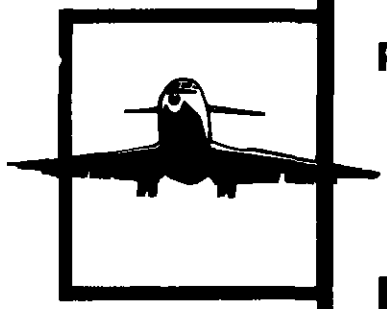

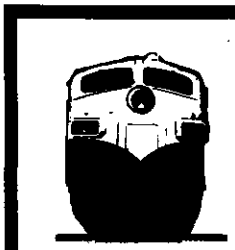

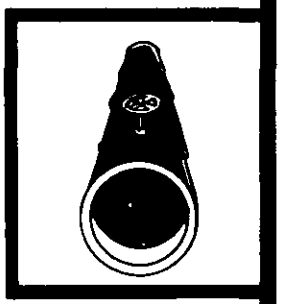

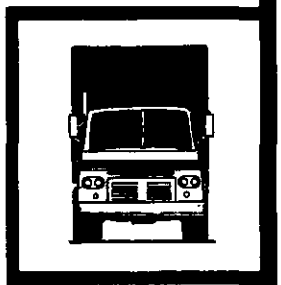

PB85-916412

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

MARINE ACCIDENT REPORT

EXPLOSION AND FIRE ABOARD THE U.S. MOBILE OFFSHORE DRILLING UNIT ZAPATA LEXINGTON GULF OF MEXICO SEPTEMBER 14, 1984

NTSB/MAR-85/11

UNITED STATES GOVERNMENT

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15. Supplementary Notes

16. Abstract About 1230 on September 14, 1984, the U.S.-flag mobile offshore drilling unit (MODU) ZAPATA LEXINGTON suffered an explosion and fire while moored and conducting drilling operations in 1,465 feet of water in the Gulf of Mexico. The accident occurred while procedures were being employed to evacuate a gas bubble from the subsea blowout preventer stack on the sea floor. Instead, gas trapped in the blowout preventer entered the base of the marine riser, rose to the surface, and escaped into the atmosphere, expelling a large volume of drilling mud out of the riser. The gas infiltrated the areas above and below the drill floor at the base of the derrick and was ignited. The explosion and fire that followed resulted in the deaths of four persons and severe injuries to three persons. Sixty-four persons abandoned the MODU using two survival capsules and three inflatable liferafts. The gas fire burned itself out about 30 minutes after the rig was evacuated. The cost of repairs was estimated at $12 million.

The National Transportation Safety Board determines that the probable cause of the explosion and fire was the accidental ignition of gas released to the atmosphere through the marine riser during an attempt to evacuate gas from the blowout preventer stack. Contributing to the cause of the accident was the failure of the drilling crew to use the diverter system when the return flow of drilling mud became excessive. Contributing to the number of injuries was the failure of the rig's supervisory personnel to exclude nonessential personnel from high-risk areas during critical well control operations.

17. Key Words	18. Distribution Statement
mobile offshore drilling unit (MODU); drilling rig; formation gas; kick; drilling fluid; drill pipe; blowout preventer (BOP); casing; tool joint; annular; choke manifold; shale shaker; gumbo box; diverter; kill mud; gas-cut mud; lifeboat winch; drill floor	This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

MARINE ACCIDENT REPORT

Adopted: October 1, 1985

EXPLOSION AND FIRE ABOARD THE U.S. MOBILE OFFSHORE DRILLING UNIT ZAPATA LEXINGTON, GULF OF MEXICO, SEPTEMBER 14, 1984

INTRODUCTION

This accident was investigated by the National Transportation Safety Board together with the Mineral Management Services, U.S. Department of the Interior and the U.S. Coast Guard. Public hearings were held in Metairie, Louisiana from December 3, 1984, to December 7, 1984, and sworn testimony was taken on January 3, 1985, in New York, New York, and on March 19, 1985, in Houston, Texas. This report is based on factual information developed in the investigation. The Safety Board has considered all the facts pertinent to the Safety Board's statutory responsibility to determine the cause or probable cause of the accident and to make recommendations.

The Safety Board's analysis and recommendations are made independently of the Mineral Management Services and the Coast Guard. To insure public awareness of all Safety Board recommendations and the response thereto, notices of all such recommendations and responses are published in the Federal Register.

SYNOPSIS

About 1230 on September 14, 1984, the U.S.-flag mobile offshore drilling unit (MODU) ZAPATA LEXINGTON suffered an explosion and fire while moored and conducting drilling operations in 1,465 feet of water in the Gulf of Mexico. The accident occurred while procedures were being employed to evacuate a gas bubble from the subsea blowout preventer stack on the sea floor. Instead, gas trapped in the blowout preventer entered the base of the marine riser, rose to the surface, and escaped into the atmosphere, expelling a large volume of drilling mud out of the riser. The gas infiltrated the areas above and below the drill floor at the base of the derrick and was ignited. The explosion and fire that followed resulted in the deaths of four persons and severe injuries to three persons. Sixty-four persons abandoned the MODU using two survival capsules and three inflatable liferafts. The gas fire burned itself out about 30 minutes after the rig was evacuated. The cost of repairs was estimated at $12 million.

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INVESTIGATION

The Accident

On September 14, 1984, the semisubmersible U.S.-flag mobile offshore drilling unit (MODU) ZAPATA LEXINGTON (see figure 1) was moored and conducting drilling operations in 1,465 feet of water at a drilling site in the Gulf of Mexico, about 150 miles south-southeast of New Orleans, Louisiana. The drilling rig, owned and operated by Zapata Off-Shore Company (Zapata), was under contract to Conoco, Inc. (Conoco) to drill an exploratory well for petroleum in Green Canyon Block 69, Lease OCS-G 5893. Drilling was suspended at 0520 1/ at a depth of 9,535 feet below the sea floor to remove an accumulation of formation gas (kick) [15] 2/ from the well. The senior toolpusher [26] and Conoco's representative [6] were notified of the situation and immediately reported to the drill floor [10]. (See figure 2.) The No. 3 pipe rams [20] in the blowout preventer (BOP) [3] were closed. (See figure 3.) Heavier drilling mud [12] was pumped through the drill pipe into the well bore [28], thereby displacing the lighter drilling mud and gas which was circulated back to the surface through the choke manifold [5] via a subsea flow line or choke line [4]. The process continued until the heavier mud appeared on the surface through the annulus [1] and choke line and the pressure readings in the drill pipe and the well casing were reduced to zero. By 1000, the drilling crew had circulated the gas out of the well and believed that it had prevented a well blowout [2], which can occur when gas accumulates in a well while drilling. However, the pipe rams may have been closed on a tool joint [25] in the drill pipe which would have permitted the gas to enter the upper portion of the BOP. (A later examination of the tool joint revealed scours that matched the No. 3 pipe rams in the BOP.)

Shortly after 1030, the drilling crew started a procedure to evacuate any trapped gas that might be remaining in the blowout preventer and the marine riser [18]. The drilling crew had closed the No. 3 pipe rams (see figure 3). In the process, gas under pressure entered the marine riser and as it rose to the surface expelled drilling mud from the marine riser. Shortly after noon, Conoco's representative left the drill floor and went to a lower deck to observe the mud returns at the gumbo box [14] where drilling mud is exposed to the atmosphere during the recycling process. Anticipating that gas-cut mud [13] would appear in the gumbo box (see figure 4), the Conoco representative instructed two rig crewmen to spray water over the area to wet and cool any gas that might be released, meanwhile keeping the senior toolpusher on the drill floor informed by telephone. The on-duty driller, the assistant driller, a floorhand, and a cleaner/painter were also on the drill floor. The cleaner/painter and the floorhand were washing mud from the bulkheads and decks and a stair landing outside a drill floor entry. Another floorhand was tending the equipment in the shale shaker [22] room, located below the drill floor level.

The Conoco representative stated that about 1230 the rate of flow decreased slightly, but that toward the end of the evacuation process in the riser based on his observation, the flow of mud and gas to the gumbo box increased significantly, splashing uncontrollably about the area, and a loud rumbling was heard, shaking the entire rig. The mud flow across the gumbo box increased. There was a diverter [8] system installed on the vessel through which the flow of drilling mud could be directed directly overboard rather than through the gumbo box and the shale shaker. However, the location of the telephone with respect to the gumbo box was such that the mud flow prevented the

1/ All times are central daylight time based on a 24-hour clock.
2/ The numbers in brackets throughout this report refer to the glossary of terms used in the offshore industry in appendix A.

