

Deepwater Horizon's Final Hours

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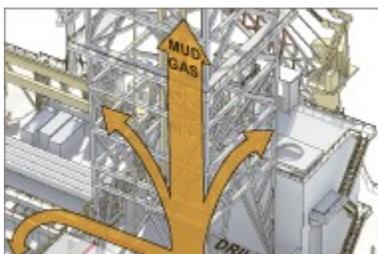
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Provided to The New York Times

As the fire raged, the Deepwater Horizon buckled. More than 110 people escaped the rig on April 20, but 11 men died. Photographs of the burning rig were provided to The Times by a worker on a nearby boat who asked not to be identified.

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The worst of the explosions gutted the Deepwater Horizon stem to stern.

Crew members were cut down by shrapnel, hurled across rooms and buried under smoking wreckage. Some were swallowed by fireballs that raced through the oil rig's shattered interior. Dazed and battered survivors, half-naked and dripping in highly combustible gas, crawled inch by inch in pitch darkness, willing themselves to the lifeboat deck.

It was no better there.

That same explosion had ignited a firestorm that enveloped the rig's derrick. Searing heat baked the lifeboat deck. Crew members, certain they were about to be cooked alive, scrambled into enclosed lifeboats for shelter, only to find them like smoke-filled ovens.

Men admired for their toughness wept. Several said their prayers and jumped into the oily seas 60 feet below. An overwhelmed young crew member, Andrea Fleytas, finally screamed what so many were thinking:

“We’re going to die!”

It has been eight months since the Macondo well erupted below the Deepwater Horizon, creating one of the worst environmental catastrophes in United States history. With government inquiries under way and billions of dollars in environmental fines at stake, most of the attention has focused on what caused the blowout. Investigators have dissected BP’s well design and Halliburton’s cementing work, uncovering problem after problem.

But this was a disaster with two distinct parts — first a blowout, then the destruction of the Horizon. The second part, which killed 11 people and injured dozens, has escaped intense scrutiny, as if it were an inevitable casualty of the blowout.

It was not.

Nearly 400 feet long, the Horizon had formidable and redundant defenses against even the worst blowout. It was equipped to divert surging oil and gas safely away from the rig. It had devices to quickly seal off a well blowout or to break free from it. It had systems to prevent gas from exploding and sophisticated alarms that would quickly warn the crew at the slightest trace of gas. The crew itself routinely practiced responding to alarms, fires and blowouts, and it was blessed with experienced leaders who clearly cared about safety.

On paper, experts and investigators agree, the Deepwater Horizon should have weathered this blowout.

This is the story of how and why it didn’t.

It is based on interviews with 21 Horizon crew members and on sworn testimony and written statements from nearly all of the other 94 people who escaped the rig. Their accounts, along with thousands of documents obtained by The New York Times describing the rig’s maintenance and operations, make it possible to finally piece together the Horizon’s last hours.

What emerges is a stark and singular fact: crew members died and suffered terrible injuries because every one of the Horizon’s defenses failed on April 20. Some were deployed but did not work. Some were activated too late, after they had almost certainly been damaged by fire or explosions. Some were never deployed at all.

At critical moments that night, members of the crew hesitated and did not take the decisive steps needed. Communications fell apart, warning signs were missed and crew members in critical areas failed to coordinate a response.

The result, the interviews and records show, was paralysis. For nine long minutes, as the drilling crew battled the blowout and gas alarms eventually sounded on the bridge, no warning was given to the rest of the crew. For many, the first hint of crisis came in the form of a blast wave.

The paralysis had two main sources, the examination by The Times shows. The first was a failure to train for the worst. The Horizon was like a Gulf Coast town that regularly rehearsed for Category 1 hurricanes but never contemplated the hundred-year storm. The crew members, though expert in responding to the

usual range of well problems, were unprepared for a major blowout followed by explosions, fires and a total loss of power.

They were also frozen by the sheer complexity of the Horizon's defenses, and by the policies that explained when they were to be deployed. One emergency system alone was controlled by 30 buttons.

The Horizon's owner, Transocean, the world's largest operator of offshore oil rigs, had provided the crew with a detailed handbook on how to respond to signs of a blowout. Yet its emergency protocols often urged rapid action while also warning against overreaction. Fred Bartlit, chief counsel for the presidential commission that is looking into the Horizon disaster, said Transocean's handbook was "a safety expert's dream," and yet after reading it cover to cover he struggled to answer a basic question:

"How do you know it's bad enough to act fast?"

Transocean has defended the Horizon's crew. "They acted appropriately based on the information they had at the time," the company said in a statement, adding, "This world-class crew — some of whom lost their lives — battled to the end to gain control of the well."

In the end, though, after the Horizon's elaborate defenses had failed, many lives were saved by simple acts of bravery, the interviews and records show. All over the rig, in the most hellish of circumstances, men and women helped one another find a way to live.

Morning, April 20

Caleb Holloway, a lanky 28-year-old floorhand, headed up to the Horizon's vast main deck just after 11 a.m. It had always been a breathtaking sight.

The deck, nearly as big as a football field, was dominated by a 25-story derrick flanked by two cranes. Below deck were two more floors, including quarters for up to 146 people. Each room had its own bathroom and satellite television. There was a gym, a sauna and a movie theater. Housekeepers cleaned the crew members' rooms and did their laundry. "A floating Hilton," they called it.

