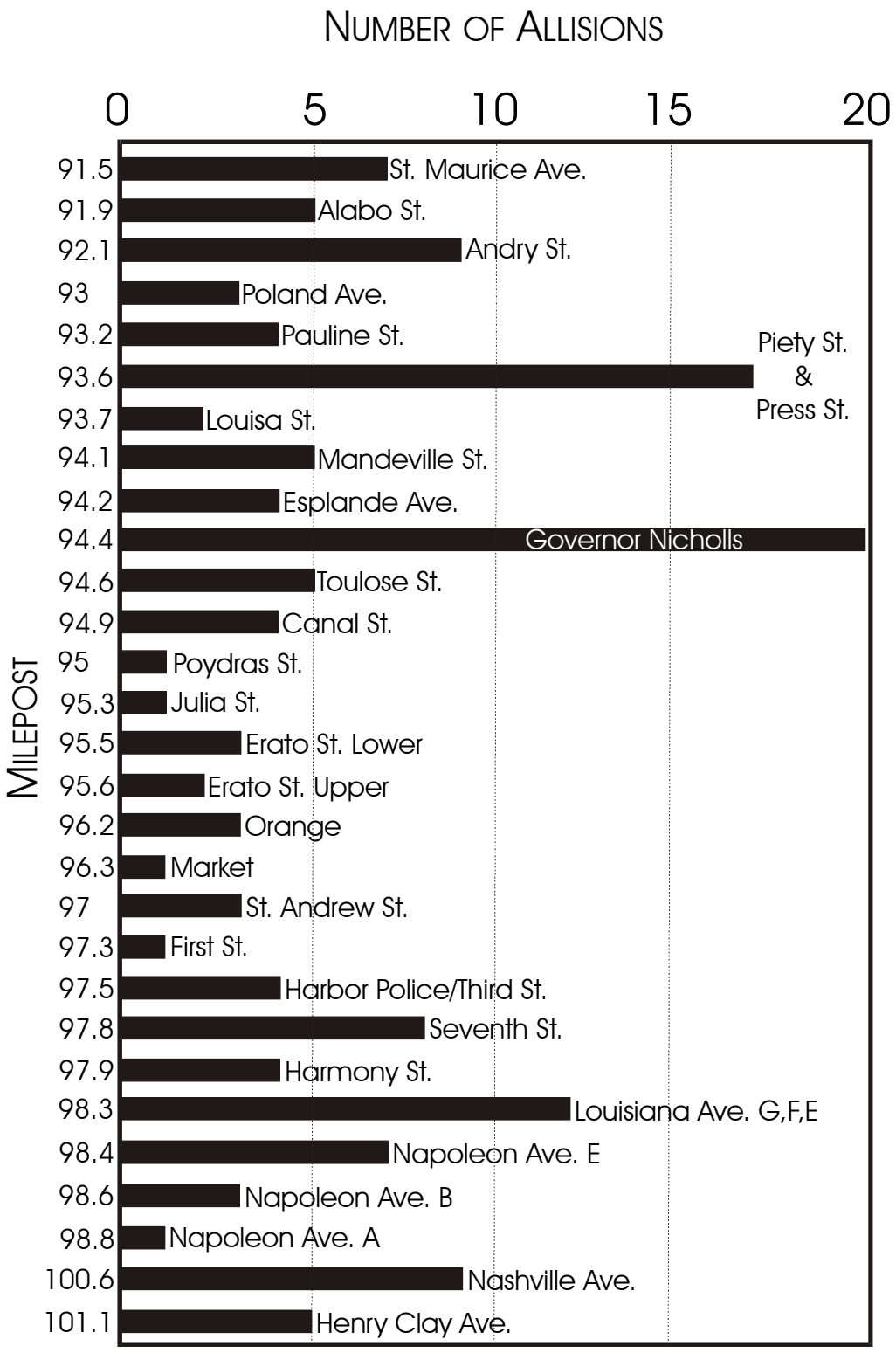


Figure 14 -- Allisions in the Mississippi River (total 166) between miles 91-101 AHP (left descending bank) 1983-1993

should be moored in the area of lowest historical accident rate (Poydras Street to First Street);

- Gaming vessels should remain moored during periods of low visibility, high winds, or high river stage;
- The potential for protecting the moored gaming vessel by allowing berths to silt in should be investigated;
- Fully equipped rescue craft capable of handling the volumes of passengers should be available, either through the public sector or by contracts with the private sector;
- Contingency and disaster management plans should be developed, and routine preparedness drills should be held;
- The issue of providing emergency egress from passenger vessels to other vessels, to a dock, or to a river bank should be investigated. The objective must be to remove passengers when underway or moored during a crisis without having persons resort to leaping into the water.

The phase I study reported expert opinion that "high river stage was an important factor in river casualties" and stated that this opinion was supported by casualty data. According to that data, casualties (allisions and collisions) show a seasonal trend, with the high water months of February, March, April, and May experiencing two to three times the number of casualties as the low-water months of July through October. The phase I study did not determine the frequency with which high-risk events were likely to occur and thus could not provide an overall estimate of risk for the port.

The phase II study developed methods to further quantify the risk levels and thus enable an evaluation of the overall risk, as well as risk reduction, due to the mitigation measures identified in phase I. A simulation of the Port of New Orleans integrated the expert assessments of phase I using available data, and simulation results were validated against historical casualty statistics. The simulation estimated that 2.24 vessels incidents per month could be expected in the port area from miles 80 to 106 AHP and that, of these incidents, 0.75 incident per month could be expected between miles 90 and 95 AHP.[41]

The phase II report reached the following conclusions regarding gaming vessels:

- The probability of occurrence of an incident at high river stage is 10 times greater than at low river stage;
- A 25 percent increase in traffic in the river would result in a 37 percent increase in the number of vessel incidents that could be expected.

One phase II study recommendation for minimizing the risk of high-capacity passenger vessel operation in the Port of New Orleans was the following:

> The Coast Guard and the Port of New Orleans should ensure that response plans and resources are adequate to deal with a casualty involving a high-capacity passenger vessel. Although the probability of an incident involving one of these vessels can be minimized, the only way to minimize the potential impact of such an event is to invest in the resources and planning required to effectively respond to such a casualty.

In 1993, the Governor's Task Force on Maritime Industry, which addresses safety issues on the Mississippi River and Mississippi River—Gulf Outlet, formed a Marine Safety Committee to address the issue of gaming vessels berthing on the Mississippi River. The committee was to solicit and promulgate suggestions from local mariners regarding protection of the areas in which gaming vessels would be operating. The committee was later subsumed into the Coast Guard Passenger Vessel Safety Committee and other groups formed by the Port of New Orleans to address the issue of minimizing casualties from a collision between a deep- or shallow-draft vessel and a gaming vessel. This committee functioned as an advisory group to the

[41]Mile 95 AHP is at the approximate location of the allision.

Governor's Task Force and made the following suggestions:

- Assign a rescue boat to the immediate vicinity of the gaming vessels and equip it for handling a large number of passengers in case of a casualty;
- Station in the area a fully equipped fire boat, which could be utilized as an additional rescue boat;
- Install a weather and river monitoring system;.
- Assign a dedicated communications marine radio channel to be used by vessels transiting the area;
- Post and otherwise publicize notices to mariners advising of this controlled zone;
- Conduct joint Coast Guard, harbor police, fire department, and police department emergency preparedness drills;
- Establish a fire and rescue station equipped with a helicopter pad to provide rapid evacuation in case of a casualty;
- Ensure that all vessels are in full compliance with classification society and Coast Guard requirements;
- Meet with all gaming interests to review designs and recommendations of safety programs.

One member of the advisory group recommended that the area from the Crescent City Connection Bridges to Canal Street be allowed to silt in, forming a barrier 150 to 200 feet into the river to prevent deep-draft ships from reaching the moored gaming vessels.

Operation Safe River -- In January 1994, Coast Guard Group New Orleans, together with the New Orleans Port Authority Harbor Police, the Crescent River Port Pilots Association, the City of New Orleans Office of Emergency Preparedness, and the Southeast Louisiana Search and Rescue Organization, conducted a joint search and rescue exercise on the Mississippi River between the Crescent City Connection Bridges and Algiers Point. The exercise area included the section of the river where gaming vessels were planned to berth and operate. The exercise simulated a major marine incident in the Mississippi River involving a high-capacity passenger vessel. Weather conditions during the exercise included an air temperature of 40 °F and a water temperature of 34 °F. This real-time exercise demonstrated that, during daylight hours with the resources available, only 20 to 30 percent of people in the water could be expected to be rescued.

Based on the results of this exercise and the large number of vessel casualties—particularly bridge allisions—that had occurred during 1993-94, the Eighth Coast Guard District implemented Operation Safe River to improve safety on the Lower Mississippi River. The operation initiatives called for a higher standard of care by mariners and ordered COTPs to take a harder line on enforcement and penalty sanctions. The operation also included initiatives to review the riverboat gaming vessel program, focusing on the number of vessels and their docking sites, as well as ferry vessel safety pertaining to manning and operation.

According to Coast Guard officials, initiatives developed as a result of Operation Safe River have resulted in the following:

- An extension of the regulated navigation area for barge fleeting, resulting in a reduction in barge breakaway incidents because of improved barge fleeting operating practices;
- Improved reporting of vessel power and steering losses by river pilots, and an increase in the number of incidents in which a pilot refuses to sail vessels with navigational or engineering deficiencies;
- Increased awareness by owners and operators of their responsibility for safe navigation in the river, resulting in a reduction of incidents of vessel power or steering loss;
- Better adherence by owners and operators to river draft requirements, resulting in a reduced number of mid-channel groundings; and

- Year-round operation of the Algiers traffic light.

Changes Made Since the Accident -- Several steps were taken after the *Bright Field* accident to enhance safety in the Port of New Orleans area.

River Front Alert Network -- The Coast Guard and the Dock Board, on March 11, 1997, agreed to a memorandum of understanding establishing a River Front Alert Network to provide early warning of potential shipping disasters in the area of the Port of New Orleans. The River Front Alert Network is an 800 MHz emergency radio alerting and communications system installed at the Coast Guard's Governor Nicholls traffic light control tower and the Port of New Orleans Harbor Police Department. The system links the Governor Nicholls light, the Harbor Police Department, the Delta Queen Cruise Terminal, the Riverwalk Marketplace, the Hilton Hotel, One River Place condominiums, and the Aquarium of the Americas.

The River Front Alert Network is designed to provide a capability to directly notify the Port of New Orleans Harbor Police Department and Port of New Orleans property tenants of a potential threat caused by vessels navigating in the vicinity of Algiers Point. Under the memorandum of understanding, the alert signal is initiated by the Governor Nicholls light operator, who contacts the harbor police dispatcher and the security officers of the riverfront properties whenever an abnormality or irregularity that could affect the riverfront properties is identified or reported by a vessel in the Algiers Point regulated navigation area. The light operator is to transmit a short warning message over the network describing the situation. The dispatcher and the security officers are to monitor the situation on the marine radio and make their own judgments about the appropriate response at their properties. The network system is to be activated as early as possible to provide the maximum advance notice to the riverfront properties. Once the situation is no longer a threat, an "all clear" message is to be initiated by the light operator.

Under the memorandum, the Dock Board is responsible for installing and maintaining the River Front Alert Network system hardware, including system design, maintenance, support, problem identification, and repair. The Port of New Orleans is responsible for coordinating a program to regularly test the network, including the scheduling, participation, conduct, analysis, and corrective action required to ensure the system is functioning properly. The harbor police are to implement standard operating procedures defining the actions to be taken when the network is activated during a possible emergency incident, situation, or condition. The port is to coordinate with the property tenants to define the emergency actions to be taken when the network is activated.

According to documentation provided by the Dock Board on November 3, 1997, the board has worked with the property tenants who participate in the River Front Alert Network to develop and implement standard operating procedures for emergency evacuations. The Dock Board reports that property tenants within the River Front Alert Network zone have updated their emergency plans to incorporate the network alarm system and to provide instructions for security officers to follow in the event the Coast Guard light operator activates the River Front Alert Network radio. Under the updated procedures, security officers are to listen to the broadcast from the Coast Guard light operator, monitor VHF channels 16 or 67, visually assess the situation on the river, and on the basis of this information, determine whether to order an evacuation of the property. The security officers are authorized to initiate an evacuation immediately based on the nature and immediacy of the apparent river danger. Upon determination that an evacuation is necessary, security officers are to make public address announcements of the evacuation and implement those evacuation procedures that have been established for their particular locations.

New Notices, Rules, and Operating Regulations -- In January 1997, the New Orleans COTP identified passenger vessels deemed to be at risk from allisions and issued written COTP orders directing these vessels to (1) maintain a constant bridge watch whenever passengers are embarked, (2) maintain a constant monitoring watch on VHF-FM channel 16 or other appropriate emergency and bridge-to-bridge

radio frequency, and (3) be able to alert passengers and other crewmembers and have the ability to direct initial action in the event of an emergency.

Also in January 1997, the New Orleans COTP issued a notice that on vessels of more than 1,600 gross tons, the anchors are to be kept ready for immediate release and that, while the anchor watch is in effect, effective communications are to be provided between the bridge and the foredeck.

On March 21, 1997, the commander of the Eighth Coast Guard District issued temporary rules applying new operating requirements to self-propelled vessels of 1,600 gross tons or more operating in the Mississippi River between the South and Southwest Passes and mile 233.9 AHP. According to the Coast Guard, the new requirements were prompted by the *Bright Field* accident and by subsequent unprecedented high water levels in the river, which had led to "a marked increase in vessel accidents." These temporary rules were extended twice; the second extension was set to expire on October 31, 1997.

