On April 20 at 10:43 a.m., a young BP PLC engineer sent a 173-word email to colleagues aboard the Deepwater Horizon drilling rig. The email spelled out a recent change to a key safety test that sparked confusion and debate aboard the rig.

Less than 12 hours later, the rig was engulfed in flames so hot they melted steel. Eleven workers were dead.
The worst offshore oil spill in U.S. history had begun.

The Deepwater Horizon blowout has become one of the most scrutinized maritime disasters ever. Congressional investigators and outside experts have identified a series of decisions in the weeks beforehand that made the blowout more likely.

But a central uncertainty remained: Why didn't the crew recognize the warning signs in the final hours and bring the well under control while there was still time to prevent a lethal eruption?

The Wall Street Journal has reviewed BP internal documents along with hours of public testimony before a joint Coast Guard and Interior Department panel. The Journal also interviewed dozens of witnesses to the disaster. What emerges is a startling picture of the last day of the Deepwater Horizon—a day filled with disruption and disagreement.

Many workers on the rig didn't find out until the morning of April 20 about the change in a pressure test that would help determine the well's safety. BP wanted to remove an unusually large amount of the thick drilling fluid called mud from the well and then run the test. It was unorthodox and left crew members confused.

The oil industry employs extraordinary cutting-edge technologies. BP uses some of the world’s fastest computers to locate oil reservoirs. Underwater robots tinker with wells beneath a mile of water.

But the truth about the modern oil industry is that it often relies on the judgment and instinct of men—and they are overwhelmingly men.

Wells must be listened to, they say. On April 20, a small group of men aboard the Deepwater Horizon listened to the nearly complete well and didn’t understand what it was telling them.

Key managers were out of the loop for parts of that day.

The veteran BP manager in charge of the rig said he was on shore for training with his phone off.

Two top managers from Transocean Ltd., the rig’s owner, spent much of the day hosting executives on hand to commend the crew for its safety record and to discuss coming maintenance.

Asked for comment for this story, BP and Transocean each said it had acted prudently and pointed fingers at the other company.

BP said Transocean workers were responsible for detecting and responding to problems in the well. BP also said the test "was performed in accordance with procedures established by BP and approved" by federal regulators.

Transocean said that BP was responsible for directing and interpreting tests of the well.
"The final interpretation of the test results is the responsibility of the operator's personnel on the rig and on shore—the only personnel with complete information about the properties of the well and reservoir," said a statement from the company.

Problems had plagued the well for weeks before April 20. Brian Morel, the young engineer who wrote the email that morning, had earlier called it a "nightmare well" to BP colleagues, according to an email released by investigators.

Workers had lost drilling tools in the well, fought off intrusions of explosive natural gas, run far behind schedule and over budget.

But the sun rose over calm seas that day and offered the promise that the nightmare would soon be over.

Workers had finished drilling the well 11 days earlier and had lined it with steel and cement. The job was close enough to completion that workers were already "worrying" about the next job, Mr. Morel later said, according to notes taken by BP investigators after the accident.

Mr. Morel's attorney declined to comment for this story.

On Tuesday, Mr. Morel declined to testify before a federal panel, citing his rights under the Fifth Amendment.

Before the Deepwater Horizon crew could leave for another job, there was a final step: The well needed to be tested to make sure the cement and steel locked together, preventing any gas from leaking in and causing a fire or explosion.

If the well passed, giant cement plugs—as long as a football field—would be inserted. The well then could be temporarily abandoned until BP was ready to tap its oil and gas.

Despite its importance, this "negative" test—how to do it, how to interpret it—is basically left to the discretion of rig workers. And different rigs have different procedures.

Normally, workers on the rig remove about 300 feet of mud below the blowout preventer and replace it with seawater. Mud holds down any gas that leaks into the well. So companies usually test a well fully to make sure it is sealed against any influx of gas before removing too much of the mud.

But BP engineers in Houston, including Mr. Morel and his colleague Mark Hafle, had decided to set the cement plug much deeper than usual and remove 10 times as much mud as is normal before running the test. It was unusual, but BP says it changed the procedure in order to avoid damage to a key seal.

Ronald Sepulvado, the top BP manager who was on shore that day with his phone switched off, was asked under oath by the Interior Department-Coast Guard panel in July if he had ever run a negative test where so much mud had been removed.

"No, ma'am," replied Mr. Sepulvado. Had he ever heard of BP doing so anywhere? "No, ma'am."

BP had asked federal regulators for permission to use a deeper plug on April 16, and received approval after only 20 minutes. But Transocean workers and contractors aboard the rig later said that they weren't informed of the change until the morning of April 20.

The decisions to pull out so much mud perplexed Robert Kaluza, BP's day-shift manager on April 20.
"Don't know why—maybe trying to save time," he later told BP internal investigators, according to notes from that conversation reviewed by the Journal. "At the end of the well sometimes they think about speeding up."

Mr. Kaluza has declined to testify before either Congress or the federal panel, citing the Fifth Amendment. BP has denied cutting corners to save time and money. BP said the notes are only investigators’ interpretation of Mr. Kaluza’s comments.

Jimmy Wayne Harrell also found the directive unorthodox. A 54-year-old from small-town Mississippi, Mr. Harrell had worked for Transocean almost his entire adult life. He was the most senior of the 79 Transocean workers aboard the rig that day.

At a daily 11 a.m. meeting in the rig’s cinema room, Mr. Kaluza told everyone about BP’s plan. Mr. Harrell protested.

"All these plans kept changing," Mr. Harrell later testified. Mr. Harrell and Mr. Kaluza argued about the negative test, according to one witness.
"This is how it's going to be," Mr. Kaluza said, according to sworn testimony from one witness, and Mr. Harrell "reluctantly agreed."