Before joining the Horizon in 2007, Mr. Holloway had worked on a rusty little jack-up rig just off the Gulf Coast. But this place — a space-age behemoth packed with up to 5,000 pieces of sophisticated drilling equipment — practically gleamed. "Everything on Horizon, it's like, pretty," he said.

Mr. Holloway gathered with the rest of his drilling crew, about a dozen men in all, to discuss the day ahead with their bosses, Wyman Wheeler, the toolpusher, and the driller, Dewey Revette. They were a tight-knit bunch, working in close quarters 12 hours a day, day after day, over a 21-day hitch. They knew one another's moods and quirks. They all knew Mr. Revette was a nut for Jeeps, and that Steve Curtis, an assistant driller, could do a turkey call that was so convincing you half expected a turkey to land on the rig. Everyone had a nickname — Mr. Holloway was "Hollywood" — and their bond went beyond work. Some hunted and fished together, others worked out together, and a few studied the Good Book together.

"It was family," Mr. Holloway said.

It was also a family with some swagger.

Drilling is a competitive business, and it was an article of faith that the Horizon's crew members were among the best. Just last year, the Horizon drilled the deepest oil well on earth, at 35,055 feet.

They shared something else — a clear-eyed realization that they held one of the last great blue-collar jobs, where someone with a high school diploma could easily make six figures a year.

The Horizon was not just a job; it was a path to a life otherwise out of reach.

Doug Crawford of Mount Olive, Miss., had hit a dead end in the poultry industry. Patrick Morgan of McCool, Miss., saw the writing on the wall when his Georgia-Pacific plant began downsizing. Six years ago, Mr. Holloway was pouring concrete foundations and wondering if he would ever get a paid vacation. Now he and his wife owned an Infiniti and a sprawling brick home.

Leo Lindner, a former college English teacher who discovered that he could make far more money handling drilling fluids on the Horizon, was not fooled by the rig's collection of good old boys. "Sometimes maybe a little rough," he said, "but a very intelligent crew."

On this day, the main task was finishing off the "well from hell." The Macondo had been behind schedule nearly from the get-go, and the Horizon had been sent to get it back on track. At first the Horizon drilled rapidly, welcome news for a crew whose bonuses were tied to meeting schedules.

But drilling quickly adds risk. For all of the Horizon's engineering wizardry, it was tangling with powerful and unpredictable geological forces. And pushing rapidly into a highly pressurized, three-mile-deep reservoir of oil and gas can be particularly problematic in the Gulf of Mexico's unstable and porous formations.

Sure enough, the Horizon hit trouble. Heavy drilling fluid, called mud, kept disappearing into formation cracks. Less mud meant less weight bearing down on the oil and gas that were surging up. This set off violent "kicks" of gas and oil that sent the Horizon's drilling teams scrambling to control the well. March 8 had been especially bad. A nasty kick had left millions of dollars worth of drilling tools jammed in the well. Operations were halted for nine maddening days. There was still so much gas filtering up that cookouts were suspended on the deck.

For the crew, the sooner they left the Macondo the better, so the team quickly got down to business. Mr. Holloway worked the drilling floor with Adam Weise and Dan Barron, the team's newest member. Before long, Mr. Holloway received a call over his radio from Mr. Revette: "Mr. Jimmy needs to see you down in his office."

Jimmy Harrell, 54, had started off as a floorhand just like Mr. Holloway. Now, after three decades with Transocean, he was the boss of the Deepwater Horizon. He was revered by his crew, regarded as approachable, competent and to the point. Mr. Holloway found most of the rig's leaders waiting in Mr. Harrell's office, including Curt Kuchta, the captain, and Randy Ezell, the senior toolpusher, who supervised drilling operations.

"All right," Mr. Harrell began. "Close the door."

Mr. Harrell handed him a box. Inside was a handsome silver watch — a reward for spotting a worn bolt on the derrick. "You did a really good derrick inspection," Mr. Harrell said.

The gesture was typical of the potent safety culture on the Horizon, where before every job, no matter how routine, crew members were required to write out a plan identifying all potential hazards. Despite the long hours and harsh conditions, injuries were remarkably rare. So rare that two BP executives and two senior Transocean officials had flown out earlier in the day to praise the crew's safety performance.

But the V.I.P.'s were also there to discuss the Horizon's crowded schedule. Along with finishing the Macondo, the rig had to complete several repairs before beginning two other high-priority projects for BP. The executives were keen to keep the Horizon on track. In e-mails, BP managers — whose bonuses were heavily based on saving money and beating deadlines — kept asking when the well would be finished.

Mr. Holloway returned to work, and he and the other floorhands got busy cleaning the drilling floor. They avoided the drill shack, though. Lately, there had been too much stress there.

Mr. Holloway could tell when the BP "company men" got on Mr. Revette's nerves: he would rub his head a certain way. This had happened a lot on the Macondo job. The Horizon might have been Transocean's rig, but it was BP's well, and it was obvious that the guys in the shack felt that the BP men were breathing down their necks. "You could just tell," Mr. Holloway said.

BP has denied pressuring the Horizon's crew to cut corners, but its plans for completing the well kept changing, often in ways that saved time but increased risk. "It's a new deal every time we get up," Jason Anderson, a 35-year-old toolpusher, complained to his father.

By early evening, there was one crucial test remaining before the Horizon could plug the Macondo and move on. To make sure the well was not leaking, the crew would withdraw heavy mud from it and replace it with lighter seawater. Then they would shut in the well to see if pressure built up inside. If it did, that could mean hydrocarbons — oil and gas — were seeping into the well.