Before the expiration of the temporary rules, the Coast Guard, on October 30, 1997, published the new requirements as an interim rule (33 CFR Part 165) in the *Federal Register*. Interested parties have until December 29, 1997, to comment. In its discussion of the rule, the Coast Guard stated that the new requirements were needed to "protect vessels, bridges, shoreside facilities, commercial businesses and the public from a safety hazard created by deep-draft vessel operations along the Lower Mississippi River." The Coast Guard noted that during 1995 and 1996, more than 300 self-propelled vessels of 1,600 gross tons or greater experienced loss of power, loss of steering, or engine irregularities while operating in the Mississippi River. It stated that the new rules would enhance safe navigation of the river by requiring that masters and engineers take measures to minimize the risk of steering casualties or engine failures/irregularities.

Under interim 33 CFR 165.810(e), passengers vessels with one or more passengers on board that are anchored or moored in the Lower Mississippi River below mile 233.9 AHP are required to keep a continuously manned pilothouse,[42] and to

> monitor river activities and marine VHF emergency and working frequencies of the port so as to be immediately available to take necessary action to protect the vessel, crew and passengers in the event that an emergency radio broadcast, danger signal or visual indication of a problem is received or detected.

Under interim 33 CFR 165.810(f), self-propelled vessels of 1,600 gross tons or more operating in the regulated area are to comply with the following:

> (1) The engine room shall be manned at all times while underway in the RNA [Regulated Navigation Area].
>
> (2) Prior to embarking a pilot when entering or getting underway in the RNA, the master of each vessel shall ensure that the vessel is in compliance with 33 CFR Part 164 [specifying tests of steering gear, internal vessel control communications, emergency generators, storage batteries for emergency systems, and main propulsion machinery, ahead and astern, all of which are to be completed prior to entering or getting underway in U.S. navigable waters].
>
> (3) The master shall ensure that the chief engineer has certified that the following additional operating conditions will be satisfied so long as the vessel is underway in the RNA:
>
> (i) The main propulsion plant is in all respects ready for

[42] The rule exempts ferryboats and small passenger vessels of less than 49-passenger capacity from this requirement to maintain a manned pilothouse.

operations including the main propulsion air start systems, fuel systems, lubricating systems, cooling systems and automation systems;

(ii) Cooling, lubricating and fuel oil systems are at proper operating temperatures;

(iii) Automatic or load limiting main propulsion plant throttle systems are operating in manual mode with engines available to immediately answer maneuvering commands; and

(iv) Main propulsion standby systems are ready to be immediately placed in service.

Steering Loss Study -- After the *Bright Field* accident, a number of maritime, port community, and public stakeholders in the Port of New Orleans began to work together to address mutual concerns. One result was a study of propulsion and steering losses experienced in the Lower Mississippi River, which was expanded as a national issue for the Coast Guard's Navigation Safety Advisory Council (NAVSAC). In April 1997, the NAVSAC Navigation Equipment Committee concluded that loss of propulsion and steering by vessels while navigating the Mississippi River is a national problem and that the nature of these incidents is of great concern to all stakeholders. The committee is exploring solutions, regulatory and nonregulatory, that can be implemented to help prevent steering and propulsion casualties.

Another area of concern to stakeholders was development of objectives for a vessel traffic system (VTS) for the Lower Mississippi River. After the *Bright Field* allision, an ad hoc committee produced in January 1997 a "foundation of needs," which addressed a number of government, industry, and public objectives for improved river safety. According to the Coast Guard, it has designated the Lower Mississippi River as the location of a demonstration project for a new "silent" VTS system that is expected to begin limited operation in mid-1998. Under the silent VTS system, vessels will be equipped with transponders that will transmit a wide range of vessel description and position information that can be displayed on computer screens aboard any vessel in the area. The system will provide instantaneous and positive vessel information while reducing VHF radio traffic.

Ship Drill Alarms -- Immediately following the *Bright Field* accident, the president of the Port of New Orleans issued a letter to the cruise line owners at the Julia Street wharf asking them to suspend the sounding of their ships' whistles during drills in order to avoid confusion about the source and meaning of the whistle. The letter requested that the cruise lines suspend the drills and whistle soundings until they have departed the Julia Street wharf. In addition, the Port of New Orleans revised its general rules and regulations to read:

> No vessel, whether a cruise ship or an excursion boat, shall sound a distress, fire or emergency alarm as part of its preparation drills while it is docked at or near the Board's wharves from Robin Street to Governor Nicholls Street except for such alarms required as part of a vessel's quarterly drills required to maintain U.S. Coast Guard certification. In the latter event, each vessel shall notify in advance of such, the surroundings of the Board's Harbor Police Department, the Hilton Hotel, One River Place and the New Orleans Riverwalk Associates. To the extent that a vessel needs to familiarize passengers with the sounds of such alarms as part of its on-board safety drills, these exercises should be conducted when the vessel is either below the Governor Nicholls Street wharf or above the Robin Street wharf.

Riverwalk Marketplace Alert System -- According to minutes taken during a public Dock Board meeting on February 6, 1997, the Riverwalk Marketplace plans to install three cameras that will monitor and display river traffic to all mall merchants. The River Front Alert Network

provides an alarm to the Riverwalk security desk, which then monitors maritime activities by marine radio and visual monitoring. The security desk determines the appropriate course of action, including the sounding of evacuation alarms. In addition, representatives of the complex proposed the installation of a color-coded alarm system display monitor that will notify merchants of the type of evacuation protocol to follow in the event of an emergency.

According to representatives of the Riverwalk Marketplace, the public address system in place at the time of the accident operated through the mall's Simplex alarm system, which used speakers mounted at alarm locations throughout the mall interior. Emergency instructions were broadcast through these speakers. Since the accident, the system has been modified so that emergency messages can be broadcast throughout the mall via the background music system. Riverwalk is investigating the possibility of a dual strobe-horn combination alarm system that would alert the mall tenants, employees, and patrons to the type of evacuation required under various emergency scenarios.

In an August 22, 1997, letter to the Safety Board, a Dock Board official stated that the Dock Board had encouraged the IRC to widen the remaining portion of the Upper Poydras Street wharf by 50 feet to match the portion of the wharf that was previously widened to accommodate gaming vessels. The Dock Board also recommended that silt be allowed to accumulate under the wharf as an additional safety factor. The letter noted that the Dock Board has no authority to compel the IRC to carry out these modifications.

Vessel Egress -- The Dock Board, in its *Public Protection and Emergency Management Guidelines for Gaming Vessels and Berthing Areas*, states that "a powered mobile elevating platform suitable for emergency access or casualty removal from upper decks is conveniently available in the wharf area." Also in its August 22, 1997, letter, the Dock Board described how the gaming vessel located at the Poydras Street wharf has complied with the Dock Board's guidelines. The letter stated that the *Queen of New Orleans* had provided an elevator-equipped gangway and a wharf-mounted crane.

The same guidelines state that "for passenger use, at least two regular gangways leading directly to the wharf are necessary." This guidance applies to all three vessels owned by New Orleans Paddlewheels, Inc., (the *Queen of New Orleans*, the *Creole Queen*, and the *Cajun Queen*). In its August 22, 1997, letter, the Dock Board stated that:

> The excursion vessels have aluminum gangways as a secondary means of egress in addition to their primary gangways. The Flamingo (*Queen of New Orleans*) has such emergency gangways at all levels. The *Creole Queen* and the *Cajun Queen* have secondary emergency gangways and additional gangways are currently on order.

According to the Dock Board's letter, both the board and the Coast Guard require that riverboat gaming vessels, excursion vessels, riverfront commercial properties, and oceangoing cruise ships prepare their own emergency response plans and conduct related training and drills. The Dock Board stated that it had recently reviewed all such plans.

Status of the Queen of New Orleans -- According to documentation received by the Safety Board on October 22, 1997, the gaming license of the *Queen of New Orleans* expired on September 30, 1997, and the vessel was not expected to resume operations in the Port of New Orleans. Arrangements were reportedly underway to have the vessel moved from the Poydras Street wharf.

ANALYSIS

General

The following factors were determined not to have been causal or contributory to the accident involving the *Bright Field*: weather, fatigue, malfunctioning of vessel steering gear or equipment on the bridge, and alcohol or other drugs. (See "Toxicological Testing" section of this report for additional information.) The pilot was properly licensed and certified by the State of Louisiana and was qualified to serve in his position. All officers of the *Bright Field* were properly licensed and certified by the Liberian government and were qualified to serve in their positions.

The *Bright Field* was not, nor was it required to be, equipped with a voyage data recorder (VDR). (See appendix C.) Had it been equipped with a fully configured VDR, valuable information such as the vessel's exact position, course, rudder setting, throttle setting, engine speed, and vessel speed at each point along the accident track may have been available to investigators. Such information could have been used to perform a comprehensive computer simulation that might have proved helpful in evaluating engineering and human performance on the day of the accident.

The major safety issues identified in this investigation and discussed in this analysis are the adequacy of the ship's main engine and automation systems, the adequacy of emergency preparedness and evacuation plans for vessels moored in the Poydras Street wharf area, and the adequacy of port risk assessment for activities within the Port of New Orleans. This analysis also addresses three other issues: the actions of the pilot and crew during the emergency, the lack of effective communication (as it relates to the actions of the pilot and crew aboard the *Bright Field* on the day of the accident), and the delay in administering toxicological tests to the vessel crew.

Accident Overview

The event that precipitated this accident, the sudden and unexpected reduction in engine power at a critical point in the *Bright Field*'s navigation down the Mississippi River, was of relatively short duration. However, the combination of vessel speed, vessel direction, river current, and high river stage left little margin for error in responding to the emergency. The *Bright Field* struck the wharf in an area between two docked vessels, missing one of them by less than 170 feet and coming to rest only about 70 feet from the other. Thus, by sheer chance, an allision with an occupied passenger, gaming, or excursion vessel—and the associated high risk of numerous serious injuries—was barely averted. Even so, patrons of a popular commercial district were placed in jeopardy when the *Bright Field* struck portions of shoreside buildings or undermined their foundation supports. Had this accident occurred during the evening, at night, or in the morning hours, most of the hotel rooms that were destroyed in the accident would probably have been occupied. It is unlikely that even the River Front Alert Network would have been able to awaken the sleeping guests, alert them to the danger, and evacuate them in time to prevent serious injury or possible death.

The significant reduction in the *Bright Field*'s engine power resulted from low main engine lubricating oil system pressure and the nonautomatic starting of the backup (No. 2) lubricating oil pump. With main engine power reduced and the ship swinging toward the Riverwalk, the time and options available to the pilot and crew to avoid an allision were limited. The options involved pulling ahead and maneuvering out of danger, slowing and steering away, or stopping; however, exercising any of these options would have required more time, propulsion power, or steering control than were available to the *Bright Field* in the moments before the allision. The Safety Board could therefore not determine whether the pilot or crew could have done anything to prevent this accident. The same constraints on power and

control that hindered efforts to prevent the accident also may have rendered ineffective the actions that the pilot and crew did take prior to the allision. Thus, the final rest position of the *Bright Field* may have resulted from the combined forces of the ship and the river rather than from the efforts of the pilot or crew. The substantial role played by chance in this accident has important implications for assessing risk in and around the river, as will be discussed below.

The investigation of this accident revealed a history of maintenance and operational problems associated with the main propulsion engine of the *Bright Field*. These problems were known to the vessel's owners, who did not correct them in a timely fashion. On the open sea, in good weather, temporary malfunctions in the vessel's main engine may be tolerable; however, in the close quarters of the Mississippi River, where safe maneuvering is directly dependent upon a responsive main engine, a loss of power can, as it did in this instance, present an immediate threat to other vessels and to shoreside facilities.

Complicating the emergency created by the loss of engine power on the *Bright Field* was the interaction between the river pilot and the ship's master and crew on the vessel's bridge. At several points prior to and during the *Bright Field* emergency, the pilot, master, and crew of the vessel did not exchange important information about the nature of the emergency and its potential outcome. In slightly different circumstances, the limited communication between the pilot and the ship's crew could have compromised the vessel's ability to recover from a threatening situation.

Some of the injuries resulting from the accident were sustained by gaming and excursion vessel passengers as they attempted to escape what appeared to be an imminent allision. The lack of adequate numbers of readily available egress routes, in addition to the lack of effective evacuation procedures and plans aboard the vessel on which numerous injuries occurred, contributed to the number and severity of injuries. The lack of advance warning to the patrons and employees of the Riverwalk Marketplace also contributed to the number of injuries.

This accident demonstrates the risk represented by heavily loaded, (relatively) high-speed vessels navigating a twisting waterway bordered both by populated wharves and mooring areas for passenger vessels. While the absolute elimination of all risk associated with this operating environment would be impossible, in the view of the Safety Board, opportunities exist to reduce the risk of vessel collisions and allisions and to reduce the vulnerability of shoreside facilities.

Engineering Aspects

Main Engine Shutdown and Restart -- About 1406 on the day of the accident, as the *Bright Field* was passing under the Crescent City Connection Bridges, the vessel's automated propulsion control system reported low main engine lubricating oil pressure and main engine trip (shutdown) due to low lubricating oil pressure. The chief engineer stated that, when the alarms sounded, he noted that the lubricating oil system had depressurized.

The complete shutdown of the main engine was not immediately apparent to those on the bridge or in the control room because the "windmilling" effect as the vessel moved through the water kept the propeller (and thus the directly connected engine) turning at about 30 rpm. In fact, the engine probably did not come to a complete stop before the chief engineer cleared the fault indication and restarted the engine. The alarm log printout indicated that the power reduction was the result of main engine trip due to low main engine lubricating oil system pressure.