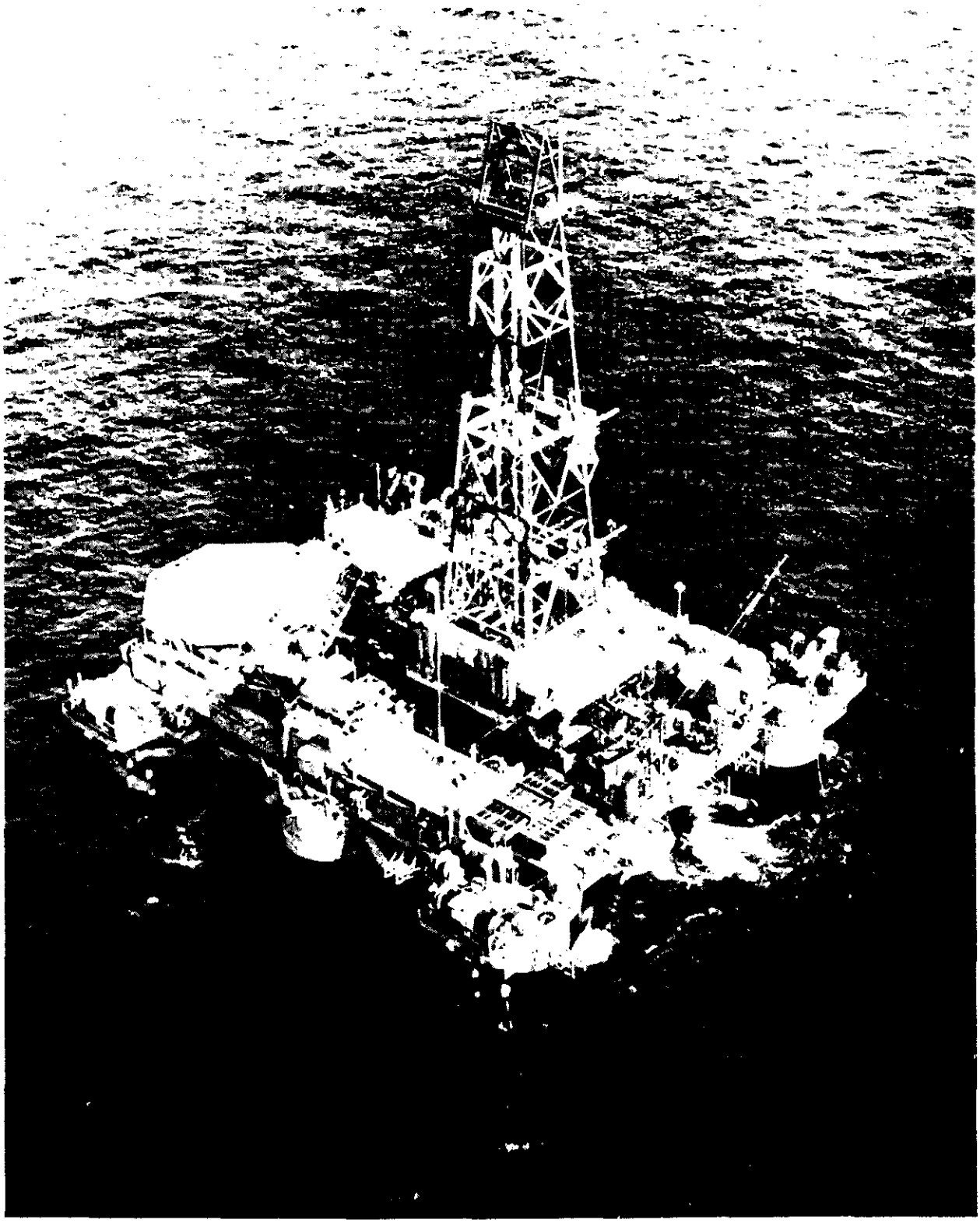

Figure 1.--U.S. mobile offshore drilling Unit ZAPATA LEXINGTON.

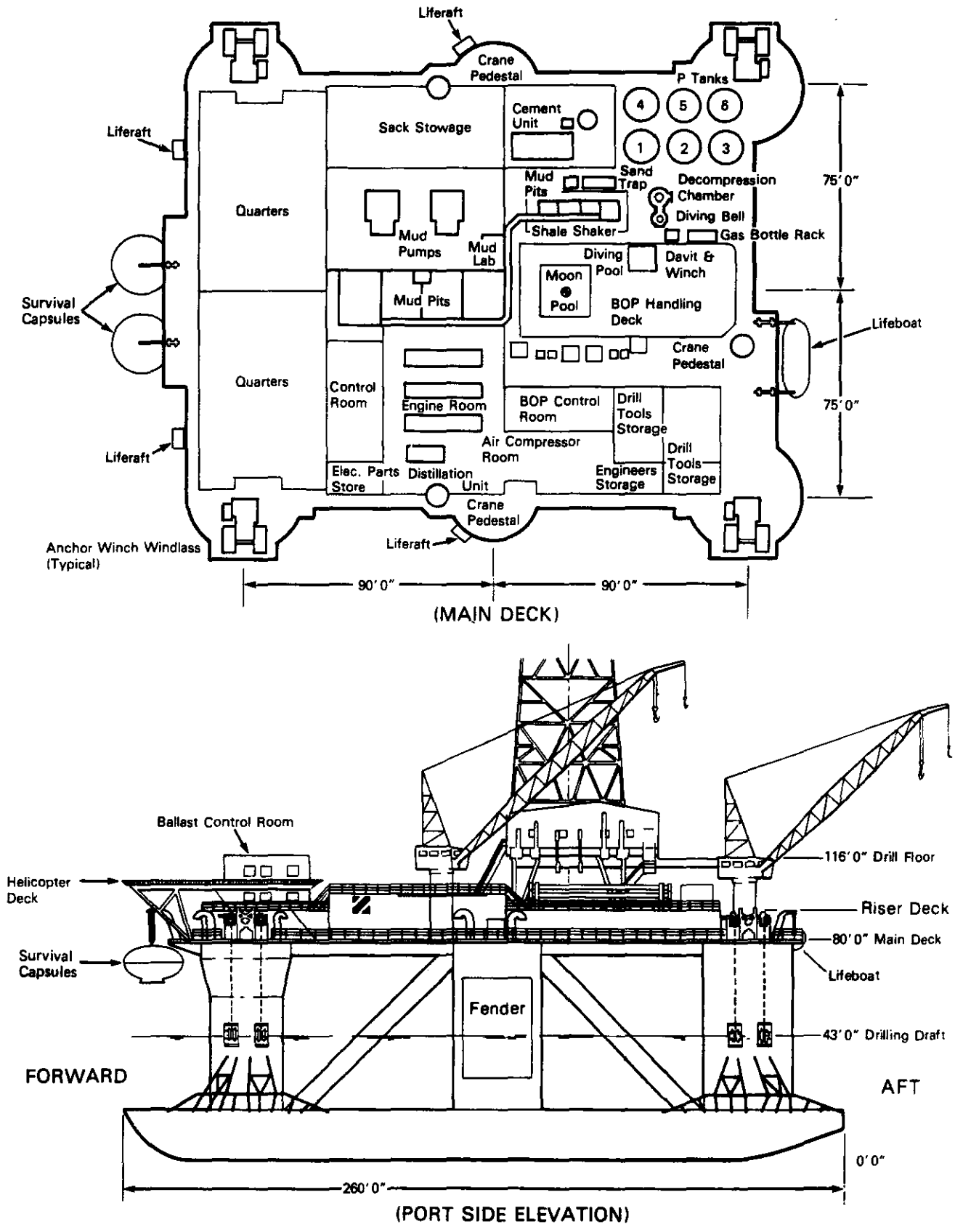

Figure 2.--Main deck arrangement and elevation of the ZAPATA LEXINGTON.

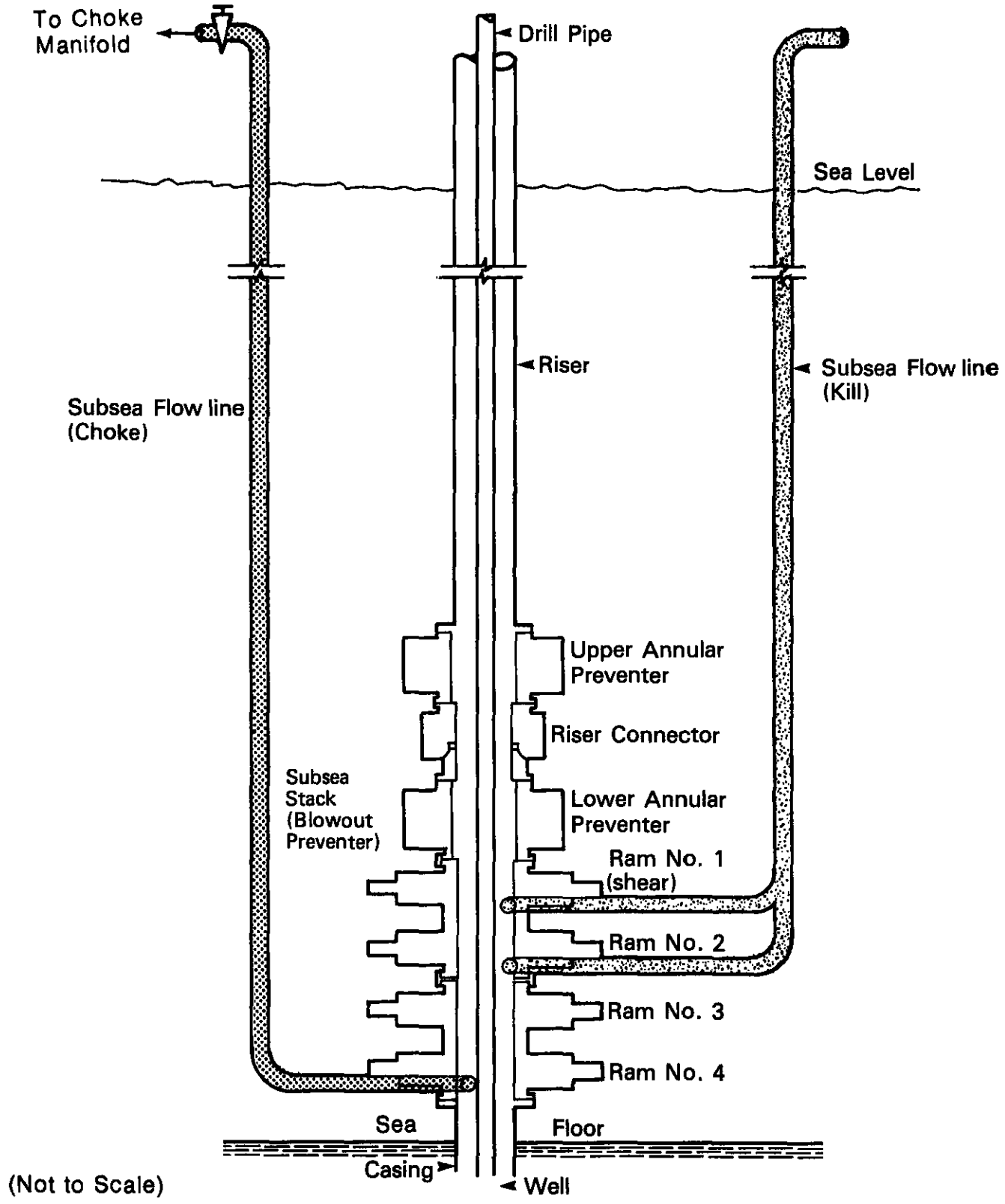

Figure 3.--Diagram of blowout preventer (BOP), marine riser, and subsea flowlines of the ZAPATA LEXINGTON.