In effect, they were daring the well to blow out. Designing and interpreting this test — a "negative pressure" test — requires a blend of art and engineering expertise. There are no industry standards or government rules. Designing the test was BP's job, yet the oil company's instructions, e-mailed to the rig that morning, were all of 24 words long.

It fell to the BP company men and the drilling crew to work out the details, but it did not go well. There was strong disagreement over the test results. Pressure had built up, exactly what they did not want, and Mr. Wheeler, the team's toolpusher, was worried. A BP company man said he thought the test went fine. Other rig managers, including Mr. Anderson, joined the discussion, and they debated whether to repeat the test.

By 8 p.m., after redoing the test, they all agreed that the Macondo was stable. In a few hours, the drilling crew's 21-day hitch would be done. They were working unusually fast. In seven years on the Horizon, Joseph Keith had never seen so much activity while sealing a well, and it made him uncomfortable. His job included monitoring gauges that detect blowouts. But all the jobs going on at once — transferring mud to a supply vessel, cleaning mud pits, repairing a pump — could throw off his instruments. Mr. Keith did not tell anyone that he was worried about his ability to monitor the well. "I guess I just didn't think of it at the time," he later testified.

Mr. Holloway and Mr. Weise were filling out paperwork when Mr. Revette called on the radio again. He needed a floorhand in the pump room below. "I'll see you at 11:30, buddy," Mr. Weise said, heading down. Mr. Holloway walked to the drill shack to drop off the papers.

By then, oil and gas had probably begun seeping into the well.

Investigators believe that the influx began about 8:50 p.m. Preparing to plug the well, the drilling crew was pumping mud from it, reducing the weight bearing down on the hydrocarbons. Investigators agree that the Macondo had in fact failed its crucial final test. They have pointed to BP's cursory instructions and

questioned whether the Horizon's crew had the skills to correctly interpret the results. They also believe that monitors should have allowed Mr. Revette's team to spot the signs of leaking within the first 20 minutes.

But Mr. Holloway detected no concern in the drill shack. Whether the team was distracted by other tasks or rushing to get done or simply complacent may never be known.

"The question is why these experienced men out on that rig talked themselves into believing that this was a good test," said Sean Grimsley, a lawyer for a presidential commission investigating the disaster.

"None of these men out on that rig want to die."

Mr. Ezell, the senior toolpusher, was in his office below deck. He had been up nearly 18 hours, but a little before 9:30 he decided to check in one last time with Mr. Anderson, who had relieved Mr. Wheeler. Mr. Ezell and Mr. Anderson had been born in the same Texas hospital, and though they were 20 years apart, Mr. Ezell considered Mr. Anderson to be "just like a brother." He knew Mr. Anderson would give it to him straight on whether there were lingering doubts about the final tests.

Mr. Anderson assured him everything was good.

"Get your ass to bed," he said.

Blowout

By now, investigators agree, hundreds of barrels of oil and gas were moving up the well, gathering force and speed as the gases expanded.

At 9:38, well data indicates, the first hydrocarbons passed through the Horizon's five-story blowout preventer. Resting on the seabed, the blowout preventer was an elaborate fail-safe device that gave the drilling crew several ways to seal the well. But once the oil and gas got past the blowout preventer, there was nothing to stop them from racing up the Horizon's riser pipe, the 5,000-foot umbilical cord to the rig.

Mr. Holloway and Mr. Barron were working on the main deck when Mr. Holloway happened to glance up at the drilling floor. He could not believe it. Drilling mud was gushing up from the well, just like a water fountain.

It would be nine minutes before the first explosion, well data shows.

Nine precious minutes.

The drilling crew had trained for blowouts. Floorhands like Mr. Holloway were the crucial first responders. A driller would call "Blowout!" and time their response. This usually involved quickly installing a special valve on the drill pipe to end the imagined blowout.

But confronted with the real thing for the first time, Mr. Holloway realized there were no floorhands on the drilling floor to respond.

Mr. Holloway cursed and sprinted for the stairs. Mr. Barron was right behind him. A waterfall of mud was pouring off the drilling floor to the main deck. Then, in a split second, mud and water exploded up inside the derrick.

When they reached the drilling floor, Mr. Holloway and Mr. Barron paused. They would have to pass through a watertight door to get to the drilling floor. Yet they could not be sure what they would find on the other side.

Mr. Holloway cracked open the door. All he could see was mud and water bouncing off the derrick in every direction with incredible force. He and Mr. Barron went through anyway.

Twenty feet from the blowout's full fury, it sounded like a jet engine, a shrill whining howl. Mr. Holloway was instantly soaked, his protective glasses coated in mud. Objects were crashing around him, some "loud enough to make you jump."

He told Mr. Barron to take shelter in the heavy tool room just behind them.

Their training sessions contemplated a blowout coming up through only the drilling pipe. This one, it seemed, was erupting from the whole well opening. "I had no idea it could do what it did," Mr. Holloway said.

He considered making a dash for the drill shack to find out what his bosses wanted to do, but he would risk being torn apart by the blowout.

He reached for his radio and called Mr. Revette.

"Dewey!" he shouted. "What do I do?" He didn't hear an answer. He took his earplugs out and tried again.

"Dewey. Dewey. What do we need to do?"

Again, no response.

'Something Ain't Right'

High above the rig floor, from his perch in a crane cab, Micah Joseph Sandell had a clear view of the blowout.