When Safety Board investigators boarded the *Bright Field* 2 days after the accident, both the No. 1 and No. 2 lubricating oil pumps were running. Had the oil pump backup system been functioning on the day of the accident, and had it been set to automatic mode, the No. 2 oil pump would have started automatically when the system sensed a drop in main engine oil pressure. The system alarm log printout for that day, however, did not indicate the automatic starting of the second pump. Moreover, Safety Board tests showed that the pressure switch that would have automatically started the second pump may have been inoperative on the day of the accident and therefore would have been

unable to effect the changeover, even with the No. 2 oil pump set on automatic standby. On the day of the accident, then, either the automated propulsion control system was not set up for automatic starting of the standby lubricating oil pump or the switch that accomplishes the changeover failed to respond properly to the drop in system pressure.

During interviews with Safety Board investigators, no crewmember acknowledged manually starting the No. 2 pump; however, the pump could only have been started either automatically—which would have been recorded on the alarm log printout—or manually. The evidence indicates, therefore, that a crewmember did, in fact, manually start (by either turning the switch to auto start or by initiating a manual start on the pump motor control panel when the changeover switch failed) the standby oil pump after the *Bright Field*'s main engine shut down because of low lubricating oil pressure. The restoration of sufficient oil pressure allowed the engine to be restarted.

Lubricating Oil Pump Operation -- Although the main engine lubricating oil system pressure with the No. 1 lubricating oil pump running was consistently observed over a period of several days after the accident to be about 2.3 bar, the exact cause of the low pressure in the lubricating oil system could not be determined. Following teardown, cleaning, adjustment, and reassembly of the No. 1 lubricating oil pump, the outlet pressures reached the rated pressure of 4 bar. Shortly after the pump was reinstalled, it again displayed the vibration and noisy operation that had been noted in earlier inspections and that had been reported to the vessel owners by the chief engineer before the accident. The source of the vibration and noise could not be determined; however, the No. 1 lubricating oil pump continued to produce rated pressure.

According to the system monitor printout, at 1400 on the day of the accident, main engine lubricating oil pressure was 2.64 bar. Although system pressure was in the acceptable range, it was critically close to the system's low-pressure-alarm level. This slight differential between the system's operating pressure and the alarm/trip pressure settings (2.5/2.3 bar) was due primarily to the pressure drop across the second filter, which resulted when contaminants in the oil clogged the fine mesh screen of the second filter's strainers. This determination is consistent with the repeated second filter high-differential-pressure alarms recorded during the December 14 voyage as well as with the results of testing of the second filter.

At 1406, the pressure had dropped below 2.3, as evidenced by the protection system's tripping the main engine off line. Several causes of this sudden pressure drop were considered, then discounted, because they would have produced outcomes that were inconsistent with information gathered in the investigation. Those causes include heavy pump cavitation from aeration of the lubricating oil; failure of the No. 2 oil pump's discharge stop check valve, which would have allowed "backflow" of oil through the No. 2 pump; a faulty pressure relief valve on the No. 1 pump, which would have allowed oil to backflow to the suction side of the No. 1 pump; catastrophic failure of the main engine lubricating oil system's piping; and manual intervention.

Several other possible causes of the sudden drop in lubrication oil system pressure could not be discounted. These included the vibration and noise problem in both oil pumps that had been noted by the chief engineer weeks before the accident and was never corrected and the abnormally low level of lubricating oil in the main engine sump. Incessant pump and piping vibration could have precipitated a transient air leak in the fittings associated with the No. 1 oil pump. Or the No. 1 oil pump may have become airbound after pulling in air through the oil sump suction pipe inlet because of the low level of oil in the sump. Either condition would have allowed air to be drawn into the suction side of the pump, resulting in the rapid oil system depressurization observed by the chief engineer. In such an event, unless the standby pump is started immediately, the depressurization can result in engine trip; as previously noted, the No. 2 pump was either not on automatic standby, or the automatic switching mechanism failed to operate on the day of the accident.

General Condition of the Bright Field's Engineering Plant -- Safety Board investigators' examination of the engineering

plant and maintenance records for the *Bright Field* revealed, as noted earlier, engine lubricating oil that was not within the allowable specifications of the oil supplier or engine designer, excessive differential pressure across the second oil filter, and uncorrected vibration and noise from both main engine lubricating oil pumps. Among other deficiencies identified were marginal lubricating oil sump level, incorrectly calibrated sensing devices, reuse of worn parts, and numerous other problems associated with the main engine and various auxiliary systems/machinery. While many of the deficiencies noted by the New Sulzer Diesel technician and chief engineer were corrected before the December 14 voyage, the vessel sailed with several significant engineering problems uncorrected.

A review of the vessel's records dating back to January 1996 revealed that the engineering crew responded to recurring engineering failures with repairs that were sufficient to keep the vessel operating most of the time. However, the crew apparently was not able to make permanent repairs to the vessel's main engine and associated engineering systems; as a result, these problems became a continuing source of voyage disruptions. In the 3 months prior to the accident, the *Bright Field* added about 1 month to its schedule due to delays attributed to engineering problems.

The crew was not required to use the automated propulsion control test procedures that were delivered with the vessel in 1988 or to periodically test the functional operability of the automated propulsion control system. The engineering plant on the *Bright Field* was equipped with a number of safety devices, and the chief electrician submitted a report concerning the status of these devices to the vessel's owners quarterly. But the report was based only on a survey of alarms and sensors. No one regularly performed operational testing and maintenance of safety control devices such as the oil pressure switch that was supposed to start the standby oil pump in case of a drop in main engine lubricating oil pressure.

While the *Bright Field*'s owners provided each vessel in their fleet with general requirements for periodic testing and maintenance of the main engine, including regular analysis of the main engine lubricating oil, Safety Board investigators determined that critical main engine components were run until failure occurred and that periodic preventive maintenance was not routinely accomplished.

The Safety Board concludes that the *Bright Field* showed evidence of recurring engineering problems that affected vessel main engine reliability, and had all engineering systems been kept in good repair and regularly tested, the vessel may not have unexpectedly lost power during its voyage down the Mississippi River. The Safety Board believes that Clearsky Shipping Company should perform a baseline engineering assessment of the *Bright Field*'s engineering plant and correct all conditions not in conformance with manufacturer's specifications.

Vessel Owner's Oversight of the Bright Field's Engineering Plant -- The *Bright Field*'s owners, Clearsky Shipping Company, received regular engineering and maintenance reports on the *Bright Field* and thus had knowledge of the vessel's engineering problems. Serious engineering problems were reported to the owners as early as January 1996. In addition to reports from the engineering crew, the owners had received periodic telexes from the master documenting the severity of engineering problems, delays in scheduling resulting from the engineering problems, and the inability of the engineering crew to make permanent repairs. The Safety Board acknowledges that, on at least one occasion in 1996, the *Bright Field*'s owners' representatives visited the vessel because of concerns about the operation of the engineering plant. The owners also replaced the *Bright Field*'s chief engineer when the vessel arrived in New Orleans on November 21 because, they said, the engineer had been unresponsive to the owners' orders. The documented problems with the *Bright Field*'s engineering plant, however, existed at least as early as 1995, which predated the arrival on board of the previous chief engineer. These engineering deficiencies are indicative of long-term, recurring problems that cannot be tied to the competence or job performance of a single individual.

The Safety Board concludes that the *Bright Field* owners' oversight of testing and

maintenance of the vessel's engineering systems was inadequate and led to unreliable performance of the engineering plant and contributed to the shutdown of the main propulsion engine on the day of the accident. The Safety Board believes that Clearsky Shipping Company should institute an engineering testing, maintenance, repair, and company oversight program for the *Bright Field* that will ensure safe and reliable operation of the vessel's engineering plant.

Communication

Quite by chance, the *Bright Field* came to rest between two docked ships in a space not significantly larger than the ship itself. While the actions of the pilot and crew during the emergency may have been reasonable, their actions were not well coordinated. Because a computer simulation of the accident scenario was inconclusive, the Safety Board could not determine how changes in the nature or timing of the crew's actions may have affected the outcome. The Safety Board therefore concludes that insufficient information was available to determine whether any actions taken by the pilot and crew of the *Bright Field* would have been effective in preventing the allision or mitigating its effects. The Safety Board also concludes, however, that at several points prior to and during the *Bright Field* emergency, the pilot, master, and crew of the vessel did not exchange information that under other circumstances could have prevented or at least mitigated the effects of the accident.

In the view of the Safety Board, the performance of the *Bright Field* pilot and crew could have benefited from effective application of the principles of BRM, which entails effective use of all available resources to achieve safe operations. The Safety Board has long supported mariners' use of BRM techniques and has advocated professional training in BRM.

Underlying effective BRM is an understanding that every officer, crewmember, and pilot on board a vessel is responsible for acting and for using resources in close coordination with others on the watch. The master, pilot, and conning officer use leadership skills and command authority to integrate the resources for any given passage or watch. At the same time, they must convey their receptivity to operating information that originates with subordinates. The role of those on the watch is to perform their assigned tasks responsibly, to know about or participate in determining the plans for navigation of the vessel, to be alert to departures from plans or from the expected performance of others, and to make those discrepancies known in time to avert an operational error. The practice of BRM by pilots and crew can be handicapped by intercultural or language differences, but these can often be overcome by deliberate and clear master/pilot/crew briefings.

Master-Pilot Briefing at the Anchorage -- The pilot of the *Bright Field* did not advise the master of his plans for making the river transit, including the fact that he intended to operate the ship at sea speed. Had the pilot offered, or had the master requested, information on the transit plans, not only would both men, as well as the bridge crew, have known when and where to expect various actions, but the flow of information could have enhanced coordination and confidence between the pilot, master, and crew.

If, for example, the master had asked, or the pilot had offered, information on the pilot's intended transit speed, that issue could have been discussed, and together they could have evaluated the operational consequences of proceeding at sea speed. Navigational situations can develop at any time for which an increase in speed (to improve rudder control or avoid collision) is a viable option, but, when a ship is already operating at top speed, that option is no longer available. If the pilot and master had discussed the intended speed, they could have reached a consensus on the best way to operate.

Although a discussion of intended actions can take place at any time during a transit, predeparture discussions generally provide the greatest latitude in both time and options. A predeparture discussion also avoids some of the practical logistical problems (related to obtaining another pilot) that could arise if a serious disagreement occurs between a master and a pilot once a trip begins. Thus, discussing and agreeing on transit plans before getting underway is more efficient.

A transit plan should include intended speeds, areas of high risk due to traffic concentration, shoreside structures, or river flow characteristics, and actions to be taken in the event of various ship power or control difficulties. According to their statements, each man felt confident of his own abilities and assumed that the other was qualified to perform any duties that might be required. The lack of discussions between the master and pilot regarding emergency maneuvering procedures did not cause this accident. Still, if the actions to be taken in an emergency had been established, cooperation and coordination in the emergency that developed would probably have been enhanced, tasks could have been clearly delineated, and orders (such as the order to drop anchor) could perhaps have been given and complied with more quickly.

While the pilot was not forthcoming with information about his transit plans, the master did not tell the pilot of the inability to start the main engine from the bridge either at 1055 or when the same difficulty was encountered at 1110. In each case, engine control had to be transferred to the engine control room and back, but this information was not made known to the pilot. Had the pilot been made aware of the situation, he and the master could have discussed options, including the location of engine control (control room or wheelhouse) or use of tug escorts. If the pilot and master could not agree, the pilot could have refused to get underway from the anchorage.

Language Differences -- Even though the ship's master and crew were Chinese and spoke their native language among themselves, interchanges between the crew and the pilot took place in English. The language difference between the pilot and the crew does not appear to have been a significant impediment to communications on the bridge.

The fact that the crew spoke Chinese among themselves, however, eliminated an adjunct source of information for the pilot. For example, because conversations between master and crew were in Chinese, the pilot was not aware of the engine starting difficulties, the content of the second mate's conversation with the chief engineer, or the master's order to drop the anchor. Of course, critical operational information should be clearly stated, and no operations should depend exclusively on overhearing a conversation. But the language differences on the bridge, combined with the fact that the ship was sailing in restricted waters, made it even more important that the master and crew convey all operations-related information to the pilot. If the master and crew did not take this initiative, then the pilot should have specifically requested that he be kept informed of all activities and conversations on the bridge affecting vessel operation. Such ongoing communication did not occur on the bridge of the *Bright Field*.

Information Exchange During the Emergency -- If more information had been exchanged during the brief period after power reduction and before the allision, the actions of the pilot and crew could have been better coordinated and perhaps more timely. Even though the eventual outcome would probably have been the same in this case, in different circumstances, more effective communication could have helped avoid or mitigate an accident.

When the pilot noticed the cessation of vibration in the vessel, he asked if there was a problem. Even though he stated that neither the master nor the mate responded, he did not ask a second time. By not following up and attempting to determine the exact nature of the problem, the pilot denied himself information that may have influenced the nature or the timing of his navigational decisions and orders.

When the pilot realized that the vessel had, in fact, lost power, he again did not converse with the master or mate. Consequently, he was unaware of what they were doing or could do to address the problem. Although the master and the mate were attempting to restore engine rpm, they did not tell the pilot of their actions.

A limited information exchange took place among the master, second mate, and chief engineer. The master instructed the second mate to call the engine control room and demand an immediate increase in speed. The second mate complied. In response, the chief engineer said he understood what had happened (a sudden drop in the pressure of the lubricating oil pump), but not why it happened, and told the second mate so. He also told the second mate the

pressurization problem had already been solved by the No. 2 pump coming on line. He then asked if the second mate wanted to switch engine control from the bridge to the engine control room. The second mate said yes, and the transfer of control began.