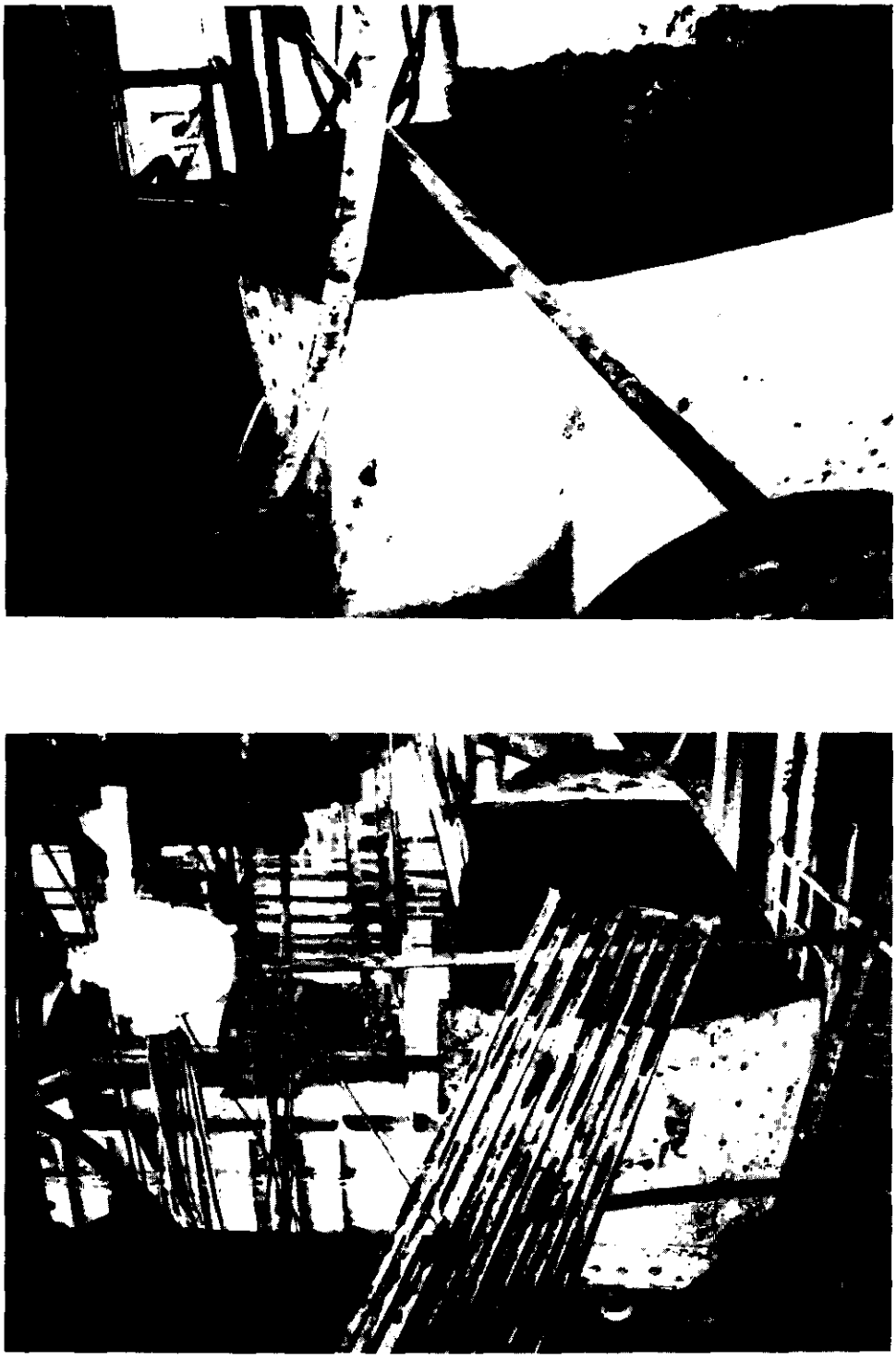

Figure 4.--Side view of the gumbo box (top) and end view of the gumbo box and gratings (bottom).

Conoco representative from reaching it to communicate with the senior toolpusher on the drill floor where the controls to the diverter system were located. Standing about 10 feet from the gumbo box, he shouted to his assistant and the two rig crewmen on the deck, "It's time to leave." The four persons ran from the area as a flash of fire erupted near the gumbo box and instantly enveloped the entire area in flame, including the shale shaker room below and the drill floor above at the base of the derrick [7]. (See figure 2.)

The ZAPATA LEXINGTON pit level and flowline indicator record, a circular time graph that automatically recorded the level of the drilling mud returns in the mud tanks and the rate of flow in the mud return line, indicated that the period of severe flow lasted for about 30 minutes, during which time gas was released to the atmosphere.

About 1230, the ballast control operator on duty in the ballast control room, located over the living quarters at the same level as the helicopter deck, heard a sound similar to gas escaping. Thinking that perhaps the sound was from gas venting overboard through the diverter system, he looked out through the starboard windows of the control room at the starboard diverter pipe. He then went into the radio room, adjacent to the control room, and through the radio room windows, saw the base of the derrick in flames, reaching up about two-thirds of the height of the derrick. He immediately returned to the ballast control room and sounded a fire signal on the general alarm. The ballast control operator stated that he sounded "six or seven short blasts and depending on the location--which was the entire drill floor--I rang two prolonged blasts." 3/ Using the controls on the ballast control board, he then opened the necessary valves and started the drill rig's two fire pumps located in the pump room of each pontoon to charge the fire hydrants. The barge engineer reported to the ballast control room, checked the ballast control panel, donned a fire suit, and attempted to fight the fire with a fire extinguisher.

The ZAPATA LEXINGTON's standby boat, the CHAD G, was made fast to a mooring buoy about 1/4 mile from the rig when it received a distress message concerning the fire broadcast by radio from the ZAPATA LEXINGTON. In addition to learning of the fire over the radio, the operator of the CHAD G also saw flames and smoke aboard the drilling rig. He immediately got underway and proceeded to the bow of the ZAPATA LEXINGTON to await launching of the survival capsules. Additional distress messages were transmitted by the operator of the CHAD G over VHF-FM channels 6 and 16. The fire pump aboard the standby boat was placed in operation, and a fire monitor was directed at the fire while the boat was awaiting the evacuation of rig personnel.

Upon hearing the fire signal, off-duty personnel aboard the ZAPATA LEXINGTON assembled at their muster stations and prepared to evacuate the rig. Although it is unknown who sounded the abandon rig signal, witnesses indicated that it was sounded from a location other than the ballast control room, probably from the toolpusher's office very shortly after the fire signal. The ballast control operator stated that in addition to the ballast control room, the general alarm could be sounded from the toolpusher's office and the engineroom. After the two survival capsules had been lowered and had moved away a safe distance from the burning drill rig, approximately 12 persons volunteered to remain aboard to continue fighting the fire.

Three firefighting parties were organized to fight the fire. Two parties manned the firehoses while the third group closed hatches and ventilators. After firefighting had been in progress about 10 minutes, water pressure on the fire main was lost. The investigation

3/ The ZAPATA LEXINGTON's Station Bill states that the fire signal is short rings on the general alarm for 10 seconds followed by three short rings indicating the rig floor as the fire location. (See appendix B.)

revealed that the compressed air supply to both pumprooms had been lost, causing the pneumatically operated suction valves for the fire pumps to close and thereby shutting off the water supply to the pumps. The ballast control operator noticed that the valves had closed, but because of his lack of knowledge of the system, he did not open the two motor-driven crossover valves that would have connected the fire pumps with the high seachests. The barge engineer, who was more knowledgeable about the firefighting system, did not react to the loss of water pressure in the fire mains.

The Conoco representative, who in the absence of the senior toolpusher apparently had taken charge of the firefighting operation, and the junior toolpusher (assistant rig manager) instructed the members of the firefighting parties to abandon the rig. Eight persons entered the ZAPATA LEXINGTON's single lifeboat and attempted to launch it by pulling the releasing ring attached to the brake release handle on the winch (see figure 5), but the lifeboat would not lower. No one tried to turn the brake drum (see figure 6) on the lifeboat winch by hand to release the brake although two certificated lifeboatmen, who should have been familiar with lifeboat equipment, were present. After several unsuccessful attempts the group moved to the other end of the rig and launched two inflatable liferafts.

Some of the group climbed down Jacob's ladders to the rafts while others used ropes hanging from the edge of the platform to reach the water, about 37 feet below. Before leaving the rig, the barge engineer made a final check through the crew's quarters and stopping in the ballast control room corrected a list that the drilling rig had developed after the fire started. After tripping the circuit breakers to the control panels in the ballast control room, the barge engineer left the rig about 1330. He stated that he was the last person to leave.

Rig personnel who were in the capsules and the liferafts were taken aboard the standby boat CHAD G where an accounting was made of the persons who had been aboard the ZAPATA LEXINGTON. Four persons were unaccounted for--the senior toolpusher, the on-duty driller, the assistant driller, and a floorhand. Three severely injured crewmembers--the cleaner/painter from the drill floor, the floorhand on the stair landing, and the floorhand in the shale shaker room--were transported to a nearby drilling rig, transferred to helicopters, and flown to a hospital in Marrero, Louisiana, for treatment.

About 1430, a party of nine men returned to the ZAPATA LEXINGTON. The diesel generators still were operating, and the fire pumps were restarted with onboard power and pressure restored to the fire mains. All fires that remained after the gas fire had burned itself out were extinguished. The barge engineer corrected a new list that the rig had developed.

The bodies of the four missing crewmembers were found--three on the drill floor and one at the base of the stairs leading from the riser deck to the drill floor above.