When the mud subsided for a moment, he thought the drilling crew had it under control. But then it erupted again, he said, so loudly that it was like "putting an air hose to your ear."

Even more unnerving was the smoky haze of gas coming from a pipe opening positioned like a large shower head high up on the derrick. The Horizon had two ways to defend against oil and gas surging to the rig. The drilling crew could turn a valve and divert the blowout out to sea. Or it could try to contain it on the rig by funneling it into a device called a mud gas separator.

The separator was much preferred for smaller kicks because it avoided any cleanup and investigation required by a spill. Drilling crews rarely even rehearse diverting blowouts into the ocean, and Transocean's handbook seemed to offer contradictory advice. It said either method could be used if hydrocarbons entered the riser.

The gas Mr. Sandell saw floating down from the derrick indicated that Mr. Revette's team had chosen the mud gas separator, only to see it quickly overwhelmed.

The gas cloud spreading over the aft deck was a grave threat.

The Horizon's six main diesel engines, spanning the rig's back end, were fed by air intakes above the deck. If the engines began taking in air suffused with gas, they might speed up to the point of breaking apart.

Doug Brown, a chief mechanic, was doing paperwork in the engine control room, which was sandwiched in the middle of the six main engines. Three of his men were with him. Suddenly, a computer console began chirping, warning that sensors had detected gas somewhere on the rig. "Something ain't right," Mr. Brown said.

Up on the bridge, the crew was busy showing off the Horizon's impressive capabilities to the V.I.P.'s.

Andrea Fleytas, one of the bridge officers, felt a jolt. Curt Kuchta, the 34-year-old captain, also sensed something wrong. There was a high-pitched hissing. On a closed-circuit television, they could see mud flying into the sea.

Suddenly, gas alarms began lighting up Ms. Fleytas's computer console. The lights showed gas spreading over the rig, from the drilling floor to the main deck. There were so many alarms it was hard to keep track of where gas was being detected. More frightening still, the lights were all magenta, signaling extremely high levels of combustible gas.

The phone rang. It was the crew in the drill shack. They said they were having a well-control situation and hung up. A second call came — the engine control room asking what was going on. "We have a well-control situation," Ms. Fleytas replied.

She said nothing about the erupting mud or the gas alarms.

The alarm system relied on dozens of sensors strategically placed all over the Horizon. When a sensor detected fire or gas, a corresponding alarm lighted up on computer consoles — not just on the bridge, but also in the two other crucial parts of the rig, the drill shack and the engine control room. In theory, this meant anyone in the three critical locations could respond swiftly to the first sign of trouble.

As originally designed, this system would also automatically trigger the general master alarm — the shrill warning that signaled evacuation of the rig — if it detected high levels of gas. Transocean, though, had set the system so that the general master alarm had to be activated manually.

The change had the Coast Guard's blessing, but Mike Williams, an electronics technician who maintained the system, testified that he had raised concerns about the setup's safety.

"They did not want people woke up at 3 o'clock in the morning due to false alarms," he said.

Ms. Fleytas, 23, had graduated from maritime school in 2008 and had only been on the Horizon for 18 months. This was her first well-control emergency. But she had been trained, she said, to immediately sound the general master alarm if two or more sensors detected gas. She knew it had to be activated manually. She also knew how important it was to get crew members out of spaces filled with gas.

Yet with as many as 20 sensors glowing magenta on her console, Ms. Fleytas hesitated. She did not sound the general master alarm. Instead she began pressing buttons that told the system that the bridge crew was aware of the alarms.

"It was a lot to take in," she testified. "There was a lot going on."

Her boss, Yancy Keplinger, was also on the bridge. The alarms, in addition to flashing magenta, were making a warning sound. Mr. Keplinger said he kept trying to silence the alarms so he could think about what to do next. “I don’t think anybody was trained for the massive detectors that were going off that night,” he said.

Ms. Fleytas and Mr. Keplinger had another powerful tool at their fingertips — the emergency shutdown system. They could have used it to shut down the ventilation fans and inhibit the flow of gas. They could have used it to turn off electrical equipment and limit ignition sources. They could have even used it to shut down the engines.

They did none of these things.

Ms. Fleytas’s lawyer, Tim Johnson, said that with so much gas, explosions were all but inevitable. “I don’t think anything she could have done would have changed the situation out there,” he said. Mr. Keplinger’s lawyer, Steve Gordon, said the bridge crew faced “an insurmountable situation.”

As with the general master alarm, the effectiveness of the Horizon’s emergency shutdown system relied on human judgment. Transocean had been warned that the human element — the need for crew members to act quickly and correctly under stress — made the shutdown system vulnerable. In 2002, a safety consultant specifically urged Transocean to consider changing the system “so that human input is not critical for success.” Transocean says that having an automatic system is less safe.

Ms. Fleytas said it never occurred to her to use the emergency shutdown system. In any event, she explained, she had not been taught how to use it. “I don’t know of any procedures,” she said.

A Fine Mist of Gas

Most of the crew members still knew nothing about the unfolding emergency. They were sleeping, watching television, calling home, posting on Facebook.

On the drilling floor, inside the heavy tool room, Mr. Holloway found Mr. Barron pacing. They were both close to losing it. “I just remember the look on his face,” Mr. Holloway said. Mr. Holloway picked up a phone and started to dial Mr. Revette again. Then he froze. He realized he was enveloped in a fine mist of gas.

“I could just feel it and taste it,” he said. “It was smothering.”