During the postaccident investigation, the master explained why engine control was transferred. He said it was standard procedure to give the engineroom control whenever a problem occurred that involved the engine, and that under normal circumstances, the engine rpm could be brought up more quickly from the engineroom. Following this normal procedure would seem to make sense, since the master acknowledged that he did not know the nature of the problem that caused the rpm reduction. However, the transfer of control takes 20 to 30 seconds and must be completed before engine speed can begin to be restored.

In this case, since the pressurization problem had already been corrected, the rpm could have been restored from the bridge as quickly as from the engineroom. If that had been done, the transfer time could have been saved. However, the second mate apparently did not recognize the implication of the chief engineer's comment, which was that the second engineer could increase rpm himself. So when the chief engineer asked if engine control should be transferred, the second mate agreed. The second mate was quite likely simply following the master's order to have "them" (the chief engineer and his staff) increase speed. If the chief engineer had supplied information to the bridge about the time necessary for him to assume control and restore engine rpm, this information may have altered the nature and timing of the master's and pilot's orders.

The second mate also did not immediately pass on the information about the lubricating oil repressurization to the master. If he had, the master may have recognized his option to increase rpm from the bridge, and the normal practice of sending engine control to the engine control room in the event of engine-related problems may not have been followed, thereby saving the control transfer time. Likewise, if the second mate had given the chief engineer additional information about the direction in which the ship was headed, the chief engineer could have made a more informed decision concerning the options for increasing rpm, such as activating the crash maneuvering feature or perhaps not transferring engine control to the engine control room. After the accident, the master testified that the engineering crew was not made aware of the emergency situation until the allision was unavoidable.

Had the above additional information been supplied during these exchanges, it may not have altered the outcome. Nevertheless, additional information should have been exchanged to facilitate decisions.

Another information exchange between the pilot and master affected the order to drop anchor. During the accident sequence, the pilot first ordered the master to have someone stand by the anchors and, later, to drop the anchors. The orders were heard and understood by the master, though the pilot was unaware of that because the master did not acknowledge either order. The master attempted to carry out the order to drop anchor, but his radio communications with the carpenter at the bow were impeded by the sound of the ship's whistle. The master did not tell the pilot of the communication problem created by the whistle; instead, he went out to the bridge wing and tried to attract the carpenter's attention by waving his arms. When this effort failed, the master tried the radio again, finally establishing intermittent contact. He still did not tell the pilot of his difficulties.

In the meantime, the pilot did not realize that he was preventing his own order from being carried out by continuing to sound the ship's whistle. Transmission of the order was delayed so long that when the master finally reached the carpenter on the radio, he deemed dropping the anchor to be an inappropriate order and countermanded it. By the time the master decided to drop the anchor, the carpenter could make only a brief effort to carry out the order before having to flee to escape injury in the imminent allision. As a result, and as confirmed by an amateur video of the accident, the anchor was not dropped before the *Bright Field* struck the wharf.

The fact that the pilot issued the order to drop anchor indicates that he believed that some

value, however small, could be gained by dropping one or both anchors. Had he not believed that dropping anchors could mitigate the emergency, he was obligated to relay that information to the master so the carpenter could be told to abandon the anchor watch and remove himself to a safer position. Yet the pilot made no real effort to determine if his order had been carried out, even when he saw the master go to the bridge wing and wave his arms. If he did not recognize that effort as an attempt to communicate with the anchor watch, he should have inquired about the meaning of the master's unusual actions at such a critical time.

The lack of information exchange and feedback on the part of the master is also notable. For example, he did not tell the pilot that he had countermanded the drop-anchor order, only to reissue it a little later. Earlier in the accident sequence, he did not ensure that the pilot was fully aware of the actions he was taking to restore engine rpm. While the pilot could have inferred the master's actions from the rpm indicator, the master should have removed any ambiguity by advising the pilot of what he was doing at all times. Likewise the master could have given the pilot an estimate of the time it might take to restore engine power. If he did not know the amount of time needed, he could have asked the chief engineer. The pilot could have used each of these pieces of information as he determined which orders to issue at what time.

The need to exchange information and ensure that orders are heard, understood, and carried out is basic to the operation of any vessel. These needs are not new and have long been familiar to mariners; however, they have in recent years been formalized as central elements of BRM. The Safety Board concludes that use of BRM precepts on board the *Bright Field* would have enhanced the exchange of information and the coordination of actions among the pilot, master, and crew during the accident sequence. The Safety Board has issued several recommendations concerning BRM since 1991. Due in part to those recommendations and the efforts of the Coast Guard, the International Maritime Organization (IMO) has issued amendments to its Standards of Training, Certification and Watchkeeping that incorporate BRM training for watch officers effective February 1, 1997. A 5-year phase-in period (from February 1, 1997) to certify licensed watch officers will follow. Signatory countries are to have plans for such training programs in place by February 1, 1998. All signatory countries, including the United States and Liberia (flag of the *Bright Field*), will require officers of vessels such as the *Bright Field* to have BRM training. Pilots will not be subject to the same training unless they hold a Coast Guard license.

Training in BRM typically includes five generic categories of knowledge and skill development: (1) the development and performance of watch or pilot briefings; (2) maintenance of situational awareness; (3) identification of error chains (and error trapping); (4) implementation of effective bridge/vessel communication; and (5) integration (coordination) of bridge/vessel resources. In whole or in part, most of theses elements were missing during the *Bright Field*'s December 14, 1996, voyage.

The Safety Board believes that NOBRA should encourage its members to participate in initial and recurrent BRM training that emphasizes team coordination between the pilot and crew. The Safety Board further believes that Clearsky Shipping Company should provide its bridge and engineroom watchstanding officers and crewmembers with initial and recurrent BRM training that includes communication and coordination between pilots and members of the bridge and engineroom watches and that addresses their use of bridge and engineroom systems.

Emergency Response

After the allision, rescue efforts were initiated at once, and emergency units were ordered. The harbor police dispatcher notified the city of New Orleans Fire, Police, and Health and Emergency Services Departments. More than 25 agencies responded; fire, police, and emergency medical service units arrived on scene within minutes. After being contacted by the Gretna light operator, the Coast Guard began an immediate search and rescue response. In addition to providing assistance through multiple city agencies, the city of New Orleans contacted the Louisiana Office of Emergency

Preparedness to provide notification and request standby for possible assistance.

Passengers aboard the cruise ships and the gaming and excursion vessels, as well as several Riverwalk Marketplace patrons, in response to Safety Board questionnaires recalled the emergency response as prompt and efficient. Although initial access to the area was hindered by damage occurring when the *Bright Field* struck the wharf, the emergency responders were able to locate and use an acceptable alternate route to respond to the incident, assist the injured, and provide crowd control. The Safety Board concludes that the response to the *Bright Field* accident by local emergency response agencies was timely and appropriate.

Vessel Emergency Preparedness and Evacuation Plans

Four vessels were docked alongside the wharf in the area of the *Bright Field* accident: the *Enchanted Isle*, the *Nieuw Amsterdam*, the *Queen of New Orleans*, and the *Creole Queen*. In the view of the Safety Board, the actions of the captains and crews aboard the cruise ships *Enchanted Isle* and *Nieuw Amsterdam* in the moments preceding the allision were adequate for the circumstances. An emergency evacuation was not attempted because of the limited amount of time that elapsed from the first awareness of the emergency until the *Bright Field* passed clear of the two vessels.

Vessel Evacuation -- According to Safety Board surveys of passengers, when the first mate of the *Queen of New Orleans* made the initial evacuation announcement, some passengers did not respond immediately. When a second announcement was made ordering the immediate evacuation of the vessel, passengers and nonoperating crewmembers began running toward the gangway. About this time, the *Bright Field* struck the wharf and was continuing to move toward the bow of the *Queen of New Orleans*. Even though the bow wave from the *Bright Field*'s approach destabilized the second deck gangway of the *Queen of New Orleans* several times during the evacuation process, passengers were not provided with an alternative means of access to the dock.

According to the *Queen of New Orleans*' *Emergency Evacuation Plan for Moored Conditions*, the vessel can be exited only from the bow section of the second deck. The plan states that to evacuate the vessel in an emergency, every passenger is to be directed to this gangway. The owner of the vessel noted that three portable emergency gangways, which are designed to be used in the event the main gangway is inoperable, were aboard the vessel. The vessel's emergency evacuation plan, however, does not refer to these portable gangways, or provide instructions on how to make them operable in an emergency, or give guidance for directing passengers to them. The evacuation plan also does not take into account the time needed to alert the crew to take action or for crewmembers to stage the portable gangways and ensure their safe operation. Because the emergency gangways were not used during the *Bright Field* accident, the only exit available was the second deck bow gangway.

New Orleans Paddlewheels, Inc., provided security camera videotapes that show areas of the vessel being evacuated in what company officials call "a calm and orderly evacuation." The Safety Board did not see, on these tapes, any passengers sustaining injuries during the evacuation. Nonetheless, some passengers were injured, as documented by medical records. While the Safety Board recognizes that the number of questionnaire responses was small relative to the number of passengers aboard the vessel, the responses are nevertheless meaningful and illustrate the panic induced when the crowd was confronted with no means of escape from a vessel directly threatened by an oncoming freighter. Furthermore, had the vessel been filled to its capacity of 1,800 passengers and crewmembers, the number of persons unable to evacuate in time could have been significantly higher. The ensuing panic most likely would have been more hazardous, possibly resulting in a higher number of, and more severe, injuries. The Safety Board concludes that evacuation of the *Queen of New Orleans* was hampered, and passenger risk increased, by the fact that only one gangway was made available for passenger egress during the emergency.

The *Creole Queen*, a New Orleans Paddlewheels, Inc., excursion vessel with a

capacity of 1,000 passengers and crew, was docked astern of the *Queen of New Orleans*. At the time of the accident, 190 passengers and crewmembers were aboard. Following the master's instructions to evacuate, passengers exited the vessel across a single dockside gangway. When the bow wave from the *Bright Field* passed the *Creole Queen*, the gangway dropped from the side of the vessel, and three passengers on the gangway fell into the river. One passenger was seriously injured; the other two sustained minor injuries. By this time, approximately one half of the *Creole Queen*'s passengers had been evacuated. The remaining passengers could not exit the vessel until the gangway was repositioned.

The Safety Board acknowledges the efforts of the senior officers of both vessels to evacuate a large number of passengers. Even so, if the 36,000-ton *Bright Field* had struck the *Queen of New Orleans*, the remaining passengers still on board the gaming vessel, regardless of the exact number, would have been in grave danger.

The Safety Board believes that New Orleans Paddlewheels, Inc., must make better provisions for all its vessels in the event of an impending allision or other emergency. Consequently, the Safety Board issued the following safety recommendations to New Orleans Paddlewheels, Inc., on September 5, 1997:

> Work with the U.S. Coast Guard to review the *Emergency Evacuation Plan for Moored Conditions* of the *Queen of New Orleans* and amend it regarding current evacuation procedures and the number of immediately accessible gangways and disembarkation locations, to ensure timely and orderly exiting of passengers in the event of emergency evacuation. (M-97-62)

> Work with the U.S. Coast Guard to develop and implement procedures for evacuation under moored or docked conditions for all your excursion vessels to ensure that passengers can exit each vessel in a timely and orderly manner should an emergency evacuation be necessary. (M-97-63)

In a September 29, 1997, letter to the Safety Board, New Orleans Paddlewheels, Inc., replied that its emergency evacuation plan for the *Queen of New Orleans* in moored conditions

> addresses the evacuation of all areas on board the vessel. We purposely did not include portable gangways because they are to be used only when the primary evacuation gangway is inoperable. Our deck crew is regularly trained and drilled on how to use these portable gangways in multiple locations.

Portable gangways were not used in this emergency. The Safety Board is concerned that the evacuation plan for the *Queen of New Orleans* does not provide a readily available additional means of escape that does not require staging in an emergency. The Safety Board's intent in issuing Safety Recommendation M-97-62 was to prompt New Orleans Paddlewheels, Inc., to amend the *Queen of New Orleans*'s *Evacuation Plan for Moored Conditions* not only to enhance evacuation procedures, but also to address the need to provide for more than one immediately accessible disembarkation location to ensure a timely and orderly exiting of passengers.

Further, although the September 29 letter states that the deck crew is trained and drilled on use of the portable gangways, the letter does not address the training of the nonoperating crewmembers, who are responsible for assisting passengers to the egress areas of the vessel during emergencies. The *Evacuation Plan for Moored Conditions* provides no guidance on the use of portable gangways to the numerous nonoperating crew on board the vessel who are responsible for directing passengers and assisting their escape. Moreover, the specific plan to which all crewmembers are to look for guidance in responding to emergency situations does not provide any information on these gangways or how to guide passengers to them. Based on the failure of New Orleans Paddlewheels, Inc., to effectively address these concerns, the Safety Board classifies Safety Recommendation M-97-62 "Closed--Unacceptable Action." New Orleans Paddlewheels, Inc., has not responded to Safety Recommendation M-97-63 concerning the development of evacuation procedures for

moored or docked conditions for all its excursion vessels. Therefore, Safety Recommendation M-97-63 remains classified "Open--Await Response."