Injuries to Persons

Injuries	Crew	Others	Total
Fatal	4	0	4
Serious	3	0	3
Minor/None	61	0	61
Total	68	0	68

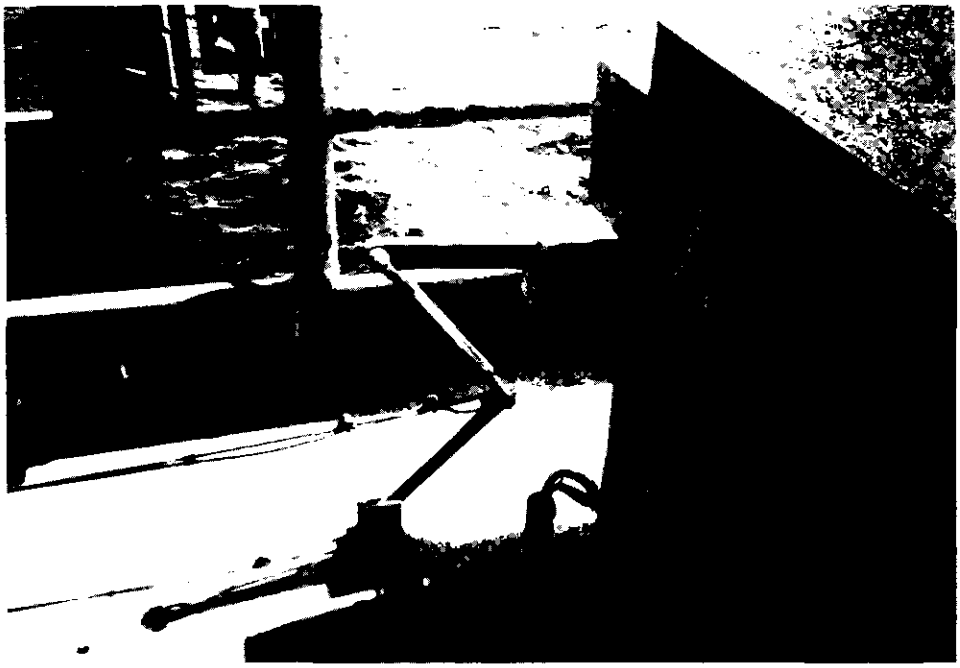

Figure 5.--Brake release handle on lifeboat winch.

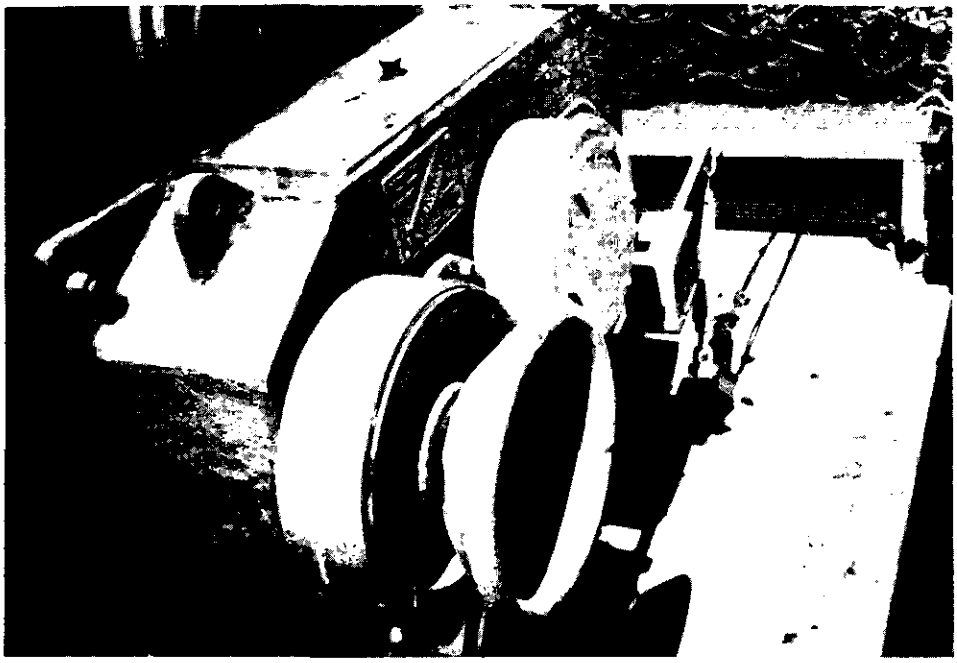

Figure 6.--Brake drum on lifeboat winch.

Crew Information

On the day of the accident, there were 68 persons aboard the ZAPATA LEXINGTON. Forty-two persons were employees of Zapata, 2 persons were employees of Conoco, and the remaining 24 persons were service personnel who provided hotel and catering services and support to the drilling operation. (See appendix C.)

The Zapata personnel worked 12 hours per day, and the work cycle was 14 days on and 14 days off. Key personnel aboard the rig such as the senior toolpusher, the barge engineer, the rig safety/training representative (RSTR), the senior mechanic/electrician, and the subsea engineer were on call 24 hours a day. A safety meeting was conducted twice daily prior to the beginning of each duty period for the oncoming shift, usually conducted by the driller and the RSTR. At the meeting the day's activities were discussed and any particular hazardous jobs were discussed.

The Conoco representative and his assistant each worked 7 days and were off duty 7 days. The remaining personnel worked a schedule prescribed by their respective service companies commensurate with Conoco's or Zapata's requirements.

The current Certificate of Inspection (COI) issued by the U.S. Coast Guard (USCG) for the ZAPATA LEXINGTON required four certificated lifeboatmen to be aboard, although only two able seamen and one ordinary seaman were called for specifically. The COI did not require any licensed personnel but stated that "A person in charge shall be designated."

Vessel Information

The ZAPATA LEXINGTON, a semisubmersible Zapata SS 2000 Series ocean drilling rig, was built in 1976 at the Avondale Shipyard, New Orleans, Louisiana. One of four similar rigs owned and operated by Zapata, it was classed +A1 (E)(M) COLUMN STABILIZED DRILLING UNIT by the American Bureau of Shipping (ABS). The twin-pontoon, six-column stabilized drilling unit was designed for ocean drilling in water depths up to 2,000 feet at a draft of 43 feet. Each pontoon was 260 feet in length and contained ballast, fuel storage, and drill water storage tanks. A combined wire rope and anchor chain mooring system with eight 40,000-pound anchors was used to moor the MODU at the drill site.

The main deck, which measured 260 feet by 190 feet, was located at the 80-foot level above the base line and arranged with living quarters at the forward end for 82 persons. The derrick and drill floor was located on the 116-foot level toward the after end of the rig (see figure 2). A 160-foot derrick located over the drill floor contained the equipment for handling the drill string [11] and subsea components.

A helicopter pad was situated over the living quarters at the port bow of the rig, adjacent to the ballast control room. Three revolving cranes, the largest of which had a capacity of 56 tons, were situated at the port, starboard, and stern areas of the platform.

Lifesaving equipment consisted of one 42-person covered lifeboat in davits at the stern of the rig and two 28-person survival capsules at the bow. In addition, three inflatable 20-person liferafts and one 25-person liferaft were stowed at various locations around the outer edge of the main deck. The lifeboat had been tested during a USCG inspection on March 3, 1984, and was found to be satisfactory. A total of 137 USCG-approved lifejackets were provided for all persons aboard, located in each of the rooms in the living quarters and in boxes at the emergency embarkation stations.

An electrically driven fire pump was located in each pumproom and was remotely controlled from the ballast control room. Each pump took suction from a low seachest in each pumproom through pneumatically operated valves. A motor-driven crossover valve, also controlled from the ballast control room, enabled each pump to take suction from a high seachest in each pumproom in the event of a loss of air pressure to the pneumatically operated valves.

Three 1,400 kW diesel generators furnished power to the equipment aboard including the drilling machinery.

The COI for the ZAPATA LEXINGTON was issued in New Orleans on March 9, 1984, with an expiration date of March 9, 1986. The inspection for recertification was started on March 2, 1984, and completed on March 9, 1984, while the drilling unit was moored on site in the Gulf of Mexico. The USCG inspector noted eight deficiencies including a missing hazardous location plan, 4/ failure to weight test the No. 2 survival capsule after repairs, a requirement for additional alarm bells in four of the six columns, submission of a repair proposal for damage found in the No. 1 port ballast tank in way of the anchor bolster, and defects in the traveling block [27] compensator pressure vessel. These outstanding deficiencies were corrected by April 9, 1984. There were no outstanding deficiencies on the day of the accident.

Vessel Damage

An initial survey of the damage to the ZAPATA LEXINGTON was made by Zapata's zone operations manager on the day of the accident when he boarded the drill rig after the fire was extinguished. He reported that the drill floor was badly burned, the traveling block had fallen, and the motion compensators [19] were severely damaged. The driller's office adjacent to the drill floor, including the equipment contained therein, was completely burned. A subsequent inspection by investigators found many of the controls for the derrick, the recording instruments, compensator hoses, and the electric cables to the drill floor equipment burned (see figure 7). The shale shaker room was only superficially damaged. The fire had spread to the starboard side of the wind wall [29] and to the mud analyst's shack. The cost of repairs was estimated to be $12 million.

The detailed damage survey began on September 14, 1985, and included an inspection of the drilling equipment. The underwater portions of the marine riser and the BOP stack were checked visually using a remote-controlled underwater vehicle and video equipment. A guide wire to the subsea equipment and several control hoses were found broken. The damaged control hoses were isolated from the BOP control system, the system was pressurized, and the components were tested. By September 16, 1985, sufficient temporary repairs had been made to enable closing the pipe rams in the BOP and disconnecting the marine riser from the BOP. With the drilling rig now separated from the well head, the rig was moved about 450 feet off location and, using a temporary winch set up on the BOP handling deck, the sections of the marine riser were brought aboard the rig. Another Zapata drilling rig, the ZAPATA CONCORD, was moved over the well later, and the drillpipe and the BOP were recovered. The drill pipe was found broken near the top of the BOP. Investigators originally thought that the drill pipe was sheared when the shear rams were activated, but later concluded that the drill pipe was sheared when the ZAPATA LEXINGTON was moved off the well. As the marine riser was pulled up, the drill pipe within fell to the ocean floor. The ZAPATA LEXINGTON was deballasted and after picking up its anchors was towed to a shipyard in Brownsville, Texas, for repairs.