He looked at Mr. Barron, and for the first time he panicked. He knew they were one spark from oblivion.

“Daniel, that’s gas,” he yelled. “We have to go.” He dropped the phone, and they ran down a set of stairs to the main deck.

Mr. Ezell’s stateroom was on the level below. After Mr. Anderson had told him to go to bed, Mr. Ezell had called his wife. He turned on his new 40-inch flat-screen television. About 15 minutes after hanging up with Mr. Anderson, his phone rang. It was Mr. Curtis, the assistant driller.

“We have a situation,” Mr. Curtis began.

“The well is blown out,” he said. Mud, he explained, was shooting to the top of the derrick. The drill shack’s windows were coated. They could not see a thing. After 33 years of offshore drilling, Mr. Ezell knew instantly that this was the nightmare they had all dreaded.

“Do y’all have it shut in?” he asked.

“Jason is shutting it in right now,” Mr. Curtis said. No one was better at shutting in a well than Mr. Anderson, but Mr. Curtis’s next words were a plea: “Randy, we need your help.”

Mr. Ezell grabbed his coveralls and socks. His boots and his hard hat were in his office. In the hall, he found Wyman Wheeler and Buddy Trahan, one of the Transocean V.I.P.’s, who had come down from the bridge. They asked what was going on. Mr. Ezell was so focused on getting to the drilling floor he did not respond.

Only minutes before the blowout, the drill shack had seemed to sense trouble. Mr. Revette and Mr. Anderson were overheard discussing puzzling pressure readings. They had also turned off the pumps removing mud from the well, and they had sent word that they were going to hold off on plugging it.

When the mud erupted, they reacted quickly, well data shows. They turned to their mightiest weapon, the 400-ton blowout preventer. It gave the men several different methods to shut in the well, the most extreme being a powerful set of hydraulic shears that could cut through drill pipe and seal the well.

A red button in the drill shack would activate the shears, yet Transocean’s well-control handbook said they should be used “only in exceptional circumstances.” It does not appear the button was pushed. The well data, though, indicates that the drilling team tried to use at least two other methods, both in keeping with Transocean’s guidelines. Neither worked.

The industry has long depicted blowout preventers as “the ultimate fail-safe.” But Transocean says the Horizon’s blowout preventer was simply incapable of preventing this blowout. Evidence is mounting, however, that the blowout preventer may have been crippled by poor maintenance. Investigators have found a host of problems — dead batteries, bad solenoid valves, leaking hydraulic lines — that were overlooked or ignored. Transocean had also never performed an expensive 90-day maintenance inspection that the manufacturer said should be done every three to five years. Industry standards and federal regulations said the same thing. BP and a Transocean safety consultant had pointed out that the Horizon’s blowout preventer, a decade old, was past due for the inspection.

Transocean decided that its regular maintenance program was adequate for the time being.

As the drilling team was trying to shut in the well, Paul Erickson, the chief mate on the Damon B. Bankston, a 262-foot work vessel moored to the Horizon, noticed something spilling off the rig. Then drilling fluids began cascading onto the ship. Dead seagulls fell, killed by the blowout’s blast. The Bankston’s captain radioed the Horizon’s bridge and was told to move to a safe distance.

In the engine control room, Doug Brown and his men overheard the conversation with the Bankston on their radios. Within arm’s reach was a console that gave them access to the emergency shutdown system. All they had to do was lift a plastic cover and hit a button and the engines would shut down in seconds.

It was not such an easy or obvious step to take.

Although they knew there was a well-control situation, they had no reason to believe that it was anything more than a routine kick. Nor did they know that highly explosive gas was gathering overhead.

There was risk in overreacting. If they killed the engines, the Horizon would drift from its position over the well, possibly damaging the drilling equipment and forcing costly delays. Indeed, Mr. Brown testified that he did not think he had the authority to hit the emergency shutdown. The practice was to “wait and listen” for instructions from the bridge, said William Stoner, one of the men with Mr. Brown.

But other than the two brief calls, each only seconds long, there were no communications or coordination among the bridge, the drill shack and the engine control room. The men in the engine control room did nothing.

Mr. Stoner saw more lights flicker on the console: someone had triggered an emergency shutdown of the electrical and ventilation systems near the drilling floor. Since the bridge and the engine control room had not hit the emergency shutdown, only the men in the drill shack could have done it. But those efforts to prevent an explosion on the drilling floor did not affect the engines.

Two of the rig’s six engines were running — No. 3 and No. 6 — and they were beginning to accelerate. The usual rumble was turning to a whine. A safety device, the “rig saver,” should have shut down the engines if they ran too fast. Yet the whine kept climbing. “Higher and higher and higher,” Mr. Brown recalled.

In the electronics shop next door, Mike Williams could hear Engine 3 revving. He pushed away from his desk to investigate.

Just then, his computer monitor exploded. Then, light bulbs began popping, one by one.

Explosions and Fire

Mr. Holloway and Mr. Barron were leaping rows of pipes, heading for the stairs that would take them down, off the main deck.

All the lights went out, casting them into darkness.

“Stay with me, Daniel,” he called.

They were turning down the stairs when they were buffeted by an explosion. Mr. Holloway felt an intense, stabbing pain in his ears. He steadied himself on the stair rail and pressed his hard hat to his head, as if it alone might shelter him.

The first big explosion centered on Engine 3, investigators believe. A second explosion centered on Engine 6. Caught in the crossfire were Mr. Brown’s engine control room and Mr. Williams’s electronics shop.