The Safety Board, also on September 5, 1997, issued the following safety recommendation to the Coast Guard:

> Work with New Orleans Paddlewheels, Inc., to review and amend the *Emergency Evacuation Plan for Moored Conditions* of the *Queen of New Orleans* regarding current evacuation procedures and the number of immediately accessible gangways and disembarkation locations, and to develop and implement procedures for evacuation under moored or docked conditions for all New Orleans Paddlewheels, Inc., excursion vessels to ensure that passengers can exit each vessel in a timely and orderly manner should an emergency evacuation be necessary. (M-97-59)

In a November 18, 1997, letter, the Coast Guard responded that the New Orleans COTP had already required a review of evacuation procedures for all high-capacity gaming vessels, but that the Coast Guard believes this safety recommendation should be expanded to cover all passenger vessels operating in the Mississippi River in the New Orleans area. The letter stated the Coast Guard's belief that,

> It would be prudent to develop reasonable, practical and appropriate evacuation criteria for the different types of passenger vessels based upon their type, configuration, passenger and crew capacity, and the extent which passengers are normally aboard the vessel while dockside. To this end, we have discussed the expansion of this recommendation with Captain of the Port New Orleans and will require further review and development of this initiative.

The Safety Board is pleased that the Coast Guard has not only addressed the specific intent of Safety Recommendation M-97-59 regarding the *Queen of New Orleans*, but has also expanded the scope of the recommendation to cover all high-capacity passenger vessels operating within the Port of New Orleans. While the Coast Guard response does not specifically address evacuation plans for New Orleans Paddlewheels excursion vessels, the Safety Board notes that these vessels will be covered by the evacuation criteria the Coast Guard plans to develop for all passenger vessels operating in the New Orleans area of the Mississippi River. Pending further information from the Coast Guard regarding the proposed review of evacuation plans for such vessels, and specifically those vessels belonging to New Orleans Paddlewheels, Inc., the Safety Board classifies Safety Recommendation M-97-59 "Open--Acceptable Response."

Emergency Drills -- The company operating manuals and station bills for both the *Queen of New Orleans* and the *Creole Queen* clearly stated that nonoperating crewmembers were responsible for distributing life jackets, keeping order in the stairways and passageways, and controlling the movement of passengers to ensure their safety. During the *Bright Field* emergency, however, several nonoperating crewmembers experienced difficulty in performing their duties. For example, when the first mate directed the crewmembers to go to their mooring stations during the evacuation of the *Queen of New Orleans*, the vessel's director of security did not understand or appreciate the implications of this announcement. Also, nonoperating crewmembers did not distribute life jackets to passengers aboard the *Creole Queen* during the emergency.

Drills held aboard the *Queen of New Orleans* had not simulated an evacuation while moored. Moreover, the drills and training sessions that were held involved only supervisory gaming staff, who were expected to inform other gaming staff crewmembers of their content. No formal methods were used to verify whether the nonoperating crewmembers were advised of the content of the safety meetings or the nature of drills performed. Unless it requires accountability for the flow of safety information from supervisory gaming staff to the rest of the nonoperating staff, management cannot ensure that the latter receive safety information that could be critical in an emergency. The Safety Board concludes that nonoperating crewmem-

bers of the *Queen of New Orleans* and the *Creole Queen* had not received training covering the full range of emergency scenarios and were unprepared to properly carry out their responsibilities in this accident.

As a result of its investigation of a 1994 fire aboard the small passenger vessel *Argo Commodore*,[43] the Safety Board issued the following recommendation to the Passenger Vessel Association (PVA):

> Develop and provide to your members crew drills for on-board crew emergency procedures/standards that include preincident planning for a variety of shipboard emergencies, including fires, and the deployment of crew resources for proper response to the emergency without compromising passenger safety. (M-95-43)

This recommendation was later placed on the Safety Board's list of Most Wanted Safety Improvements. In 1997, the PVA made available to the Safety Board its recently published *Training Manual for Passenger Vessel Safety*, which incorporates a "Non-marine Crew Training" section that outlines a comprehensive training program for nonoperating crewmembers. The introduction to this section states that specialized safety training for nonoperating employees "makes sense when management realizes that, more often than not, [these employees] will be the first person[s] on the scene in any kind of emergency."

Based on the PVA's support for the concept of comprehensive training for nonoperating employees and its development of the training manual, the Safety Board classified Safety Recommendation M-95-43 "Closed--Acceptable Action." The Safety Board notes that New Orleans Paddlewheels, Inc., which is a PVA member, has apparently not yet implemented the training program for nonoperating crewmembers set forth by the PVA in its training manual. The Safety Board believes that New Orleans Paddlewheels, Inc., should, in accordance with the guidance published by the PVA, require that nonoperating crewmembers on all its vessels participate in formal emergency training and drills in the proper handling of emergencies that have the potential to affect the persons in their charge. The company should also maintain written records to verify nonoperating crew proficiency levels and skill retention.

Safety Briefings and Signage -- According to the vessel master, when the *Queen of New Orleans* was to remain moored, he did not make any safety announcements because he believed the vessel was an extension of the dock when not underway. The *Queen of New Orleans* broadcast a vessel safety videotape throughout the vessel's queuing area; however, a significant number of passengers on board the vessel on the day of the accident, some of whom had been on the vessel several times before, did not recall ever having seen or heard the safety broadcast. Because the scheduled cruise had been canceled owing to the high river stage, no safety briefings were provided prior to the *Bright Field* accident. However, the master stated that he had instructed the engineer to start the engines to prepare for leaving the dock to avoid being struck by the *Bright Field*. Had the vessel left the dock, the master probably would not have had time to provide passengers with such basic instructions as the location of life jackets.

The Safety Board concludes that the lack of effective recurring safety briefings for occupants of the *Queen of New Orleans* regarding emergency and evacuation procedures may have contributed to the confusion and panic reported among passengers and crew during the vessel evacuation. The Safety Board believes that New Orleans Paddlewheels, Inc., should review the existing methods of providing safety information to boarding passengers and make the necessary improvements to ensure that all vessel occupants receive recurring safety briefings, regardless of whether the vessel is scheduled to leave the dock.

Emergency instruction placards and sign aboard the *Queen of New Orleans* were not conspicuously displayed and were not readily visible during the emergency. The safety instructions, printed on plain white paper with clear laminate, were subject to destruction in an

[43]Marine Accident Report--*Fire Aboard U.S. Small Passenger Vessel* Argo Commodore *in San Francisco Bay, California, December 3, 1994 (*NTSB/MAR-95/03).

emergency such as that involving fire. Moreover, the paper on which the instructions were printed was similar to the color of the walls upon which they were affixed, negating their effectiveness in an emergency characterized by haste, panic, or reduced visibility. According to a number of the vessel's passengers on the day of the accident, they did not see emergency instruction signage or egress diagrams.

The Safety Board concludes that the instruction placards and signage aboard the *Queen of New Orleans* were ineffective in disseminating emergency instructions and vessel information to passengers. The Safety Board therefore believes that New Orleans Paddlewheels, Inc., should post, on all its vessels, emergency instructions that are printed on fire- and heat-resistant material and that are clearly visible to all passengers both under normal conditions and during emergencies when lighting and visibility may be diminished.

Shoreside Emergency Alert and Response -- Under River Front Alert Network procedures established after this accident, individual riverfront commercial properties were to make their own determinations about the proper actions to be taken after receiving notification of an emergency involving a vessel on the river. According to evacuation plans that were initially in effect for property tenants, a lengthy procedural chain of command was in place that could delay a decision to evacuate. In the view of the Safety Board, such a potential for delay could endanger the employees and patrons of riverfront properties. Therefore, on September 5, 1997, the Safety Board issued the following safety recommendation to the New Orleans Dock Board:

> Develop, as part of the River Front Alert Network, an emergency evacuation announcement for broadcast by the harbor police department dispatcher using a public address system linked to river front properties that provides for a timely and efficient evacuation in the event of an impending collision or other emergency. (M-97-60)

Documentation received by the Safety Board on November 3, 1997, outlining the actions to be taken in the event of the activation of the River Front Alert Network appears to address the Safety Board concerns that prompted the issuance of Safety Recommendation M-97-60. Under the specific evacuation protocols developed for responding to the activation of the River Front Alert Network, the procedural chains of command within each property's evacuation plans have been eliminated, and property security officers have been given authority to initiate an evacuation immediately upon hearing a River Front Alert Network broadcast and assessing the danger. Because these revised evacuation plans meet the intent of the safety recommendation, the Safety Board classifies Safety Recommendation M-97-60 "Closed--Acceptable Action."

The River Front Alert Network system did not require that vessels docked or moored in its vicinity monitor the alert broadcast from the Coast Guard traffic light operator to the harbor police dispatcher indicating a vessel irregularity or loss of steering in the vicinity of the riverfront properties. The Safety Board was concerned that, unless these vessels monitored the network for emergency broadcasts, vessel occupants would be subject to delays in notification similar to those that occurred in this accident and that contributed to the disorderly evacuation and numerous injuries. Therefore, on September 5, 1997, the Safety Board issued the following safety recommendation to the New Orleans Dock Board:

> Require all vessels which dock or moor in the area encompassed by the River Front Alert Network to monitor the River Front Alert Network radio for any emergency broadcast to provide maximum advance notice of an emergency. (M-97-61)

In a September 15, 1997, reply to the Safety Board, the Dock Board said that the intent of this safety recommendation should be met by the postaccident COTP order requiring that all large passenger vessels docked in the area have a manned pilothouse and that they monitor all emergency and working marine channels. While agreeing that monitoring working and emergency radio channels should give moored passenger vessels advance warning of

potentially hazardous situations on the river, the Safety Board noted that the COTP order requiring such monitoring was an interim, and possibly temporary, measure. The Coast Guard has since published an interim rule that, when issued as a final rule, will make permanent the COTP order. In anticipation that the interim rule regarding manned pilothouses and radio monitoring will become permanent as 33 CFR 165.810(e), the Safety Board classifies Safety Recommendation M-97-61 "Closed--No Longer Applicable."

Also on September 5, 1997, the Safety Board issued the following safety recommendation to the Coast Guard:

> Require that all commercial vessels that operate within the River Front Alert Network zone participate in the network and notify the U.S. Coast Guard traffic light operator whenever they experience an irregularity or abnormality that could result in a safety risk to the Port of New Orleans area. (M-97-58)

In its November 18, 1997, letter to the Safety Board, the Coast Guard stated that existing regulations and local marine practice are now serving to meet the intent of this safety recommendation. The letter stated that,

> [Title] 33 CFR 160.215 requires vessels to immediately notify the nearest Marine Safety Office or Group of hazardous conditions aboard or caused by the vessel. Currently, the vessels in the vicinity of the traffic light notify the traffic light operator who is responsible to the Marine Safety Office. Through 33 CFR 26.03 or existing Captain of the Port orders, ALL vessels, including moored passenger vessels, must monitor Channel 67 VHF. Therefore, when a hazardous condition is reported to the traffic light operator, he activates the Riverfront Alert Network by calling the Harbor Police on the Network radio. The police then notify the impacted participating facilities and vessels. Between the Channel 67 notifications and subsequent Riverfront Alert Network radio calls, ALL vessels and facilities are notified.

Based on this response, the Safety Board classifies Safety Recommendation M-97-58 "Closed--Acceptable Action."

Toxicological Testing

Two Coast Guard regulations (33 CFR Part 95 and 46 CFR Part 4) require that postaccident alcohol tests be conducted on the pilot and *Bright Field* crewmembers directly involved in this accident. Those regulations specify that marine employers or their representatives are to ensure that urine specimens (for drug testing) and breath or blood specimens (for alcohol testing) are obtained as soon as is practicable following an accident.

In this case, the self-employed pilot supplied both breath and urine specimens in a timely manner. His specimens were negative for alcohol and drugs. *Bright Field* crewmembers also supplied breath and urine specimens, and the results were negative.[44] The Safety Board is concerned, however, that breath testing, which is a time-sensitive procedure, was not conducted in a timely fashion on some *Bright Field* personnel and, in fact, was conducted too late to have any practical value. Because of the rate at which humans metabolize alcohol,[45] evidence of alcohol consumption is usually eliminated from the body in about 8 hours. For example, an individual could be legally intoxicated (0.10 percent BAC) at the time of an accident and have a 0.00 percent BAC about 8 hours later. Consequently, to produce meaningful results, testing should occur within that time span.

In this case, tests of the master, chief engineer, and helmsman were conducted between 7 hours and 57 minutes and 8 hours and 30 minutes after the accident. Given that amount of time, it cannot be clearly determined through these tests whether alcohol had a role in this accident, although no other information suggested that alcohol was a factor. On the contrary, the first Coast Guard investigator aboard observed the crew by sight, sound, and

[44] The results of the alcohol tests on the pilot and nine crew members showed .000 percent BAC.

[45] The elimination rate ranges between about .015 percent and .020 percent per hour.

smell for signs of alcohol or other impairment and found none.

Postaccident testing could have begun sooner. The ship's agent learned of the accident 1 hour and 20 minutes after it occurred, and he and the ship's attorney were aboard in about 2 1/2 hours. The first Coast Guard investigator went aboard 2 hours after the accident, and an hour later (3 hours after the accident), he ordered the ship's attorney to have the crew tested. Either of them could have facilitated initiation of the testing process. Instead, the ship's agent general manager came aboard 3 1/2 hours after the allision and was there for another hour before he arranged for testing. Tests were not started sooner because the general manager erroneously thought the Coast Guard would make the arrangements. Further delay was incurred in locating someone to conduct the tests, which finally began 6 1/2 hours after the accident. Each of these delays diminished the value of the tests. Further, by conducting the breath tests of the helmsman, master, and chief engineer last, 8 hours or more after the accident, the value of those tests was essentially negated.