In sworn testimony, Mr. Harrell denied arguing with Mr. Kaluza. He said he just wanted to make sure that a negative test was performed and that Mr. Kaluza agreed. But his lawyer, Pat Fanning, said that Mr. Harrell also told Mr. Kaluza he didn't want to remove so much mud before running the negative test and was overruled. Mr. Kaluza couldn't be reached for comment for this story.

"It was BP's well, they were paying for it. BP gave the marching orders," Mr. Fanning said.

Not long after the meeting, a helicopter carrying a group of executives—two each from BP and Transocean—landed on the rig for a tour.

Mr. Harrell said he spent almost the entire rest of the day either showing them around or in his office. By 5 p.m., Transocean workers had removed much of the mud and started the pressure test, according to a timeline of events prepared by BP.

It didn't go well. Pressure built up unexpectedly, and no one was sure why. Workers in the rig's central "drilling shack," a type of control room, struggled to interpret the readings. In walked Mr. Harrell with the visiting VIPs.

Mr. Harrell stayed behind as the tour moved on, but he didn't think the problem was serious. He ordered another worker to tighten down a valve at the top of the blowout preventer—the device that is supposed to pinch off the well in the event of disaster—that prevented mud above from leaking down.

This seemed to resolve the problem. Mr. Harrell testified that he was satisfied with the test results and went back to the visiting executives.

It was the last time there is any record of Mr. Harrell, the rig's most experienced leader, setting foot on the drill floor. His lawyer says he wasn't distracted by the visiting executives and that the crew could have asked for his help at any time, but never did.

Mr. Harrell's second-in-command, Randy Ezell, stuck around the drill shack for a few more minutes, but soon he also left to return to the visiting executives. He later testified to the joint Interior Department and Coast Guard panel that if it hadn't been for the tour, he would have stayed longer to deal with the situation.

With Mr. Harrell gone, the argument continued. Wyman Wheeler wasn't convinced everything was all right. Mr. Wheeler was the dayshift toolpusher, the man who supervised the drilling crew for 12 hours each day.

"Wyman was convinced something wasn't right," Christopher Pleasant, another Transocean worker, later recalled in testimony. Mr. Wheeler couldn't be reached for comment.

But Mr. Wheeler's shift wrapped up at 6 p.m. on April 20. His replacement, Jason Anderson, came on duty and had his own interpretation of the test, according to Mr. Pleasant.

Mr. Anderson, 35, had worked on the rig since it left the shipyard in 2001.

A burly former high school linebacker, Mr. Anderson had earned the respect of his fellow rig workers,
and now he assured them that the pressure readings weren't unusual.

Mr. Kaluza decided to check with Donald Vidrine, an experienced BP manager who was due to relieve Mr. Kaluza at 6 p.m.

The two BP men conferred for an hour, with Mr. Vidrine peppering Mr. Kaluza with questions. Mr. Vidrine wasn't satisfied. "I wanted to do another test," he said, according to the notes of BP's internal investigation seen by the Journal.

Workers performed the test again, but this time the results were even more perplexing. One smaller tube that led up from the well showed no pressure, a sign that the well was stable. But gauges on the main pipe did show pressure, according to BP's preliminary investigation.

The two pipes were connected and should have had the same pressure. It wasn't clear what was going on in the well. One possibility, put forward by engineers who have studied the events subsequently, is that the smaller pipe was clogged, interfering with pressure readings.

Finally, about 7:50 p.m., Mr. Vidrine made a decision, according to Mr. Pleasant. He turned to Mr. Kaluza, his colleague, and told him to call BP engineers in Houston and tell them he was satisfied with the test, Mr. Pleasant said.

Mr. Vidrine, through his attorney, declined to comment.

Over the next two hours, there were other signs the well was slipping out of control. For one, more fluid was flowing out of the well than was being pumped in, according to electronic data reviewed by investigators after the explosion.

But none of the Transocean workers monitoring the well caught these signs. Investigators from the federal panel have said Transocean workers may have struggled to monitor the well because they were performing other work at the same time.

Around 9 p.m., the meeting of the executives wrapped up. A few of them went up to the bridge, including Pat O'Bryan, BP's recently appointed vice president of drilling in the Gulf of Mexico.

The rig's captain showed them a training simulator—a video game that allowed the crew to practice keeping the giant Deepwater Horizon in position during severe weather.

Mr. O'Bryan, 49, had earned a Ph.D. at Louisiana State University decades earlier on how to measure gas escaping into a well. Now, gas was escaping in, unchecked, and Mr. O'Bryan was on the bridge—standing around the simulator with the rig's captain.

Mr. Ezell, the second-in-command, was lying in bed, watching television with the lights out, when his phone rang, he testified before the panel in May. He glanced at his clock. It was 9:50 p.m.

"We have a situation," said Steve Curtis, an assistant driller, on the other end of the phone, according to Mr. Ezell. "Randy, we need your help." Mr. Ezell got up, put on his clothes and went to get his hard hat.
as alarms rang. Before he could reach it, the first of two massive explosions ripped through the rig.

In the following few minutes, Messrs. Anderson and Curtis were killed. Mr. Wheeler was badly injured. The blowout preventer failed to pinch off the well. And most of the other men who made the crucial decisions of April 20 were fleeing for their lives.

**Deep Trouble**

*Part One: BP Decisions Set Stage for Disaster*

*Part Two: There Was ‘Nobody in Charge’*

*Key Players of the Deepwater Horizon*

*Deepwater Horizon Rig: The Final Moments*

*Complete Coverage: Gulf Oil Spill*

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