Mr. Williams was contemplating the remains of his computer when everything exploded. A door smashed his forehead. Blood streaming down his face, he clenched a penlight in his mouth and began crawling. He got to another door, only to be blown 30 feet back by the second blast.

He began crawling again. He climbed across two men in the engine control room. He assumed they were dead because they did not respond. (In fact, all four men in the engine control room survived, although all were injured.)

Mr. Williams made it to the lifeboat deck just outside the engine control room. The superstructure by Engine 3 had been blown away. But the two lifeboats looked intact. They were meant to hold 73 people, but he considered launching one on his own.

Instead, he decided to offer his help on the bridge.

All over the Horizon, the explosions hit crew members who until then had been oblivious to the threat. In the galley, Kenneth Roberts was washing dishes. The explosions knocked him out. "I woke up under a table," he said. Virginia Stevens was working in the laundry. The blasts left her trapped and battered. "No warning, no nothing," she said.

On the main deck, Carlos Ramos looked up at his boss, Dale Burkeen, who was operating the Horizon's starboard crane. Mr. Ramos wanted to make sure that Mr. Burkeen was getting out. Instead, Mr. Burkeen, a father figure to many on the rig, tried to lay the crane boom in its cradle.

"Moments later, I saw him exit the cab and go down the spiral staircase while smoke and flames covered him whole," Mr. Ramos said. The blast wave from the second explosion briefly extinguished the fire engulfing Mr. Burkeen, but it also knocked him headfirst to the deck.

Joseph Keith, running for the lifeboats, stumbled on Mr. Burkeen. He was facedown in a pool of blood, without a pulse, his head caved in.

On the other side of the deck, Mr. Sandell was blown to the back of his crane cab by the second explosion. "All I know is the whole deck blew up," he recalled. A fireball, hundreds of feet high, enveloped the derrick and wrapped itself around his cabin. He could feel the heat building. He put his arms over his head and prepared for the end.

"No, God," he said. "No."

Trapped Below Deck

Mr. Ezell had just stepped into his office to get his boots and his hard hat when he was blown 20 feet into a bulkhead.

"I could hear everything deathly calm," he said.

Twice he struggled to get up.

Twice he fell back.

"Either you get up," he told himself, "or you're going to lay here and die."

He made it to his hands and knees, but he could not figure the way out. He felt a flow of air and followed it until he realized it was gas. He kept crawling, droplets of gas clinging to his face. His hand touched a body. There was a groan. It was Mr. Wheeler, buried in debris.

"Are you all right?" he asked.

"Hell no, I'm not all right," Mr. Wheeler said. "Get this stuff off of me."

Down the hallway, Mr. Ezell saw a flashlight beam. It was Stan Carden, the electrical supervisor, and Chad Murray, the chief electrician. Then the rig boss, Mr. Harrell, emerged from the remains of his stateroom. He had been in the shower and although he had managed to slip into coveralls, his feet were bare and he had been partially blinded by slivers of insulation. The gas made it hard to breathe.

Mr. Ezell told him about Mr. Wheeler.

“Yeah, O.K.,” Mr. Harrell said, disoriented and squinting. “I’ve got to see if I can find me some shoes.”

The men finally managed to get Mr. Wheeler up, but his leg was shattered and he could not walk.

“Y’all go on,” he said. “Save yourself.”

They ignored him.

A little way off, a voice called out: “God, help me.”

Mr. Ezell saw feet protruding from the wreckage. It was Mr. Trahan, the Transocean executive. He and Mr. Wheeler had been swallowed by a fireball that had roared down the corridor.

Somehow the men found a stretcher. While Mr. Carden and Mr. Murray carried Mr. Trahan away, Mr. Ezell waited with Mr. Wheeler.

“I told him I wasn’t going to leave him, and I didn’t,” Mr. Ezell said.

After the explosions, the chief engineer, Steve Bertone, raced from his room to the bridge. He did a quick survey of the rig’s condition. Its engines were dead. There was no power. The phones didn’t work. When he tried the handheld radios, they didn’t either. Meanwhile, he later wrote in a statement to the Coast Guard, Captain Kuchta was screaming at Ms. Fleytas for pushing the Horizon’s distress signal.

Then Mr. Williams arrived on the bridge, his face a mask of blood. He announced that the engine control room was gone.

“What do you mean gone?” Mr. Bertone asked.

Mr. Williams described the explosions, but the captain did not seem to absorb the news. “He looked at me with that dazed and confused deer-in-the-headlights look,” Mr. Williams testified.

The captain’s attorney, Kyle Schonekas, said no one could point to anything Mr. Kuchta “did or failed to do that caused any injury or loss of life.”

Without power, there was no way to fight the fire, no way to control the rig. They were on a “dead ship,” Mr. Bertone said.

Only after the explosions did the bridge crew finally hit the general master alarm.

It had been at least two minutes since the first gas alarms sounded, records and interviews show. And according to government officials and BP’s internal investigation, it had been nine minutes since mud had gushed onto the drilling floor, although Transocean has suggested that it might have only been six minutes.

The captain asked Ms. Fleytas to make an emergency announcement. She looked at her boss, Mr. Keplinger. “She said she couldn’t do it,” he said. “She looked pretty nervous.”

Although Ms. Fleytas disputes Mr. Keplinger’s account, it was Mr. Keplinger who got on the intercom.

“Fire, fire, fire,” he called out.