Besides arranging for the testing, the agent had to decide whom to test. The regulations state that he should do so by determining who was directly involved in the incident. The ship agent's decision was to test all crewmembers assigned to the noon watch, which was on duty at the time of the allision. However, the ship's carpenter, who was acting as the anchor watch, was not tested. He was apparently inadvertently overlooked for testing because he was not regularly assigned to the noon watch. Since no testing of the carpenter was done, no definitive conclusions can be made about drugs or alcohol with respect to his activities, though as with the other crewmembers, no information was obtained that would suggest that either had a role.

Arrangements for and timing of the alcohol testing illustrate several problems. For example, the Coast Guard investigator was fully aware of the agent's responsibilities, but the agent was not. Time was lost until the agent became fully aware. Additional time was lost while a qualified tester was contacted and brought aboard. Also, the regulations themselves do not adequately address the physiological need to conduct alcohol testing within 8 hours if the results are to be meaningful.

The Safety Board has observed these same problems in previous accidents, and several potential solutions exist. One recent accident involved the vessel *Julie N*, which struck a bridge support in Portland, Maine, on December 4, 1996. Because the problems and solutions associated with the timing of postaccident drug and alcohol testing were explored in a March 13-15, 1997, public hearing on that accident and will be comprehensively addressed in the Safety Board's upcoming *Julie N* accident report, they are not further discussed here.

Risk Assessment and Risk Management

This accident demonstrates that the many and diverse stakeholders in the area of the Port of New Orleans, including the Coast Guard, the State of Louisiana, the Dock Board, the pilot organizations, and the owners and operators of riverfront properties and nearby moored passenger ships, did not adequately prepare for or mitigate the risk of a marine casualty affecting people and property within the Port of New Orleans. Some of the stakeholders, most notably the Dock Board, had commissioned partial risk assessment studies at various times for the assets in the harbor area. Despite their limitations (in either geography or scope), these studies did provide adequate information for the stakeholders to recognize the possibility of an accident similar to the one involving the *Bright Field*.

For example, risk assessment projects predicted an increase in accidents involving collisions, rammings, and groundings due to increased river traffic. The Louisiana State University risk assessment project, in 1994, concluded that no sections of the Port of New Orleans waterfront were free of ship allisions, including the area where the high-capacity passenger vessels, gaming vessels, and riverfront properties were located. Analysis of accident data for the Port of New Orleans from 1983 through 1993 (a total of 166 rammings along the left descending bank between miles 91 and 101 AHP) identified a mooring area for gaming vessels that had seen the fewest "historical allisions on the left bank." The study acknowledged, however, that no area of the left

descending bank of the river had been completely free of vessel strikes during the 11-year period studied.

Port stakeholders did take risk management initiatives such as providing barriers and controls for some of their assets. At the time of the planning for the Louisiana world's fair in the early 1980s, a proposal was made to tie up barges (exhibit pavilions with large numbers of patrons or visitors) along the riverfront fair site at the location now occupied by the Riverwalk Marketplace. The Dock Board rejected the plan. The Audubon Institute, as a result of a preconstruction risk assessment in 1987, decided to construct the Aquarium of the Americas some 100 feet behind the levee so that it would be safe from vessel strikes. More recently, the mooring areas for the gaming, excursion, and ferry vessels were silted in to possibly protect these vessels from ramming by other ships.

Despite this history of some sensitivity to risk within the port area, the Riverwalk complex, including the condominium garage and the Hilton Hotel Riverside, were constructed on old warehouse piers on the river side of the levee. This location offered no "crush zone" that could absorb the impact of a marine ramming, and despite the fact that the piers themselves were not built to withstand being struck by a heavy vessel, no physical barriers were constructed outboard of the new buildings to offer them protection. According to the IRC, during the time when the IRC was negotiating a lease with the Dock Board, the Dock Board advised the IRC that vessels had had allisions with wharves within the Port of New Orleans, but no allisions had occurred at the Lower Poydras Street wharf. The IRC representatives were shown photographs of the allisions at other wharves, but these photographs depicted only minimal damage. The IRC apparently did no further risk assessment, and neither the initial construction of the mall nor the initial construction of the riverside portion of the Hilton Hotel resulted in any new structure extending farther into the Mississippi River. Rather, these structures were built entirely on top of existing wharves.

In contrast, the 1987 Audubon Institute-sponsored risk assessment similarly determined that there had been few allisions at the Bienville Street wharf and that because it is high up in the bend, it faced low risk of being struck by an outbound vessel. Nonetheless, recognizing low incidence, but a potential for high consequences, the Audubon Institute placed the Aquarium of the Americas behind the levee with a 100-foot buffer zone to protect the shoreside structure. No similar safety feature was considered or constructed for the Hilton Hotel or the Riverwalk Marketplace.

The IRC obtained construction permits for the riverside expansion of the hotel from the city of New Orleans, the Corps of Engineers, and the New Orleans Levee Board. In addition, the construction plans were approved by the Dock Board. According to the Dock Board, it may make recommendations to the IRC or other stakeholders in the area to widen the wharf, to allow silt to accumulate, or to further increase the robustness of construction in the area immediately outbound of their structures; however, it has no authority to compel such action. Currently, the damaged portions of the Riverwalk Marketplace mall, the parking deck, and the Hilton Hotel are being rebuilt in the same location. No physical barriers have been included in the rebuilding of these facilities. As with the initial construction, all permits were granted, and all plans were approved.

Given the hazardous operating environment in the Port of New Orleans and the number of instances of loss of propulsion and steering, any number of which could have resulted in similar accidents or far more serious ones, the Safety Board does not understand the property owners' reluctance to provide adequate barriers to protect their assets in the port area. Although the River Front Alert Network is a commendable effort to alert the harbor police and security officers in the event of a need to evacuate the area, such efforts are unlikely to result in a complete evacuation under even slightly different circumstances. For example, the *Bright Field* rammed the Hilton Hotel during daylight hours when, fortunately, few guests were occupying rooms and no cleaning personnel were in the immediate area. Had this accident occurred during the evening, at night, or in the morning hours, most of the rooms would probably have been occupied. It is unlikely that even the River Front Alert Network would have

been able to awaken the sleeping guests, alert them to the danger, and evacuate them in time to prevent serious injury or possible death.

The Safety Board is concerned that, despite the historical record of marine incidents and accidents in that section of the Mississippi River, the Dock Board permitted the placement of a commercial facility within about 20 feet of an unprotected wharf. More than 13,500 people a day visit the Riverwalk Marketplace. Those visitors have a reasonable expectation that the Port of New Orleans will assert its responsibility to protect their safety by exercising the power to disapprove a building plan that does not adequately account for a known risk. The Safety Board concludes that the IRC and the Dock Board did not conduct adequate risk assessment nor perform adequate safety management oversight to protect their properties and the people that use them from an allision such as that involving the *Bright Field.*

While the construction of a shopping mall and a hotel in such a high-risk area was ill-advised, the Safety Board recognizes that economy and practicality argue against attempting to correct the error by relocating those facilities. Nonetheless, the *Bright Field* accident highlights the risk to shoreside structures within the Port of New Orleans and the need to consider that risk in the approval process for future construction there. The Safety Board believes that the Dock Board, as part of the permit-approval process for new commercial and residential development along the wharves within its jurisdiction, should require that any new construction of occupied space be sited behind a buffer zone sufficient to protect persons and property by safely absorbing the impact should a vessel strike a wharf.

After this accident, the Dock Board, in effect, identified a buffer zone for the Riverwalk Marketplace. The Dock Board "encouraged" the IRC to widen the Upper Poydras Street wharf by 50 feet. The company had already widened the wharf by that amount in one area to accommodate a gaming vessel, and the Dock Board suggested that the remainder of the wharf be extended as well. The Safety Board concurs in this suggestion and believes that the IRC should enhance the safety of the patrons and employees of the Riverwalk complex by immediately undertaking to widen, by a minimum of 50 feet, that length of the Poydras Street wharf that has not previously been extended. Such an extension prior to this accident would have added a "crush zone" that would probably have prevented the structural damage and threat to persons that resulted from the *Bright Field* accident.

Several passenger vessels, including gaming, tour, and cruise vessels, were allowed to dock along the left descending bank, the side of the river at highest risk. Had the *Bright Field* lost power some time later and the same accident scenario evolved, the ship would likely have rammed the gambling vessel, resulting in substantial loss of life. The cruise vessels, which had even less warning time, would quite likely also have sustained serious passenger injuries or loss of life.

While silting around the vessels' docking areas may offer some protection from ramming by deep-draft vessels at average river stages, the silt layer did not reduce water depth sufficiently to retard a runaway ship when the river was high, as it was on the day of the *Bright Field* accident, nor did it protect the moored vessels from ramming by shallow-draft vessels such as tows and barges. The Safety Board is not aware of any engineering evaluations conducted to assess the effectiveness of the silting efforts.

The property owners and other stakeholders within the Port of New Orleans clearly had the responsibility to establish and maintain a reasonable level of safety in the port area. The Safety Board concludes that the Coast Guard, the Dock Board, and the property owners did not adequately address the risks posed to moored vessels along the Erato, Julia, Poydras, and Canal Street wharves; as a result, under certain conditions, those vessels were vulnerable to ramming by other marine traffic. The Safety Board believes that the Coast Guard and the Dock Board should reassess the risk of locating passenger vessels along the left descending bank of the Mississippi River and determine whether to remove the vessels to a less vulnerable location or put in place procedural, operational, or physical barriers that will protect them from ramming by riverborne traffic.

Additionally, no tugboats were used either as escorts or as a "barrier" to prevent a runaway ship from ramming the shore or colliding with another marine asset. And no environmental controls, such as the Corps of Engineers' opening of the Bonnet Carré Spillway, were put in place to reduce river flow or current.

On the river itself, the *Bright Field* was operating at full speed in high-river and high-current conditions. Apparently, neither the pilot nor crew considered procedures that might be employed to maximize the time available to respond to an emergency. For example, the main engines were being operated in bridge control, and although this may have created a time penalty in responding to an emergency, the pilot and bridge crew did not discuss engine control location prior to commencing the trip downriver. In his testimony, the pilot claimed that it was necessary to operate the *Bright Field* at maximum speed to attain reasonable maneuverability of the vessel in the operating environment of high water, rapid current, and a heavily laden ship designed to be maneuverable at lower speeds.

Several days after the accident, Safety Board investigators boarded a fully loaded vessel of similar size, displacement, and power to the *Bright Field* that was operating downbound in similar high water conditions. During this transit, the pilot did not use full speed to maneuver the ship. Each ship handles differently, but the operation of the *Bright Field* at full speed left no margin for error. For example, the main engine tripped off line because of a temporary loss of lubricating oil pressure. The oil pressure and engine operation were restored within about 2 minutes, which is a reasonable amount of time. However, operating at full speed in high-river conditions, the ship had no room to maneuver out of the emergency. The Safety Board concludes that operating a vessel at full speed in the restricted waters of the Mississippi River may not allow sufficient time or distance to recover from an emergency. The Safety Board believes that the Coast Guard should take the lead in working with the pilot associations serving the Port of New Orleans to evaluate the impact of operating vessels at full speed in the Mississippi River and incorporate that information in its risk-management and risk-reduction strategies for the port area.

High-river conditions are repeatedly cited as cause for concern. For example, various port risk assessments cite local experts, in interviews and in response to questionnaires, clearly expressing that high river stage is an important factor in river casualties. This opinion is strongly supported by available data. Eleven years of casualty data from the Port of New Orleans and the Coast Guard clearly show a seasonal trend to river casualties. The high water months of February, March, April, and May experience two to three times the casualties that occur during the low-water months of July through October.

In addition, the studies point out that the Coast Guard acknowledges the fast Mississippi River current and low seasonal water temperatures as creating a very hostile environment. No matter how many Coast Guard, State, local, and other resources respond to a casualty involving a large number of persons in the water, it would be difficult to rescue everyone. The Coast Guard 1994 search and rescue exercise lead to the conclusion that, under adverse conditions, the Coast Guard could expect to rescue and save only a small percentage of the people in the water. This finding should be unacceptable to the Coast Guard and the Port of New Orleans, and the two agencies should consider alternative means to deal with this emergency. For example, prior to the *Bright Field* accident, the Bonnet Carré Spillway had only been opened seven times to alleviate high water conditions, apparently because of the cumbersome and lengthy tasks necessary to do so. Nonetheless, the risks associated with high water and rapid current were considered "unusual" enough that in March 1997, the spillway was opened for the eighth time. The Port of New Orleans, the Coast Guard, and the Corps of Engineers might consider more aggressive use of the Bonnet Carré Spillway to alleviate these high water conditions and to deal with the safety issues created by them. Further, if the major impediment to opening the spillway is the time and effort it takes to do so, it may be appropriate for the Corps of Engineers to consider ways to make the spillway more usable and to employ it for risk mitigation as well as for flood control.

No practical physical barrier aboard ship exists that will safely stop a runaway vessel. In

such an emergency, a safe outcome depends on the successful interaction of several physical and operational factors. For example, if main engine power is lost, adequate steering can usually be maintained until the ship slows enough for the anchors to be dropped. If a vessel loses its steering, engine power can be used to either slow the vessel (astern power) or, if it is a twin-screw vessel, to maneuver the ship.

Anchors are perceived as providing some level of protection by serving as "brakes" that will stop or at least slow a ship. But anchors are neither designed nor adequate for stopping a heavily loaded ship traveling at high speed. Had the *Bright Field*'s anchors been released, the anchor chain would quite likely have payed out at a speed that could not be controlled by the windlass brake, and the chain would simply have continued to run out until it parted from the ship. In this accident, the dropping of the anchor and paying out of chain could not have been expected to significantly slow, let alone stop, the ship.