4/ Plan identifying those areas aboard a drilling rig where gas may be present requiring gas-proof machinery and electrical installations.

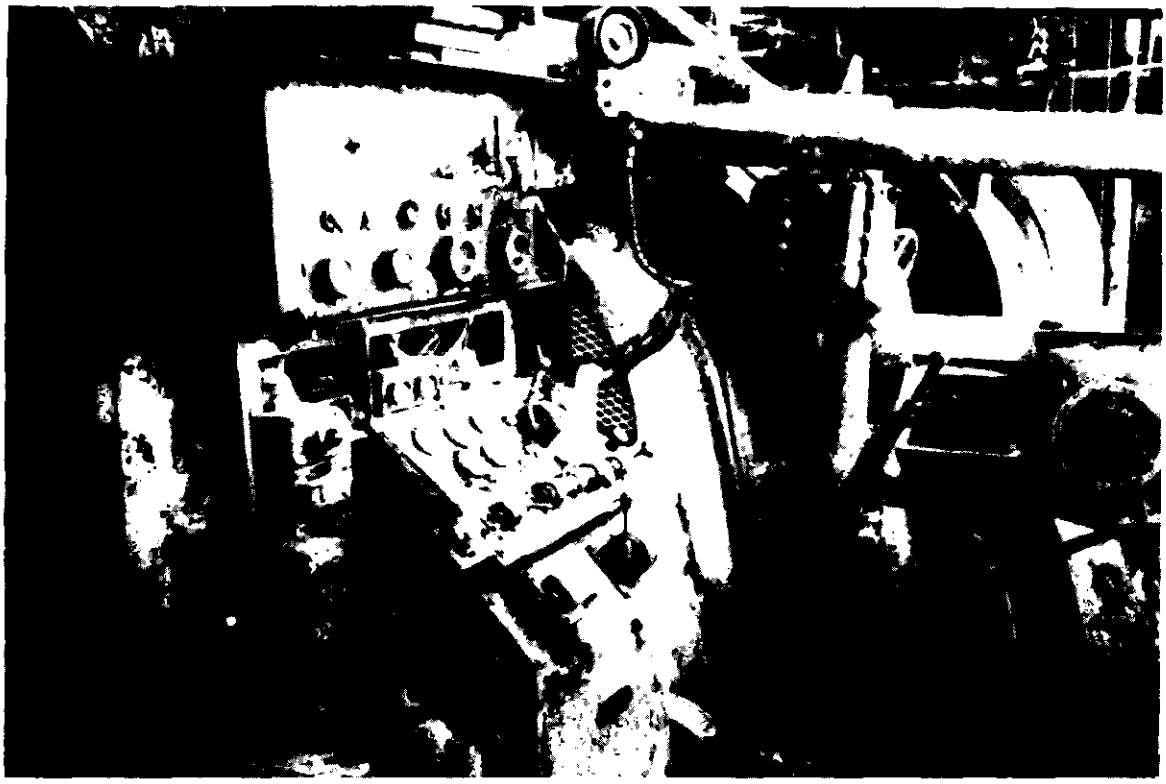

Figure 7.--Fire damage on drill floor (drawworks control).

Method of Operation

The company's operating manual, comprising three volumes, has two sections dealing with rig operation. A marine section of the operating manual, required by the USCG, discusses rig stability and related marine aspects of the vessel, while the industrial (drilling) part of the operating manual discusses rig safety and drilling procedures. Zapata's operations manager stated that although there are directives in the manual for evacuation of nonessential personnel for different emergencies, none exists for well control situations. He also stated that keeping nonessential personnel away from hazardous areas during well control operations would be considered good oil field practice. The manual describes the duties of the various people involved with well control but does not specify that nonessential personnel will be excluded from the hazardous areas.

A diverter system is used to divert overboard and away from personnel and equipment any significant hydrocarbon flow which cannot be shut-in [23] or controlled. The ZAPATA LEXINGTON's diverter system was controlled from the BOP control panel on the drill floor and the main BOP control room. The diverter was not used at any time during the attempt to evacuate gas from the marine riser on the day of the accident.

Zapata's area zone manager stated that:

> By activating that diverter, the flow through the riser would not come across the gumbo box or into the shale shakers, it would have gone over the side.

* * *

> On the BOP control panels, there is a button that you push. . . . to divert, the valve to the diverter would open and the valve to the flowline would close.
>
> * * *
>
> The equipment was operable and it was possible to divert in the last 2 minutes before the fire, it they had so desired.

Meteorological Information

The weather at the time of the accident was reported to be generally clear with few scattered clouds, easterly winds at 8 knots, 3-foot seas, and 7 nautical miles visibility.

Medical and Pathological Information

Autopsies revealed that the four crewmembers died from burns received in the accident. The three injured crewmembers suffered extensive burn injuries; one required extensive facial surgery.

Survival Aspects

When the eight persons entered the ZAPATA LEXINGTON's single lifeboat and attempted to launch it by pulling the releasing ring attached to the brake release handle (see figure 5), the lifeboat would not lower. No one tried to turn the brake drum (see figure 6) on the lifeboat winch by hand to release the brake. After several unsuccessful attempts the group moved to the other end of the rig and launched two inflatable liferafts. A postaccident examination of the brake mechanism on the lifeboat winch revealed that several sharp raps on the brake band dislodged an accumulation of rust and allowed the brake to release.

Fire and boat drills were held weekly aboard the ZAPATA LEXINGTON, usually on Sunday. Upon hearing the fire signal, all Zapata personnel were required to report to their fire stations wearing lifejackets. Firehoses usually were laid out and the fire pumps started. Service personnel were instructed to go to their abandon rig stations and stand by. The abandon rig drill usually followed the fire drill, and all persons aboard were required to muster at their respective abandon rig stations. They were assigned to either the survival capsules or the lifeboat. When questioned about the conduct of the emergency drills, witnesses gave testimony that varied somewhat, although most witnesses recalled that they climbed into the capsules or lifeboat and buckled their seatbelts. Several witnesses could not recall if either the lifeboat or the two capsules had been lowered, although the barge engineer stated that they were lowered to the waterline every 3 months.

The ZAPATA LEXINGTON's station bill (see appendix B), in addition to describing the signals for fire and abandon rig, lists the rig personnel by job title, and depending on their status, i.e., on duty or off duty, notes their fire stations, abandon rig stations, and corresponding duties. Unless the person is listed as being on duty at all times, such as the senior toolpusher or barge engineer, his station (with few exceptions) depends on his duty status. On-duty personnel usually are assigned to the area or compartment where they are working, while the off-duty personnel are assigned to a fire station. The abandon rig assignments also are dependent on duty status. The station bill was not required to indicate which persons are certificated lifeboatmen; four certificated lifeboatmen were required by the USCG manning requirements listed on the ZAPATA LEXINGTON'S COI. The RSTR maintained a list of crewmembers who were certificated lifeboatmen. He

stated that as the rig's training officer, he checked to see that a sufficient number of certificated lifeboatmen were included in the roster of personnel. If additional persons required training, he arranged for them to attend an "AB's" school in New Orleans.

On the day of the accident, many of the Zapata personnel, upon hearing the fire signal, reported directly to their abandon rig stations. Several individuals, when asked what signal they had heard, could not recall which signal was sounded or whether both signals were sounded. With no record of when the general alarm bells were sounded, other than the opinion of several witnesses that the abandon rig signal was sounded shortly after the fire signal, investigators could not ascertain how much time elapsed between the signals. Investigators could not establish who sounded the abandon rig signal or where it was activated.

A survey by the Safety Board of witness interviews and testimony revealed that more than half of the uninjured Zapata personnel on the ZAPATA LEXINGTON did not report to their fire stations when the fire alarm was sounded. Notwithstanding that some of the areas were inaccessible due to the fire, the investigation showed that many persons went directly to their abandon rig stations without checking whether their presence was required at their respective fire stations.

During a fire drill held in the presence of the USCG inspector on May 8, 1984, the inspector and the senior toolpusher discussed the training of rig personnel in firefighting procedures. Of particular concern to the inspector was the assignment of better qualified rig personnel to key firefighting positions. He noted that at the time, many rig personnel had no "smoke house" or formal firefighting training. USCG records of a fire and abandon rig drill conducted during the USCG inspection included a discussion between the inspector and the senior toolpusher concerning an actual fire that had occurred previously aboard the ZAPATA LEXINGTON. The inspector noted:

> He [toolpusher] related that in only rig fire they had had, 70% of crew panicked and it was the rig mechanic that actually entered the smoke filled compartment with the SCBA [self-contained breathing apparatus].

These facts were noted in the hull inspection report booklet for mobile drilling units and industrial units used in the Eighth Coast Guard District.

Tests and Research

Prior to the accident, the Mineral Management Services (MMS) of the U.S. Department of the Interior had contracted with the Petroleum Engineering Department of the Louisiana State University (LSU) to perform research in the development of well control procedures for use in deepwater drilling operations. Since the procedures and equipment used aboard the ZAPATA LEXINGTON already were under study, the university's petroleum engineering department was requested to review the accident and make recommendations to the MMS about actions which might prevent such accidents in the future.

Drilling information such as mud densities, mud volumes, pressure observations at critical points during the various phases of the operations, valve settings and assemblage of the various parts of the well control system were evaluated and conclusions were reached. The study pointed out the difference between conventional procedures and special procedures required for deepwater drilling conditions. Calculations were

performed to evaluate the procedures used by the person directing the operations on the ZAPATA LEXINGTON on the day of the fire. Computer simulations also were used to recreate the subsea conditions that existed when the heavier drilling mud was circulated in the marine riser.

Drilling procedures vary according to the equipment in use and the conditions under which the well is being drilled. Federal regulations do not contain detailed provisions for all phases of drilling operations such as the evacuation of gas from a subsea BOP stack. Instead, there are recommended practices that have been developed through common usage throughout the drilling industry. The report prepared by the petroleum engineering department of LSU stated also that the study will not produce a fail-safe method for all situations but will stimulate redesign work of existing systems and recommend methods of removing gas from a BOP during deepwater drilling operations.