A Fighting Chance

There was still a way to keep the Horizon from sinking. Chris Pleasant saw it first.

Mr. Pleasant was one of the supervisors responsible for the blowout preventer. With the main deck on fire, he ran for the bridge with one thought: they needed to disconnect the rig from the blowout preventer — and therefore from the well itself. That would cut off the fire’s main source of fuel and give the Horizon a fighting chance.

He just needed to activate the emergency disconnect system. Like a fighter pilot hitting eject, it would signal the blowout preventer to release the Horizon. It would also signal it to seal the well, perhaps stopping the flow of oil into the Gulf of Mexico.

“I’m hitting E.D.S.,” he told the captain.

Witnesses differ about what happened next. But they agree on a basic point: even with the Horizon burning, powerless and gutted by explosions, there was still resistance to the strongest possible measure that might save the rig.

According to Mr. Pleasant, the captain told him, “No, calm down, we’re not hitting E.D.S.”

Mr. Bertone, the chief engineer, recalled someone hollering that they needed Jimmy Harrell’s approval.

As it happened, Mr. Harrell had finally made it to the bridge despite being half-blinded by insulation and gas. Ms. Fleytas recalled the captain asking Mr. Harrell’s permission to hit the emergency disconnect. Mr. Harrell said he told Mr. Pleasant to go ahead.

Mr. Bertone assumed that the Horizon was now freed from the Macondo. The inferno consuming the derrick would soon subside. If they could get the standby generators to work, he reasoned, they could start one of the remaining engines and fight the fires. The generators, however, were on the back end of the Horizon, just beyond the burning derrick. Someone would have to brave the flames to get to them.

Mr. Bertone said he was going. Mr. Williams and a third man, Paul Meinhart, said they would go, too.

The three crept along the rig’s edge, holding one another by the shirttails. But when they finally reached the generators, they could not get them to start.

Meanwhile, David Young, the chief mate, had discovered a new problem. Mr. Young was in charge of the Horizon’s two firefighting teams, which practiced each Sunday. After the explosions, he went to a fire locker and waited for his men to show up. Only one did.

“We weren’t trained to fight a blowout fire,” said Matt Jacobs, a firefighter who went straight to the lifeboats.

But the death knell for the Horizon was the emergency disconnect system itself. Like so many of the rig’s defenses, it failed to work for reasons that remain unclear.

The Horizon was still handcuffed to the well from hell. There was nothing left for the crew to do but to get off the doomed rig before they all died.

‘We Got to Go’

Mr. Holloway and Mr. Barron ran along a catwalk toward the rig’s forward lifeboat deck.

There were two lifeboats, with crew members assigned to one or the other. Mr. Holloway and a couple of other men climbed into lifeboat No. 1.

Then they waited.

They waited some more.

Where was everyone? Why weren’t they coming?

They felt the second explosion, and for a sickening moment, it seemed as if the lifeboat was going to plummet into the gulf. But it held fast.

Mr. Holloway climbed out. The door leading to the crew quarters had been blown open. He stepped into a darkened hallway. The theater was to his right, the mess hall to his left. He had been there a hundred times. But nothing was recognizable. Walls were caved in. Ceiling tiles dangled. Bits of insulation floated in the air. He went deeper, his flashlight shining ahead. He wanted to get people moving. Suddenly he became aware of a mass of dazed men coming toward him. Some were shirtless or shoeless or wearing only underwear.

Together, they made their way to the lifeboats.

Of all the emergency procedures on the Horizon, evacuation was the most practiced. But the routine rapidly disintegrated. Out on the now-crowded lifeboat deck, everyone could see, feel and hear the flames engulfing the derrick. Mr. Jacobs said it was “like staring into the face of death.”

The crew was supposed to first report to a supervisor. Yet many were simply piling into the lifeboats. Someone ordered the men to get out. “Needless to say that didn’t happen,” Benjamin Lacroix said.

Inside the enclosed lifeboats, heat and smoke were building. Men began screaming at the coxswains to launch. The burning derrick, they warned, might collapse on all of them. “We got to go,” they yelled. Some were crying.

Lifeboat No. 2 left first, without many of its assigned passengers, records and interviews show.

Darin Rupinski, the coxswain for lifeboat No. 1, refused to leave with empty seats. “Let me do my job,” he said.

Greg Meche had seen mayhem as an infantryman in Iraq. The fire and explosions ripping the Horizon apart were even more terrifying. “I never heard a bomb like that in Baghdad,” he said in an interview. He made a quick decision; he and a friend jumped into the gulf.

Mr. Holloway saw his friend Matt Hughes clinging to the handrail and urged him not to jump. But Mr. Hughes lost his footing and fell, glancing off the rig and cartwheeling into the water. Mr. Holloway climbed the rail, prepared to go after Mr. Hughes if he did not come up swimming.

The gulf, he recalled, was as calm as a “mud puddle.” At last, Mr. Hughes popped up and backstroked away.

Mr. Holloway was one of the last into lifeboat No. 1. Soon he noticed Mr. Harrell and a few others coming from the crew quarters, carrying someone on a backboard. It was Mr. Trahan, and he was in excruciating pain. His entire back had been burned. He had a deep puncture wound on his neck. His left calf was mangled, and his fingernails were gone.

But the backboard would not fit into the packed lifeboat. So they took Mr. Trahan off the board, and Mr. Holloway, Mr. Pleasant and others eased him into the boat and strapped him in.