Since this accident, the Coast Guard has placed renewed emphasis on having anchors at the ready (backed out of the hawsepipe, disengaged from the windlass, and being held by the brake), with a two-person forecastle watch. While having the anchors manned and at the ready may prove beneficial in certain circumstances, it is unlikely to achieve anything meaningful aboard a heavy vessel operating at relatively high speeds in the Mississippi River. Further, "increased emphasis" on having the anchors at the ready may even provide a false sense of security without effectively addressing the dangers inherent in operating heavy vessels at high speed in proximity to shoreside businesses and passenger vessels.

The notable characteristic of all previous risk assessment studies commissioned by the Coast Guard or the Dock Board was their limited scope. Most were conducted in light of specific proposals, such as the addition of gaming vessels to the port. Investigators determined that no comprehensive study has been done that considers all types of risks to all port properties and people. The Safety Board concludes that the stakeholders within the Port of New Orleans, including Federal, State, and local agencies; private commercial entities; shipowners; and pilot associations have not determined the overall level of risk associated with the full range of activities within the port area and have not provided adequate protection for persons and property in that area.

The Coast Guard has overall responsibility for maintaining public safety in the Port of New Orleans area. Under the *Ports and Waterways Safety Act of 1972*, the Congress charged the Coast Guard with monitoring and managing risk in all U.S. ports and taking actions to maintain risk at an acceptable level. In carrying out this role, the Coast Guard must assess and manage the risk that is inherent in all commercial activities within U.S. ports. In fact, in its *1996 Performance Report*, the Coast Guard's Office of Marine Safety and Environmental Protection asserts that managing risk is its primary mission. The Safety Board concurs with this assessment and notes that the Coast Guard has the authority, the responsibility, and the experience to direct a comprehensive assessment of risk in the Port of New Orleans.

The Safety Board believes that the Coast Guard, with the cooperation of all stakeholders within the Port of New Orleans, should conduct a comprehensive risk assessment that considers all activities, marine and shoreside, within the port area. In addition to those risk factors discussed earlier, this assessment should consider the risks to people and property, including shoreside businesses and passenger vessels, that are associated with relatively high-speed navigation of the river, high river stage and rapid river current, railroad and highway bridges spanning the waterway,[46] and the carriage of cargoes such as bulk oil or other hazardous materials or chemicals that can cause pollution, fire, or explosion.

The Safety Board notes that many of the risk factors associated with river commerce within the port area have already been identified in previous risk assessment studies and, further, that these factors may be amenable to known risk-reduction or risk-mitigation initiatives.

[46]For more information, see Highway-Marine Accident Report--*U.S. Towboat* Chris *Collision with the Judge William Seeber Bridge, New Orleans, Louisiana, May 28, 1993* (NTSB/HAR-94/03).

Such initiatives might include reducing vessel speed, opening the Bonnet Carré Spillway on a more regular basis, using tugboats either as escorts or as a "barrier" to protect marine assets, adequately assessing the protection afforded by silting-in of vulnerable areas, and moving the passenger vessels to a safer location. The Safety Board believes that the Coast Guard should, in cooperation with the appropriate stakeholders, including Federal, State, and local agencies; private commercial entities; shipowners; and pilot associations, implement risk-management and risk-mitigation initiatives that will ensure the safety of people and property within the Port of New Orleans. The Safety Board further believes that the Corps of Engineers, the State of Louisiana, the Dock Board, the IRC (including the New Orleans Hilton Riverside Hotel), New Orleans Paddlewheels, Inc., the New Orleans Baton Rouge Steamship Pilots Association, the Crescent River Port Pilots Association, and Associated Federal Pilots and Docking Masters of Louisiana, Inc., should participate with other stakeholders in instituting risk management and mitigation initiatives that will ensure the safety of people and property within the Port of New Orleans.

CONCLUSIONS

Findings

1. The following factors were not causal or contributory to the accident involving the *Bright Field*: weather, fatigue, malfunctioning of either the vessel's steering gear or equipment on the bridge, alcohol or other drugs, crew health, crew qualifications, or crew experience.

2. The *Bright Field* showed evidence of recurring engineering problems that affected vessel main engine reliability, and had all engineering systems been kept in good repair and regularly tested, the vessel may not have unexpectedly lost power during its voyage down the Mississippi River.

3. The *Bright Field* owners' oversight of testing and maintenance of the vessel's engineering systems was inadequate and led to unreliable performance of the engineering plant and contributed to the shutdown of the main propulsion engine on the day of the accident.

4. Insufficient information was available to determine whether any actions taken by the pilot and crew of the *Bright Field* would have been effective in preventing the allision or mitigating its effects.

5. At several points prior to and during the *Bright Field* emergency, the pilot, master, and crew of the vessel did not exchange information that under other circumstances could have prevented or at least mitigated the effects of the accident.

6. Use of bridge resource management precepts on board the *Bright Field* would have enhanced the exchange of information and the coordination of actions among the pilot, master, and crew during the accident sequence.

7. The response to the *Bright Field* accident by local emergency response agencies was timely and appropriate.

8. Evacuation of the *Queen of New Orleans* was hampered, and passenger risk increased, by the fact that only one gangway was made available for passenger egress during the emergency.

9. Nonoperating crewmembers of the *Queen of New Orleans* and the *Creole Queen* had not received training covering the full range of emergency scenarios and were unprepared to properly carry out their responsibilities in this accident.

10. The lack of effective recurring safety briefings for occupants of the *Queen of New Orleans* regarding emergency and evacuation procedures may have contributed to the confusion and panic reported among passengers and crew during the vessel evacuation.

11. The instruction placards and signage aboard the *Queen of New Orleans* were ineffective in disseminating emergency instructions and vessel information to passengers.

12. The International RiverCenter and the Board of Commissioners of the Port of New Orleans did not conduct adequate risk assessment nor perform adequate safety management oversight to protect their properties and the people that use them from an allision such as that involving the *Bright Field*.

13. The U.S. Coast Guard, the Board of Commissioners of the Port of New Orleans, and the property owners did not adequately address the risks posed to moored vessels along the Erato, Julia, Poydras, and Canal Street wharves; as a result, under certain

conditions, those vessels were vulnerable to ramming by other marine traffic.

14. Operating a vessel at full speed in the restricted waters of the Mississippi River may not allow sufficient time or distance to recover from an emergency.

15. The stakeholders within the Port of New Orleans, including Federal, State, and local agencies; private commercial entities; shipowners, and pilot associations have not determined the overall level of risk associated with the full range of activities within the port area and have not provided adequate protection for persons and property in that area.

Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the failure of Clearsky Shipping Company to adequately manage and oversee the maintenance of the engineering plant aboard the *Bright Field*, with the result that the vessel temporarily lost power while navigating a high-risk area of the Mississippi River. Contributing to the amount of property damage and the number and types of injuries sustained during the accident was the failure of the U.S. Coast Guard, the Board of Commissioners of the Port of New Orleans, and International RiverCenter to adequately assess, manage, or mitigate the risks associated with locating unprotected commercial enterprises in areas vulnerable to vessel strikes.

RECOMMENDATIONS

As a result of its investigation of this accident, and in addition to the safety recommendations issued previously to the U.S. Coast Guard, to the Board of Commissioners of the Port of New Orleans, and to New Orleans Paddlewheels, Inc., the National Transportation Safety Board makes the following safety recommendations:

--to the U.S. Coast Guard:

In cooperation with the Board of Commissioners of the Port of New Orleans, reassess the risk of locating passenger vessels along the left descending bank of the Mississippi River and determine whether to remove the vessels to a less vulnerable location or put in place procedural, operational, or physical barriers that will protect these vessels from ramming by riverborne traffic. (M-98-1)

Conduct, with the cooperation of all stakeholders, a comprehensive risk assessment that considers all activities, marine and shoreside, within the Port of New Orleans. (M-98-2)

Take the lead in working with the pilot associations serving the Port of New Orleans to evaluate the impact of operating vessels at full speed in the Mississippi River and incorporate that information in your risk-management and risk-reduction strategies for the port area. (M-98-3)

In cooperation with the appropriate stakeholders, including Federal, State, and local agencies; private commercial entities; shipowners; and pilot associations, implement risk-management and risk-mitigation initiatives that will ensure the safety of people and property within the Port of New Orleans. (M-98-4)

--to the U.S. Army Corps of Engineers:

Participate with the U.S. Coast Guard and other stakeholders in a comprehensive risk assessment that considers all activities, marine and shoreside, within the Port of New Orleans. (M-98-5)

In cooperation with the appropriate stakeholders, including Federal, State, and local agencies; private commercial entities; shipowners; and pilot associations, implement risk-management and risk-mitigation initiatives that will ensure the safety of people and property within the Port of New Orleans. (M-98-6)

--to the State of Louisiana:

Participate with the U.S. Coast Guard and other stakeholders in a comprehensive risk assessment that considers all activities, marine and shoreside, within the Port of New Orleans. (M-98-7)

In cooperation with the appropriate stakeholders, including Federal, State, and local agencies; private commercial entities; shipowners; and pilot associations, implement risk-management and risk-mitigation initiatives that will ensure the safety of people and property within the Port of New Orleans. (M-98-8)

--to the Board of Commissioners of the Port of New Orleans:

As part of the permit-approval process for new commercial and residential development along the wharves within your jurisdiction, require that any new construction of occupied space be sited behind a buffer zone sufficient to protect persons and property by safely absorbing the impact should a vessel strike the wharf. (M-98-9)

In cooperation with the U.S. Coast Guard, reassess the risk of locating passenger vessels along the left descending bank of the Mississippi River and determine whether to remove the vessels to a less vulnerable location or put in place procedural, operational, or physical barriers that will protect these vessels from ramming by riverborne traffic. (M-98-10)

Participate with the U.S. Coast Guard and other stakeholders in a comprehensive risk assessment that considers all activities, marine and shoreside, within the Port of New Orleans. (M-98-11)

In cooperation with the appropriate stakeholders, including Federal, State, and local agencies; private commercial entities; shipowners; and pilot associations, implement risk-management and risk-mitigation initiatives that will ensure the safety of people and property within the Port of New Orleans. (M-98-12)

--to International RiverCenter:

As previously suggested by the Board of Commissioners of the Port of New Orleans, immediately enhance the safety of the patrons and employees of the Riverwalk complex by widening, by a minimum of 50 feet, that length of the Poydras Street wharf that has not previously been extended. (M-98-13)

Participate with the U.S. Coast Guard and other stakeholders in a comprehensive risk assessment that considers all activities, marine and shoreside, within the Port of New Orleans. (M-98-14)

In cooperation with the appropriate stakeholders, including Federal, State, and local agencies; private commercial entities; shipowners; and pilot associations, implement risk-management and risk-mitigation initiatives that will ensure the safety of people and property within the Port of New Orleans. (M-98-15)

--to Clearsky Shipping Company:

Perform a baseline engineering assessment of the *Bright Field*'s engineering plant and correct all conditions not in conformance with manufacturer's specifications. (M-98-16)

Institute an engineering testing, maintenance, repair, and company oversight program for the *Bright Field* that will ensure safe and reliable operation of the vessel's engineering plant. (M-98-17)

Provide your bridge and engineroom watchstanding officers and crewmembers with initial and recurrent bridge resource management training that includes communication and coordination between pilots and members of the bridge and engineroom watches and that addresses their use of bridge and engineroom systems. (M-98-18)

--to New Orleans Paddlewheels, Inc.:

In accordance with the guidance published by the Passenger Vessel Association, require that nonoperating crewmembers on all your vessels participate in formal emergency training and drills in the proper handling of emergencies that have the potential to affect the persons in their charge. Maintain written records to verify nonoperating crew proficiency levels and skill retention. (M-98-19)

Review the existing methods of providing safety information to boarding passengers and make the necessary improvements to ensure that all vessel occupants receive recurring safety briefings, regardless of whether the vessel is scheduled to leave the dock. (M-98-20)

On all your vessels, post emergency instructions that are printed on fire- and heat-resistant material and that are clearly visible to all passengers both under normal conditions and during emergencies when lighting and visibility may be diminished. (M-98-21)

Participate with the U.S. Coast Guard and other stakeholders in a comprehensive risk assessment that considers all activities, marine and shoreside, within the Port of New Orleans. (M-98-22)

In cooperation with the appropriate stakeholders, including Federal, State, and local agencies; private commercial entities; shipowners; and pilot associations, implement risk-management and risk-mitigation initiatives that will ensure the safety of people and property within the Port of New Orleans. (M-98-23)

--to the New Orleans Baton Rouge Steamship Pilots Association:

Encourage your members to participate in initial and recurrent bridge resource management training that teaches the principles of resource management and that emphasizes team coordination between the pilot and crew. (M-98-24)

Participate with the U.S. Coast Guard and other stakeholders in a comprehensive risk assessment that considers all activities, marine and shoreside, within the Port of New Orleans. (M-98-25)

In cooperation with the appropriate stakeholders, including Federal, State, and local agencies; private commercial entities; shipowners; and pilot associations, implement risk-management and risk-mitigation initiatives that will ensure the safety of people and property within the Port of New Orleans. (M-98-26)

--to the Crescent River Port Pilots Association:

Participate with the U.S. Coast Guard and other stakeholders in a comprehensive risk assessment that considers all activities, marine and shoreside, within the Port of New Orleans. (M-98-27)

In cooperation with the appropriate stakeholders, including Federal, State, and local agencies; private commercial entities; shipowners; and pilot associations, implement risk-management and risk-mitigation initiatives that will ensure the safety of people and property within the Port of New Orleans. (M-98-28)

--to Associated Federal Pilots and Docking Masters of Louisiana, Inc.:

Participate with the U.S. Coast Guard and other stakeholders in a comprehensive risk assessment that considers all activities, marine and shoreside, within the Port of New Orleans. (M-98-29)

In cooperation with the appropriate stakeholders, including Federal, State, and local agencies; private commercial entities; shipowners; and pilot associations, implement risk-management and risk-mitigation initiatives that will ensure the safety of people and property within the Port of New Orleans. (M-98-30)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

JAMES E. HALL
Chairman

ROBERT T. FRANCIS II
Vice Chairman

JOHN A. HAMMERSCHMIDT
Member

JOHN J. GOGLIA
Member

GEORGE W. BLACK, JR.
Member

January 13, 1998

APPENDIX A

Investigation

The Safety Board learned of the accident involving the *Bright Field* about 1700 on December 14, 1996. A five-person investigation team consisting of an investigator-in-charge, an engineering specialist, an operations specialist, a human performance specialist, and a survival factors specialist arrived on scene on December 15, 1996, accompanied by representatives from the Safety Board's Offices of General Counsel and Public Affairs. Member Hammerschmidt was the Board Member on scene.