The study concluded that the accident occurred when trapped gas in the BOP stack was released to the marine riser during routine operations. The "U-tube" method employed to circulate the trapped gas out of the BOP did not succeed although the procedure has been used before in the industry. The study also stated that if the severity of the situation had been recognized sooner, alternate procedures could have been employed to greatly reduce the hazard, underscoring the need to expand research on the use of the diverter system and to modify the equipment as needed to reduce the volume of trapped gas in the BOP.

Other studies of deepwater drilling operations by the drilling industry have offered varied solutions to the problem of circulating gas out of the marine riser. One suggested solution was to employ a second diverter device at the upper end of the riser, below the slip joint [24], to provide another flow control point. 5/ This device could be used without any major alterations to the well control devices currently in use.

ANALYSIS

The Fire

Because of the loss of the key personnel directly involved in the operation, the events that occurred on the drill floor during the minutes preceding the fire will never be known accurately, including any actions taken by the senior toolpusher to avert the accident. The Conoco representative had left the drill floor to observe the flow of drilling mud returns through the gumbo box located on a deck below, probably anticipating a gas release. He had been in communication with the personnel on the drill floor just before the increase in the return flow of mud, but since the excessive mud flow out of the gumbo box made the telephone inaccessible, he was no longer able to communicate with the drill floor personnel. If the diverter system, which could have redirected the flow of gas-cut mud returns overboard, had been activated at the control panel on the drill floor, the gas could have been dissipated into the atmosphere, clear of the rig. The inability of the Conoco representative at the gumbo box to communicate with the senior toolpusher on the drill floor probably led to the failure of the toolpusher to activate the diverter system. Zapata should relocate the telephone at the gumbo box aboard the ZAPATA LEXINGTON and any similar installation aboard other Zapata drilling rigs to a more protected area so that any rapid flow of return drilling mud will not prevent use of the telephone.

5/ See OGJ Report, Oil and Gas Journal, May 6, 1985.

The fact that two men were directing water hoses over the gumbo box to wet down and cool any gas accumulation indicates that the Conoco representative anticipated a gas release that when combined with air would form a flammable mixture. Instead of spraying water over an area where gas is present, a device should be developed to separate the gas from the drilling mud returns while filtering out the gumbo or heavy drill cuttings during drilling operations. The gas could then be vented safely to the atmosphere at some remote point. Such a device could eliminate the need of the gumbo box as found on the ZAPATA LEXINGTON. This enclosed gas/mud separator should be capable of receiving a large volume of return mud, as indicated by the experience aboard the ZAPATA LEXINGTON immediately before the fire. The toolpusher may have been waiting for direction from the Conoco representative before activating any diverter system. Diverting the drilling mud overboard would have directed the gas clear of the rig and prevented accumulation of gas around the confined areas. While the overall authority for the safe operation of the drilling rig was vested with the toolpusher, the advice of the operating company representative is usually sought by the toolpusher in well control operations. In this instance, another diverter control switch, located in the vicinity of the gumbo box, could have been activated by the Conoco representative when he was unable to communicate quickly with the drill floor. The Safety Board believes that the Conoco representative, who was watching the mud returns at the gumbo box, should have reacted quicker when the flow first began to be excessive by advising the toolpusher to activate the diverter system to divert the gas-cut mud overboard.

Injuries and Fatalities

When the well control problem developed and there was a possibility of a blowout from the well, personnel such as the floorhand and the cleaner/painter who were assigned to wash mud off the drill floor and stairs and who were not actively participating in the operation should have been instructed to remain out of such areas where gas may be present until the problem was remedied. The exposure of nonessential personnel to such risks as possible blowouts should not have been permitted under any circumstance. The person-in-charge in the situation was the senior toolpusher who, having the ultimate responsibility by reason of his authority on the rig, should have established a danger zone and kept nonessential persons out of the area. The driller who conducted the safety meeting before the beginning of each shift failed to instruct rig personnel as to the location of those danger areas during well control operations, and also failed to convey specific instructions as to who would be permitted in these areas. Zapata should include in its general safety rules a requirement that a danger area, similar to the classified or hazardous locations as defined in 46 CFR 108.170 and 46 CFR 111.105-33, be established during any well control problem and that the RSTR be instructed to monitor the personnel allowed in the danger area during well control operations.

Lifesaving Equipment

The ZAPATA LEXINGTON was equipped with one 42-person covered lifeboat, two 28-person survival capsules, three 20-person and one 25-person inflatable liferafts. Abandonment of the drilling rig was not a factor in the loss of life or injuries, although the covered lifeboat failed to lower when the brake on the lifeboat winch failed to release. After several attempts to pull the remote brake release handle, the personnel in the lifeboat chose other means to abandon the rig. A later examination of the brake mechanism on the lifeboat winch revealed that several sharp raps on the brake band allowed the brake to release. If a person who was familiar with lifeboat equipment had rapped the brake band or moved the brake drum on the lifeboat winch by hand using the

hand grip provided, the lifeboat probably would have lowered. The two USCG-certificated lifeboatmen who were in the area should have tried to release the brake at the winch before accepting an alternate method of abandoning the rig. A primary means of rig evacuation, such as a lifeboat, must be checked at frequent intervals and the lowering mechanism exercised to ensure proper operation. Rig personnel should be knowledgeable about the operation of the lifesaving equipment so that problems such as a stuck brake band can be easily identified and dealt with immediately.

Emergency Stations

Because such a large percentage of rig personnel failed to report to their assigned fire stations when the fire alarm sounded, a serious doubt exists as to the adequacy of the weekly fire and emergency drills. Although circumstances may not have permitted all fire stations to be manned when the fire alarm was sounded, the Safety Board found that many of the Zapata personnel reported directly to their abandon rig stations before the abandon rig signal was sounded without ever reporting to their fire stations. The response was not unlike that to a previous fire that occurred aboard the MODU during which, according to a toolpusher's statement to a USCG inspector, 70 percent of the rig crew panicked. Stricter adherence to the emergency procedures should be insisted upon by the Zapata management. The safety of the rig and those aboard depends on the responsiveness of personnel in emergency situations. Emergency preparedness can be accomplished only through meaningful drills and practice.

Fire Pumps

When the water pressure in the fire mains was lost, the volunteers who remained aboard were unable to continue their firefighting efforts. Water pressure was lost when the loss of air pressure to the pneumatically operated suction valves at the lower seachest was lost and caused them to close. An alternative method of supplying water to the fire pumps was available. When the ballast control operator noticed the valves close, he could have opened a motor-driven crossover valve to the high seachest and restored suction to the pumps. Each pumproom had an arrangement permitting actuation of the motor-driven valve from the control panel. Not only did the ballast control operator, because of his lack of knowledge, fail to open the two crossover valves, but also the barge engineer who knew the system failed to direct the use of the crossover valves when the loss of water pressure from the fire pumps became apparent. Although his actions of donning a fire suit and engaging in the firefighting activities are commendable, the fact remains that the barge engineer's fire station assignment, as stated on the station bill, was the ballast control room. Had he been there, it is possible that the damage to the drilling rig could have been reduced by action he might have taken to restore water pressure to the fire mains. Nevertheless, Zapata should consider a modification of the valves in the lower sea suction of the ZAPATA LEXINGTON and other MODU's of this class so that operation of the fire pumps is dependent only on the availability of electric power, and not air pressure. The Safety Board believes that the USCG should amend the regulations for MODU's (46 CFR 108.170) to include a requirement that pneumatically operated valves on the suction side of the fire pumps remain open in the event of a loss of air pressure so long as electrical power to the pump has not failed, so as to ensure a continuous supply of water to the system.

CONCLUSIONS

Findings

1. Flammable gas was released into the atmosphere during the attempt to evacuate gas from the blowout preventer stack and the marine riser.

2. Use of the diverter system to redirect the gas-cut mud overboard might have prevented the accumulation of gas around the rig.

3. Although the fire originated in the area of the gumbo box, its source of ignition is not known.

4. The excessive flow of return drilling mud across the gumbo box prevented the Conoco representative from reaching the telephone to notify drill floor personnel immediately of the excessive mud flow.

5. A system to separate drilling mud returns and gas which eliminates the need for a gumbo box should be developed to safely handle gas released during well control operations.

6. There might have been fewer fatalities and injuries if nonessential persons had been kept out of areas where gas may be present during well control operations.

7. The successful evacuation of the mobile offshore drilling unit was not affected by the failure of the lifeboat to lower.

8. Since over half of the rig personnel failed to report to their assigned fire stations when the fire alarm sounded, the adequacy of the weekly fire and boat drills is questionable.

9. Fire main pressure could have been restored by the ballast control operator by opening the motor-driven crossover valves between the high and low seachests had he been more familiar with the system.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the explosion and fire was the accidental ignition of gas released to the atmosphere through the marine riser during an attempt to evacuate gas from the blowout preventer stack. Contributing to the cause of the accident was the failure of the drilling crew to use the diverter system when the return flow of drilling mud became excessive. Contributing to the number of injuries was the failure of the rig's supervisory personnel to exclude nonessential personnel from high-risk areas during critical well control operations.

RECOMMENDATIONS

As a result of this accident, the National Transportation Safety Board made the following recommendations:

--to the U.S. Coast Guard:

Amend U.S. Coast Guard regulations for mobile offshore drilling units (46 CFR 108.170) to include a requirement that pneumatically operated valves on the suction side of fire pumps remain open during a loss of air pressure so long as electrical power to the pump has not failed so as to ensure a continuous supply of water to the fire main system. (Class II, Priority Action) (M-85-102)

--to the Zapata Off-Shore Company:

Relocate the telephone at the gumbo box aboard the ZAPATA LEXINGTON and any similar installation aboard other company drilling rigs to a more protected area so that any rapid flow of return drilling fluids (mud) through the recovery system will not prevent access to the telephone. (Class II, Priority Action) (M-85-103)

Develop a device to separate and vent gas from return drilling fluids (mud) to the atmosphere at a remote area of company drilling rigs during drilling operations. (Class II, Priority Action) (M-85-104)

Establish a danger zone aboard company drilling rigs during well control operations when flammable gas may be present, and prohibit all nonessential personnel from entering the zone. (Class II, Priority Action) (M-85-105)

Upgrade the quality of the fire drills and the instructions given in firefighting procedures aboard company drilling rigs, and establish a system to evaluate the drills regularly. (Class II, Priority Action) (M-85-106)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ G.H. PATRICK BURSLEY
Member

October 1, 1985

APPENDIXES

APPENDIX A

GLOSSARY OF TERMS USED IN THE OFFSHORE OIL INDUSTRY

1. Annulus: a large valve usually installed at at the top of a BOP stack to separate it from the marine riser.

2. Blowout: an uncontrolled flow of gas, oil, or other well fluids into the atmosphere.

3. Blow out preventer (BOP): equipment placed on the ocean floor to prevent a blowout or sudden release of pressure from the well.