Mr. Holloway turned to help Mr. Harrell. “I can’t see,” Mr. Harrell said. “What’s happening?”

“It’s me, Caleb, Mr. Jimmy. Just hang tight, and we’re going to get these straps on.”

But when it came time for Mr. Holloway to strap himself in, his hands would not cooperate. He fumbled and gave up. He could hear the nitrogen tanks bursting on the main deck. The heat was suffocating. He looked around for other members of his drilling crew. “Where are my guys?”

He began to pray. A passage from Isaiah came to him: “Yea, I will uphold thee with the right hand of my righteousness.”

10 Left Behind

Both lifeboats had left, but at least 10 people were still alive on the rig.

When Mr. Bertone, Mr. Williams and Mr. Meinhart finally made it back to the bridge from their attempt to start the generators, they found the captain, Ms. Fleytas and Mr. Keplinger still there.

“That’s it,” Mr. Bertone said to his men. “Abandon ship.” The captain said it was time to go, too.

Down on the lifeboat deck they found Mr. Ezell, Mr. Carden and Mr. Murray tending to Mr. Wheeler on a gurney. They gently put him in a life vest.

“My leg,” Mr. Wheeler moaned.

The plan was for everyone to leave in an inflatable raft, a backup to the lifeboats. But this plan, too, went awry. For all the evacuation drills, they had never rehearsed inflating and lowering the raft. They had trouble freeing it from the deck, more trouble keeping it level and more trouble still getting it loaded.

Small explosions kept going off around them, sending projectiles every which way. Intense waves of heat were now coming up from under the rig.

“I honestly thought we were going to cook right there,” Mr. Bertone said.

In his written Coast Guard statement, Mr. Bertone said the captain suggested leaving Mr. Wheeler behind. Mr. Bertone wrote that he “pushed past” the captain, shoved Mr. Wheeler’s gurney into the raft and climbed in himself.

The captain’s lawyer disputed Mr. Bertone’s statement, saying Captain Kuchta acted in “an incredibly heroic and skilled manner.”

The raft, far from full, began to descend, leaving several people on the deck. The raft pitched and spun wildly, spilling Mr. Wheeler from his stretcher. Ms. Fleytas said it felt like they were “free falling,” and when it hit the gulf, she went tumbling into the water. The raft’s remaining occupants were stuck under a burning, exploding, sinking oil rig, and they couldn’t find the paddles.

Mr. Bertone jumped in the water and tried to drag the raft away. Others did, too. Then, out of the smoke, he saw someone plunging at him.

It was the captain.

He barely missed Mr. Bertone.

Another crew member fell through the smoke. It was Mr. Keplinger.

Mr. Bertone could make out Mr. Williams up on the helicopter pad. He watched him sprint and then leap, his legs churning as he arced into the sea.

Try as they might, they could not get the raft away from the rig. It turned out the raft was still tied to it. Captain Kuchta thought fast. He swam to a rescue boat launched by the Bankston, fetched a knife and returned to cut the raft free.

On the Bankston

It seemed to take the lifeboats forever to get to the Bankston.

When lifeboat No. 1 arrived, Mr. Holloway scrambled up a ladder to the deck. He was quickly put to work directing the injured to a makeshift triage area. But he kept looking for his drilling crew. He kept asking others if they had seen his guys. No one had.

Eventually he went to sign in with a man who had a list of the crew. The name of everyone who had reported in was highlighted. Mr. Holloway scanned the list. Only two names from his team were marked — his and Mr. Barron’s.

He felt sick and heartbroken all at once. Eleven men were missing, including Dale Burkeen, Dewey Revette, Steve Curtis, Jason Anderson and Mr. Holloway’s buddy, Adam Weise. All but Mr. Burkeen had been working either on the drilling floor or just below it.

The life raft arrived, and Mr. Wheeler was rushed to the triage area. He seemed close to passing out from the pain, yet when he saw Mr. Holloway, he managed a question.

“Hollywood, who made it?” he asked.

Mr. Holloway avoided answering him directly. “I didn’t have the heart to tell him,” he said.

After the Coast Guard arrived and moved Mr. Wheeler and the other injured off the Bankston by air, Mr. Holloway searched for a place inside the ship where he would not have to watch the Horizon burn, a private spot where he could at last weep for his friends.

Out on the deck, the Horizon's crew gathered in groups. Across the water, the rig hissed and groaned as it began to list. The mighty derrick finally crashed. Several crew members said it was like watching your home burn.

In quiet conversations, they tried to make sense of what had happened. That so many had escaped seemed a miracle, but why had the rig's defenses failed? What had the drilling crew seen?

They turned to Mr. Holloway for answers. "There was nobody else to ask," he said.

Mr. Harrell stayed with his crew on the deck. He looked as if he were carrying the weight of the entire disaster. Some thought he might be having a heart attack. Crew members took turns trying to comfort him. He kept saying he wished he could turn back time.

"I don't know what happened," he told Mr. Holloway.

"I don't either, Mr. Jimmy."

The next morning was clear and calm. The Horizon, receding in the distance, burned brightly. The crew gathered on the Bankston's deck. Shoulder to shoulder, they formed a large circle. A BP manager explained that they were headed to Port Fourchon, La.

Mr. Lindner, the former English teacher, interrupted.

"We should really say something for our fallen," he said.

The group fell silent.

Patrick Morgan, an assistant driller, spoke up first.

"Our Father," he said, and with that everyone joined in the Lord's Prayer.

Ian Urbina contributed reporting.