This accident was investigated jointly by the Safety Board and the U.S. Coast Guard under the authority of section 304(a)(1)(E) of the Independent Safety Board Act of 1974 and in accordance with 49 CFR 850, "Coast Guard-NTSB Marine Casualty Investigations." The Coast Guard invited the Government of Liberia to participate in the investigation, in accordance with the IMO resolution A637, "Co-Operation in Maritime Casualty Investigations." The Government of Liberia accepted the invitation and a representative participated fully in all aspects of the investigation.

Hearing / Deposition

The Safety Board did not conduct a public hearing in connection with this accident. However the Safety Board was a participant in the U.S. Coast Guard Marine Board of Investigation public hearings held in New Orleans, Louisiana, on December 17-21, 1996; January 6-11 and 29-30, 1997; and March 19-20, 1997.

this page intentionally left blank

APPENDIX B

Chronology of *Bright Field* Engineering Problems

October 1995

25th Owner notes concern about continuing cracking problems on Sulzer RTA62 main engines and attributes problem to design, material, manufacturer, operation and handling. Provides specific instructions to masters and chief engineers about operation and maintenance parameters.

January 1996

1st Chief engineer reports to owner about serious engineering problems on the Bright Field including cracked main engine cylinder liners, and loss of power while transiting the Panama Canal due to low main engine lubrication oil system pressure because of an excessive pressure drop across the second filter.

February 1996

2nd Master telexes owner that he has to run at reduced rpms because of main engine overheating problems and frequent “auto slowdowns”.

March 1996

Master telexes owner that engineering equipment malfunctions frequently due to the age and condition.

April 1996

Bright Field dry docked in Nan Tung, China.

May 1996

20th Master telexes owner about severe damage to the main engine’s No. 2 cylinder and piston. No spare parts available.

June 1996

2nd Second engineer's maintenance log reports repairs to the main engine's No. 2 and 3 cylinder liners and pistons.

July 1996

5th 0900, arrived Long Beach, California.

23rd Anchored, Japan.

26th Renewed #2 piston, cylinder liner and rings to main engine.

August 1996

3rd Trouble with a pneumatic control valve 14B in automated propulsion pneumatic logic control.

4th Removed #5 piston and cylinder liner to main engine, replaced cylinder liner.

5th Removed #4 cylinder liner and piston rings to main engine, replaced piston rings with "used" rings.

6th 1500, departed for Indonesia.

16th 0440, arrived Pulau Laut, Indonesia.

18th 1245, departed Pulau Laut, Indonesia for Hong Kong.

26th Arrived Hong Kong. Owner's representative boards vessel.

27th Repaired main engine pneumatic control valve 38A

28th 0005, departed Hong Kong

September 1996

2nd Arrived Banjarmasin, Borneo, Indonesia to load cargo of steaming coal.

3rd Renewed #1 cylinder liner and piston to main engine (liner cracked, piston head burnt and dented).

5th Master informs owner must purchase fresh water, evaporator can only make 10 metric tons, vessel consumes 15 metric tons daily.

6th Owner telexes Bright Field that main engine lubrication oil analysis shows low flash point and high viscosity with possible fuel oil leakage into sump.

9th Ordered replacement parts for main engine fuel injection pump, cracked valve

12th Departed Banjarmasin, Indonesia, enroute Davant, Mississippi River (e.t.a. Oct 26th)

17th 0400, #4 piston rings seized and broken, running at reduced speed (65 rpms). Master hopes to make Singapore for repairs. Chief engineer recommends lifting out #4 piston for repairs.

18th 0500, drifting while repairing rings to #4 piston, changed piston crown to #4 broken piston crown bolts and no more spares. Also found water leakage in #4 cylinder by piston crown damage. Discovered ring damage to #1, 2, 4, 5 pistons, found blocked holds where cylinder oil is injected. #5 cylinder not working correctly, found cylinder liner cracks. Not enough spare parts for piston ring and cylinder liner repairs, Master telexes owner, "Serious trouble! Except for #1, all cylinder liners leaking gas. Not sure of safety".

18th 0448, stopped main engine for repairs. Renewed #4 piston rings and piston crown. Welded cracked in cylinder liner.

19th Rough seas main engine still under repair. Notes high level of impurity in main engine and blockage of filters.

20th Master reports vessel in area of typhoon. Main engine damage is serious with no spare parts available. Welded cracks in #5 cylinder liner. Replaced #4 cylinder liner with old used liner (old #1). Engineering crew exhausted.

21st Dirty air cooler. Can not dismantle to clean because of sea conditions.

22nd 1600, completed temporary main engine repairs. #4 cylinder liner still leaking, running at reduced rpms enroute Spore, Singapore for repairs main engine, air cooler e.t.a. 30 Sept.

25th High main engine scavenging temp due to malfunctioning sea water cooler and main engine air cooler.

26th Repairs to both main high pressure air compressors.

28th Evaporator out of commission due to faulty pump.

29th Main engine slowdown.30th , 0700 arrived Spore, Singapore.

October 1996

1st Chief electrician tests some temp/pressure sensors.

2nd Telephone conversation between second engineer and owner concerning the quality of the main engine's lubrication oil. In telex to owner, master reports that the chief engineer has increased main engine cylinder oil flow rate.

3rd Owner's representative boards vessel and reports concern about poor operating condition of *Bright Field's* main engine and lack of confidence in chief engineer. Master telexes repairs completed, enroute Devant, LA, via Suez Canal, e.t.a. 15 Nov

4th Urgent request for spare parts at Suez for high pressure air compressor, boiler fuel oil burning pump, evaporator.

7th Revised e.t.a. Devant, LA, Nov 21th.

9th Mmaster requested permission to reduced main engine speed to 63 rpms due to high exhaust gas temps and 'overloads'. Reports continued cylinder cracking problems if speed isn't reduced.

10th Main engine temp problems due to air/electrical valve in speed control system. Chief engineer overhauls 14A, 4B, and 7D pneumatic control valves.1st , renewed #1 piston rings. Renewed #4 cylinder liner.

11 Main engine fuel timing cannot be adjusted.

17th Response to owner message, can't increase speed more.

21st 1400, arrived Suez Canal.

21st No. 2 & 3 cylinder leaking past piston rings and stuffing boxes. #2 piston found to have dented head, planned to lift out #2 and #3 pistons to inspect/change damaged rings before departure from Suez.

23rd Renewed #2 and #3 piston rings.

24th Main engine repairs completed. Ring damage attributed to poor quality of rings. main engine cylinder oil consumption is 1.32 g/hp-h. Departed Port Said, e.t.a. Devant, LA is Nov 16th.

28th Second engineer looking for tools to set main engine fuel oil injecting timing.

30th Main engine calibration tools found on board surveyed in response to owner request.

November 1996

4th Reduced rpm to 61 due to high exhaust gas temperatures (508C vs. alarm at 515C). Request repair of CRT monitors and main engine fuel injection pump timing.

5th 2200, slow down caused by the high crank case oil mist alarm. Heavy smoke emitted from main engine, repair work underway.

6th 1800, stopped main engine, found hole in #5 piston head cracked and leaking exhaust gases through stuffing box into crank case, contaminating lube oil. Found #5 main engine piston head burn through. Replaced with old used piston head. Engineering crew renews main engine sump lubricating oil due to concern about low flash point of oil. Only replaced 8.4 cubic meters of oil (all that was in storage). Owner informed main engine sump was cleaned.

7th 2300 underway again running at reduced speed (61 rpms) due to high exhaust temperatures.

8th Request for spare parts: 2 piston heads, piston rings, main engine fuel injection valve. Request for 14 tons of main engine lubrication oil (no spare), 10 tons for storage and 4 tons to be added to the main engine sump. New e.t.a is Nov 20th.

12th Chief engineer notes that vessel does not have proper tools to set main engine fuel oil pump timing correctly. Consulting instruction books. 1200 hours stopped to try to adjust fuel pump timing based on instructions from owner. 1800 work completed underway again.

13th New e.t.a. Nov 21st

14th Requesting 14,000 liters of main engine lube oil on arrival Davant. Auxiliary boiler FO boost pump ooc (requested spare parts on August 27th), no spare parts. Must use diesel oil instead of bunker fuel oil every time main engine and G/Es are started and stopped.

14th Master requests main engine expert meet vessel to solve problems, no one on board knows how to fix problems. Attempted to increase rpms from 61. At 63 turbocharger inlet temp rose to 510 (alarm at 515C). Reduced speed to 61 rpms.

15th Master notes last d/d 04-28-96 and last special survey 17-09-95.

20th Second engineer still looking for missing tool to set main engine fuel oil injector timing.

21st 0610 at sea buoy, set manned engine room. Chief engineer relieved of duty and replaced. 1630 along side Davant coal dock to off load coal.

21st Sulzer technical representative checks main engine. Identifies several sources of possible lube oil contamination. Notes many serious problems with the main engine.

22nd Master reports results of Sulzer survey to owner.

24th Tested main engine emergency shut downs.

25th 0849 coal discharge completed, anchored Mississippi River to clean cargo holds.

25th Overhauled #2 main engine cylinder, new piston head.

26th Bunkering fuel oil and diesel oil.

27th Vessel fails cargo hold inspection. Engineering crew rebuilds main engine injector pumps and set timing with help of Sulzer technical representative. Vessel receives approximately 8,000 liters of main engine lubrication oil.

28th Overhauled #5 main engine cylinder, replaced piston rings, found three small cracks in liner.

30th Repaired defective main engine emergency stop valve.

December 1996

1st Master requests engineering spare parts. Notes status of repair work; #2 and #5 cylinders cracked and piston rings worn (poor quality), cleaned stuffing boxes and scavenging air boxes, air/water separator for air cooler and exhaust manifold, M/E fuel oil pump timing with assistance of Sulzer, main engine emergency stop system repaired 3 control air valves.

2nd Crew attempted unauthorized repair to Terasaki monitors.

5th Vessel passed hold inspection. Repaired main engine control air supply pressure reducers (A-124HA,124HB).

7th Tested main engine with sea trial data and found continued high turbocharger inlet temps. Recommended repairs to turbocharger and /or air cooler.

9th Chief engineer sends notice to owner confirming seriousness of engineering problems observed by Sulzer technician. At 1200, along side Cargil (Reserve) grain loading facility to load cargo.

11th Found turbocharger rotor rings worn. 1317 completed loading corn.

12th Renewed #5 cylinder piston rings. Chief engineer sends off main engine lube oil sample.

12th Anchored Mississippi River for repairs to turbocharger and air cooler by local engineering repair service.

13th ETD December 14, 0800. Next port of call is Cristobal, Panama with an ETA of December 19th at 1600.

14th 0700, engineering repairs completed, 0945, vessel underway from Reserve, sailed from

anchorage at 1112, draft forward 11.96m, draft aft 12.06m., ETA Kashima, Japan on January 18, 1997.

14th 1055 and 1110, main engine will not start in W/H control.

14th 1158 and 1235, main engine experiences overheating alarms/problems due to jacket water cooling problems.

14th 1406, loss of main engine lube oil pressure. Failure of standby lube oil pump to start. Low pressure alarm and main engine trip.

APPENDIX C

Voyage Data Recorders (VDRs)

The Safety Board has long considered that marine VDRs (also known as voyage event recorders, or VERs), when used as management oversight tools, can provide valuable information, not only on engineering plant performance, but on crew performance and training needs. Use of a VDR to monitor crew performance can provide management with a means of measuring training effectiveness and identifying needed changes in training or procedures. When used as accident reconstruction tools, VDRs help investigators determine how an accident occurred so that they can develop measures to help prevent similar accidents.

The Safety Board has promoted the use of VDRs of various types since the 1970s and is on record in support of the value of these systems as management tools as well as accident investigation tools. Safety Board staff has been extensively involved in aviation and surface vehicle data recorder readout, data analysis, rulemaking, and technical standards development for VDRs. The Safety Board has been working closely with the Coast Guard for more than 1 year in an effort to develop International Maritime Organization (IMO) carriage requirements and technical standards for VDRs.

The IMO's Navigation Subcommittee has requested that the International Electrotechnical Commission (IEC) develop an international technical testing standard for VDRs. The standard will be based on the IMO recommendations. The IEC working group (TC-80/WG-11) commenced work in March 1997 and expects to publish a standard in 1999. Representatives from the Safety Board are working with the IEC group to develop the standard.

The IMO is expected to require the installation of VDRs on roll-on roll-off (RORO) passenger ferries as early as 1998, followed by a requirement for VDRs on all vessels of more than 1,600 gross tons within the next 4 to 5 years. While the Safety Board would prefer more timely deployment of VDRs, it is encouraged that this significant issue is finally receiving international attention and action.