4. Choke line: an extension of pipe from the BOP used to direct well fluids to the choke manifold aboard the drill rig.

5. Choke manifold: an arrangement of piping and valves through which drilling mud is circulated when the blowout preventers are used, used to control the pressures encountered during a kick.

6. Company man: the operating company representative aboard the drill rig; drilling foreman.

7. Derrick: a large load bearing structure located over the drill floor to support the drawworks.

8. Diverter: a system used to protect floating drill rigs during well blowouts by directing the return flow of drilling fluids away form the rig.

9. Drawworks: the hoisting mechanism of a drill rig that raises and lowers the drill string and other equipment.

10. Drill floor (rig floor): the area under the derrick where the rotary table, BOP controls, drawwork controls, and working area is located.

11. Drill string: the column of drill pipe and attachments that transmits fluid and rotational motion to the drilling bit.

12. Drilling mud (fluid): the fluid that is circulated down the drill pipe to cool the bit, counteract downhole formation pressure, and force cuttings (returns) out of the well bore to the surface. Usually a mixture of barite, clay, water, and chemicals.

13. Gas-cut mud: drilling mud that has entrained formation gas, lower in density than the drilling mud, which must be treated to reduce the chance of a blowout.

14. Gumbo box: a term applied to a device that filters out gumbo or sticky clay from the return drilling mud before it enters the mud return system for processing.

15. Kick: an entry of water, gas, oil or other formation fluid into the wellbore during drilling when the column of drilling fluid is not heavy enough to overcome the pressure exerted by the fluids in the formation. If prompt action is not taken to control the kick or kill the well, a blowout may occur.

16. Kill: to prevent a threatened well blowout by taking suitable preventive measures, e.g., to shut-in the well with the blow out preventers, circulate the kick out, and increase the weight of the drilling mud.

17. Kill line: a high-pressure line connecting the mud pump and the well through the BOP so that heavy drilling fluid can be pumped into the well to control a threatened blowout.

18. Marine riser: the pipe and special fittings used to establish a seal between the well bore and the drilling vessel on the surface to conduct the drilling fluid from the well to the vessel and to act as a guide for the drill pipe.

19. Motion compensator (riser tensioner): a device to support the weight of the marine riser and compensate for the heave or vertical motion of a floating drill rig.

20. Pipe ram: a sealing component in a BOP that closes the space between the drill pipe and the BOP.

21. Rotary table: the principle component of the rotary machine to turn the drill pipe and support the drilling assembly.

22. Shale shaker: machinery to remove the drill cuttings and other foreign material from the drilling mud during the recovery process.

23. Shut-in: to close the appropriate valves to stop flow in a well; to close in a well in which a kick has occurred.

24. Slip joint (telescoping joint): a device used in the marine rise system of a mobile offshore drilling rig to compensate for the verticle motion of the rig caused by wind, waves, or weather. It consists of an inner barrel attached beneath the rig floor and an outer barrel attached to the riser pipe and is an integrated part of the riser system.

25. Tool joint: a heavy coupling element, larger in diameter than the drill pipe, to join the drill pipe made of special alloy steel to sustain the weight of the drill string and provide a leak proof seal.

26. Toolpusher: an employee of the drilling company who is in charge of the drilling crew and the drilling rig when moored at the drilling site. Sometimes referred to as the rig manager, rig supervisor, or rig superintendant.

27. Traveling block: the lower block in the drawworks that moves vertically in the derrick to lift drillpipe, riser pipe and casing.

28. Well bore: the hole made by the drilling bit, which can be open, cased, or both. Also called well, borehole, or hole.

29. Wind wall: a protection erected around the drill floor to break the force of the wind and afford protection to the drilling crew.

APPENDIX B

ZAPATA LEXINGTON STATION BILL

STATION BILL

FOR

SEMI—SUBMERSIBLE ZAPATA SS 2000 SERIES

PERSON DISCOVERING FIRE IMMEDIATELY SOUND THE GENERAL ALARM

FIRE SIGNAL
SHORT RINGS ON THE GENERAL ALARM BELLS FOR 10 SEC. FOLLOWED BY:
ONE SHORT RING—FIRE LOCATION—CREW QUARTERS
TWO SHORT RINGS—FIRE LOCATION—ENGINE ROOM
THREE SHORT RINGS—FIRE LOCATION—RIG FLOOR

ABANDON RIG SIGNAL
A CONTINUOUS RINGING OF THE GENERAL ALARM BELLS AND WHISTLE

DISMISSAL FROM DRILLS
THREE SHORT RINGS OF GENERAL ALARM

MAN OVERBOARD
HAIL, PASS THE WORD "MAN OVERBOARD"
THROW RING BUOYS OVER, ALERT STANDBY BOAT.
PREPARE LIFEBOAT FOR LAUNCHING, SEND LOOKOUT ALOFT

	FIRE AND EMERGENCY			ABANDON RIG		
PERSONNEL	STATUS	STATION	DUTIES	STATION	DUTIES	REMARKS AND SPECIAL INSTRUCTIONS
1. Senior Toolpusher	On Duty All Times	Fire Team No. 1 Scene Of Fire	In Charge	No. 1 Lifeboat	In Charge—Take Walkie-Talkie—Note 6f	1. All Persons Shall Familiarize Themselves With The Locations And Duties Of Their Emergency Stations Immediately Upon Reporting Aboard.
2. Toolpusher	On Duty All Times	Fire Team No. 2 Standby Fire No. 12	In Charge—Fire Team No. 2 —Obtain Walkie-Talkie—Standby	Brueher Capsule #1	In Charge—Take Walkie-Talkie—Note 6f	
3. Driller	On Duty	Drill Floor	Suspend Drilling/Standby	No. 1 Lifeboat	As Directed By Person in Charge—Note 6a	2. All Persons Will Be Required To Wear A Life Preserver.
4. Assistant Driller	On Duty	Drill Floor	Assist Driller	No. 1 Lifeboat	Attend Brake Release—Lifeboat	
5. Derrickman	On Duty	Drill Floor	Assist Driller	No. 1 Lifeboat	As Directed By Person in Charge	3. Senior Toolpusher Shall Insure That Temporary Personnel Are Instructed In These Emergency Situations.
6. Pharman (3)	On Duty	Rig No. 9 & 10 Drill Floor	Assist Driller/Standby Rig	No. 1 Lifeboat	When Directed Release Lifeboat After It Is Weathering	
7. Crane Operator	On Duty	Main Deck	Assist Mooring Hds.—Watertight Doors and Report Over P.A. System	No. 1 Lifeboat	Release Liferaft No. 3 Prior To Reporting To Lifeboat	4. Senior Toolpusher To Provide Specific Instructions As Necessary To Implement The Provisions Of This Bill.
8. Roustabouts (4)	On Duty	Fire Team No. 1 Scene Of Fire	Obtain Walkie-Talkie—Report To Engineer On Man Fire Hose	No. 1 Lifeboat	As Directed By Person in Charge	
9. Barge Engineer	On Duty All Times	Ballast Control Room	Attend Radio Console In Charge Of Drill When Directed	Brueher Capsule #2	In Charge—Take Walkie-Talkie-Note 6d,J	5. Senior Toolpusher To Keep This Bill Up To Date And Modify The Provisions As Necessary When Circumstances Dictate
10. Ballast Controllman	On Duty	Ballast Control Room	Assist Barge Engineer	Brueher Capsule#2	Attend To Tiller—Custody Of Emergency Radio Transmitter	
11. Rig Safety/Training Representative	On Duty All Times	Hospital	Report Over P.A. System When Quarters are Cleared/Help Hospital	Brueher Capsule #2	As Directed By Person in Charge	6. During An Abandon Situation:
12. Jr. Mechanic/Electrician	On Duty All Times	Fire Team No. 1 Scene Of Fire	Obtain Walkie Talkie Per Sr. Toolpusher Proceed to Scene of Fire	No. 1 Lifeboat	Start Lifeboat Engine—Note 6c	a. Driller, As A Minimum, Attempt To Secure The Well By Picking Up The Pipe, Closing The Kelly Cock, Closing The Pipe Rams And Then Set The String Down And Block Off.
13. Electrician	On Duty	Control Room	Secure Electricity in Affected Areas	Brueher Capsule #2	Release Liferaft No. 2 Prior To Reporting To Capsule	
14 Motorman	On Duty	Engine Room	Standby Engines	Brueher Capsule #2	Start And Attend Capsule Engine	b. Close All Watertight Doors.
15. Pumpman/man	On Duty	Mud Pump Room	Standby Mud Pumps	Brueher Capsule #2	As Directed By Person in Charge	
16 Mechanic	On Duty	Fire Pumps	Start Fire Pumps	Brueher Capsule #2	Assist Motorman With Capsule Engine	c. Secure All Engines.
17 Welder	On Duty All Times	Fire Team No. 1 Scene Of Fire	Proceed Forward If Operative Continue Assist As Directed	No. 1 Lifeboat	Assist In Preparing Lifeboat For Lowering Away	
18. Storekeeper	On duty	Fire Team No. 1 Scene Of Fire	Provide Fire Ax/Extra Ax Messenger For Toolpusher	No. 1 Lifeboat	As Directed By Person in Charge	d. Fire Distress Signals.
19. Subsea Engineer	On Duty All Times	Emergency Team Standby/Assist	In Charge Assist Toolpusher As Directed	No. 1 Lifeboat	Release No. 4 Liferaft Prior To Reporting To Lifeboat	
20. Operator Personnel (3)		Radio Room	Obtain Walkie Talkie—Assist Standby Boat And Company Boom Boats	Brueher Capsule #2	As Directed By Person in Charge	e. Send Out Distress Radio Traffic As Directed By Person in Charge
21. Catering Crew (5)	On Duty	Living Quarters/Galley	Secure Galley—Go Through Quarters & Assure Everyone Is Alerted-Notify REIR	Brueher Capsule #1	Provide Blankets—Go Through Quarters And Assure Everyone Is Alerted	
22. Cleaner/Painter	On Duty	Emergency Team Standby/Assist	Assist As Directed By Person in Charge	Brueher Capsule #2	As Directed	f. Lifeboat And Capsules Will Not Be Lowered Away Until The Order To Abandon Is Given By The Person In Charge.
23. Driller	Off Duty	Fire Team No. 3 Standby Fire No. 17	In Charge—Fire Team No. 3 Obtain Walkie-Talkie—Standby	Brueher Capsule #1	As Directed By Person in Charge	
24. Assistant Driller	Off Duty	Fire Team No. 3 Standby Fire No. 17	Assist As Directed By Person in Charge	Brueher Capsule #1	Release Liferaft No. 4 Attend Releasing Gear When Capsule Is In Water	
25. Derrickman	Off Duty	Fire Team No. 3 Standby Fire No. 17	Assist As Directed By Person in Charge	Brueher Capsule #1	Attend To Tiller	
26. Pharman (3)	Off Duty	Fire Team No. 3 Standby Fire No. 17	Assist As Directed By Person in Charge	Brueher Capsule #1	As Directed By Person in Charge	
27. Electrician	Off Duty	Fire Team No. 3 Standby Fire No. 12	Assist As Directed By Person in Charge	Brueher Capsule #1	Release Liferaft No. 1 Prior To Reporting To Capsule	
28. Crane Operator	Off Duty	No. 1 Lifeboat	Secure Derrick—Secure Loose Gear And Report Over P.A. System—Make Ready Lifeboat	No. 1 Lifeboat	Attend To The Tiller	
29. Roustabout (4)	Off Duty	Fire Team No. 3 Standby Fire No. 12	Assist As Directed By Person in Charge	Brueher Capsule #1	As Directed By Person in Charge	
30. Ballast Controllman	Off Duty	Brueher Capsules	Obtain Walkie To Operator—Open Life Preserver Storage—Standby	Brueher Capsule #2	Attend Brake Release—Attend Releasing Gear When Capsule Is In Water	
31. Ballast Controllman (trainee)		Ballast Control Room	Assist Barge Engineer	Brueher Capsule #2	As Directed By Person in Charge	
32. Motorman	Off Duty	Engine Room	Assist On Duty Motorman	Brueher Capsule #1	Start And Attend Capsule Engine	
33. Pumpman	Off Duty	Mud Pump Room	Assist On Duty Mud Pumpman	Brueher Capsule #2	As Directed By Person in Charge	
34. Mechanic	Off Duty	Fire Pumps	Assist On Duty Mechanic	Brueher Capsule #1	Assist Motorman With Capsule Engine	
35. Storekeeper	Off Duty	Emergency Team Standby/Assist	Put On Person's Cloth—Assist As Directed By Person In Charge	No. 1 Lifeboat	As Directed By Person In Charge	
36. Cleaning Crew (5)	Off Duty	Living Quarters	Go Through Quarters And Assure Everyone Is Alerted-Notify REIR	Brueher Capsule #1	Provide Blankets—Go Through Quarters And Assure Everyone Is Alerted	
37. Cleaner/Painter	Off Duty	Fire Team No. 3 Standby Fire No. 17	Assist As Directed By Person In Charge	Brueher Capsule #2	As Directed By Person In Charge	
38. Service Personnel (24)		Abandon Station	Standby	No. 1 Lifeboat	As Directed By Person In Charge	
39. Visitors (12)		Abandon Station	Standby	Brueher Capsule #2	As Directed By Person In Charge	

	LIFE SAVING CAPACITY
No. 1 Capsule—34	26
No. 2 Capsule—16 + Visitors	25
No. 1 Life Boat—16 + Service Personnel	42
	88

PERSON IN CHARGE

DATE

APPENDIX C

PERSONNEL INFORMATION

Dalton D. Walker, Sr., Toolpusher, Age 42 (Deceased)

Mr. Walker was Zapata's senior employee aboard the ZAPATA LEXINGTON and the person-in-charge. He had 17 years' experience in the drilling industry. He had been employed by Zapata for 8 years, 5 of which were as toolpusher. He had been assigned to the ZAPATA LEXINGTON for 2 years.

Johnnie W. Calton, Driller, Age 37 (Deceased)

Mr. Carlton was in charge of the drilling crew on his shift. He had 7 years' experience in the industry, all with Zapata and had been assigned to the ZAPATA LEXINGTON for 2 years. He had been a driller for 6 months.

Gilbert Jones, Assistant Driller, Age 25 (Deceased)

Mr. Jones had 5 years' experience in the offshore drilling industry, all with Zapata. He was assistant driller for 1 year and had been aboard the ZAPATA LEXINGTON for 2 years.

David W. Fletcher, Floorman, Age 26 (Deceased)

Mr. Fletcher had worked in the industry for 3 years. He had been assigned to the ZAPATA LEXINGTON for 11 months and had held the position of floorman for 6 months.

Joe L. Smith, Floorman, Age 21

Mr. Smith had been employed by Zapata for 2 years, and he had been assigned to his present position for 1 year. His work experience in the industry was entirely aboard the ZAPATA LEXINGTON. He had no formal training for his job before joining the company, and his knowledge of drilling came from on-the-job training.

Rusty L. Huckabaa, Floorman, Age 22

Mr. Huckabaa had been employed by Zapata for 2 years. He had been assigned to the ZAPATA LEXINGTON for 9 months and in his position as floorman for 3 months. His job experience consisted of on-the-job training with no special offshore safety training.

Paul J. Buckman, Cleaner/Painter, Age 25

Mr. Buckman had been employed aboard the ZAPATA LEXINGTON for about 1 month. His actual time aboard the rig was about 22 days. He had no prior oilfield experience and no training before joining the rig. His limited knowledge of the rig operation came from on-the-job training. He had no prior marine experience.

APPENDIX D

U.S. COAST GUARD CERTIFICATE OF INSPECTION FOR THE ZAPATA LEXINGTON (PAGE 1)

CERTIFICATION DATE : 09MAR84

EXPIRATION DATE : 09MAR86

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Certificate of Inspection

DATE DRYDOCKED: 11MAY84

VESSEL NAME	OFFICIAL NUMBER	CALL SIGN	SERVICE
ZAPATA LEXINGTON	DN571193		MODU
HOME PORT	**HULL MATERIAL**	**HORSEPOWER**	**PROPULSION**
HOUSTON, TEXAS	STEEL		
PLACE BUILT	**DATE BUILT**	**GROSS TONS**	**NET TONS**	**DWT**	**LENGTH**
AVONDALE, LOUISIANA	15DEC76	8609	7719		260.00

OWNER	OPERATOR
ZAPATA OFFSHORE COMPANY INC., ZAPATA TOWER P. O. BOX 4240 HOUSTON, TX 77001	ZAPATA OFFSHORE COMPANY INC., ZAPATA TOWER P. O. BOX 4240 HOUSTON, TX 77001

THIS VESSEL MUST BE MANNED WITH THE FOLLOWING LICENSED AND UNLICENSED PERSONNEL, INCLUDED IN WHICH THERE MUST BE 4 CERTIFICATED LIFEBOATMEN AND 4 CERTIFICATED TANKERMAN,

___MASTER	___MASTER & 1ST CLASS PILOT	2 ABLE SEAMEN	___CHIEF ENGINEER	___FIREMEN-WATERTENDERS
___CHIEFMATE	___ ___CLASS PILOT	1 ORDINARY SEAMEN	___1ST ASST. ENGINEER	___OILERS
___2ND MATE	___RADIO OFFICER(S)	___DECKHANDS	___2ND ASST. ENGINEER	1 ___
___ ___MATES	___ ___OPERATOR(S)	___ ___	___ ___ENG'RS.	___ ___

IN addition, THIS VESSEL MAY CARRY ___ PASSENGERS, 9 OTHER PERSONS IN CREW, ___ PERSONS IN ADDITION TO CREW, AND 86 TOTAL PERSONS ALLOWED

SEVENTY-FOUR (74) INDUSTRIAL PERSONNEL

ROUTE PERMITTED AND CONDITIONS OF OPERATION

OCEANS

A PERSON IN CHARGE SHALL BE DESIGNATED.

SPECIAL EXAM (WORKING DRAFT) IN LIEU OF DRYDOCK: 11MAY84

*** SEE NEXT PAGE FOR ADDITIONAL CERTIFICATE INFORMATION ***

WITH THIS INSPECTION HAVING BEEN COMPLETED AT GREEN CANYON BLOCK 98 GOM ON 09MAR84, THIS VESSEL IS CERTIFIED BY THE OFFICER IN CHARGE, MARINE INSPECTION, NEW ORLEANS, LOUISIANA, TO BE IN ALL RESPECTS IN CONFORMITY WITH THE APPLICABLE VESSEL INSPECTION LAWS AND THE RULES AND REGULATIONS PRESCRIBED THEREUNDER.

PERIODIC REINSPECTIONS

DATE	ZONE	SIGNATURE

THIS CERTIFICATE ISSUED BY:

J. W. KLOTZ, CAPTAIN, USCG
OFFICER IN CHARGE, MARINE INSPECTION
NEW ORLEANS, LOUISIANA
INSPECTION ZONE

LEKTRIEVER NO. 1 2 3 4 5 (6)

*U.S. GOVERNMENT PRINTING OFFICE: 1985-491-093:20052

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