Lessons Learned

The Big Spill

A glimpse into the largest marine casualty investigation in Coast Guard history.

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On April 20, 2010, a series of explosions and fire onboard the Mobile Offshore Drilling Unit *Deepwater Horizon* set off a chain of events that resulted in the loss of 11 mariners, and the eventual sinking and complete loss of the vessel. This would become the largest oil spill disaster in U.S. history.

Due to the magnitude of the event, U.S. Coast Guard personnel and the public focused much of their attention on the rescue and response operations. However, a group of CG investigators and members of the Minerals Management Service (MMS) (which evolved into the Bureau of Safety and Environmental Enforcement and the Bureau of Offshore Energy Management) had a different mission in mind—to determine what went wrong and the cause of this fatal disaster.

The First Investigators On Scene

On the afternoon of April 21, 2010, MMS and Coast Guard investigators reached the scene of the incident. With the *Deepwater Horizon* still burning on the horizon, they boarded an offshore supply vessel, loaded with a majority of the survivors.

The first step in a marine investigation process is to establish a timeline of events, which involves:

- inspecting the incident scene;
- gathering and recording physical evidence;
- interviewing witnesses;
- reviewing documents, procedures, and records;
- conducting any required specialized studies.

However, when a vessel (such as the one involved in this incident) sinks, the scene of the incident is 70 miles offshore and 5,000 feet below the ocean's surface, the main witnesses are missing, and the key pieces of evidence are mammoth in size—establishing a timeline can be complicated.

Nevertheless, the first order of business was to identify all of the survivors and to determine which ones to interview. All survivors were asked to provide a written statement detailing their role aboard the vessel, their location at the time of the first explosion, and their recollections of the events. After reviewing the statements, investigators split into two teams to interview the key witnesses.

While the witnesses were interviewed offshore, investigating officers at Marine Safety Unit Morgan City arranged for post-casualty drug testing and prepared for the major investigation that would soon manifest.

Meanwhile, the Office of Investigations and Analysis at Coast Guard headquarters established a dialogue with the Department of the Interior and MMS headquarters in anticipation of convening a formal investigation into the incident. They searched for candidates who were qualified to perform a Marine Board of Investigation, and staff members were sent to New Orleans to establish a base of operations for the investigators, and to make the logistical arrangements for the public hearings to accompany the formal investigation.

The Joint Investigation Team

On April 27, 2010, the Secretary of Homeland Security and the Secretary of the Interior established a joint investigation team (JIT) that consisted of co-chairs CAPT Hung Nguyen, of the U.S. Coast Guard, and Mr. David Dykes, of the MMS, along with technical experts, legal advisors, and administrative staff from each agency. In all, hundreds of Coast Guard and MMS employees were involved.

The USCG and MMS have authority to investigate incidents on the outer continental shelf,[1] so working together was not something new. However, neither the USCG nor the MMS had ever faced an event or investigation of this magnitude, so DHS and DOI issued a convening order that spelled out the authorities and defined the rules for the investigation. Per the order, the JIT operated under the procedures for a Coast Guard Marine Board of Investigation to provide transparency of effort.

Interviewing Witnesses

The joint investigation team held seven public hearings to obtain testimony from witnesses. Interviewing took place in a public venue; furthermore, parties with a vested interest, or "parties in interest," such as the owner and operator of the vessel, the owner of the Macondo well, and the vessel's flag state, were allowed to question witnesses.

The investigation team looked at the sequence of events that led to the loss of well control, and the sinking of the vessel. They also asked questions about the immediate response and evaluation efforts.

Members of the *Deepwater Horizon* joint investigation board prepare to question a witness. U.S. Coast Guard photo by Petty Officer Prentice Danner.

In addition to interviewing all witnesses, the team collected thousands of documents and examined more than 400,000 pages of documentary evidence, which helped them understand:

- the chain of events leading up to the explosion and fire,
- offshore drilling operations in general,
- the equipment on the *Deepwater Horizon*,
- the safety systems and regimes in place.

All of the documentary evidence the JIT collected was electronically imaged. In addition, protocols were developed so that the JIT could receive information, such as videos or photos, in electronic format. Electronic document storage facilitated evidence collection, review, and cataloging as well as sharing information with other investigating bodies, such as the Oil Spill Commission and the National Academy of Engineers.

In addition, the joint investigation team established a secure server for all of the documents on the Coast Guard Data Network to provide Coast Guard JIT members with access to the evidence from any Coast Guard workstation.

Inspecting the Scene

There was a significant amount of underwater video of the Macondo well from the response efforts, but very little video footage of the vessel itself. Due to the lack of video footage that documented the wreckage of the *Deepwater Horizon*, the joint investigation team determined that an underwater survey of the wreckage as well as a map of the evidence on the seabed were needed.

After weighing various options and determining that an impartial third party was needed to conduct the dive operations, the team called upon the U.S. Navy Supervisor of Salvage (SUPSALV) for assistance. Given the water depth at the wreckage site, the SUPSALV recommended using an underwater remotely operated vehicle (ROV)[2].

The ROV sent back hundreds of hours of video footage of the vessel structure and the debris on the ocean floor. In addition to documenting the wreckage, the survey also provided SUPSALV with the information that was

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Retrieving and Examining Physical Evidence

The Evidence Yard

As the first pieces of physical evidence floated ashore in April 2010, the *Deepwater Horizon* joint investigation team recognized the need for general evidence collection procedures and an evidence processing and storage facility. With that in mind, the JIT issued several subpoenas and an accompanying directive requiring that all parties involved in the response collect and preserve all evidence from the vessel, including the drilling equipment. In addition, the JIT issued guidance to all federal agencies involved in the response to ensure that all debris from the incident scene was collected and sent to the JIT for evaluation.

Given the proximity of the Coast Guard Base Support Unit New Orleans to the JIT's base of operations in New Orleans, and the base's security, waterside access, and ample space, the BSU was the logical choice for the *Deepwater Horizon* "evidence yard."

Later on in the investigation, while the joint investigation team was planning the retrieval of the subsea evidence, the team determined that the evidence facility needed to accommodate transportation, preservation, storage, and, most importantly, the forensic analysis of the subsea evidence.

Given the size of the subsea evidence, like the blowout preventer (BOP)[1], this was not an easy requirement to accommodate. After much deliberation, the JIT determined that NASA's Marshall Assembly Facility (MAF) met all of the aforementioned criteria. And, since BSU New Orleans was a tenant of NASA MAF, the proximity of both locations simplified managing the evidence.

Subsea Evidence

The investigation team recognized early on that the physical evidence at the bottom of the ocean would be critical to the investigation—in particular, the blowout preventer from the Macondo well. However, retrieving anything from the bottom of the ocean requires special equipment and skills. Furthermore, evidence retrieval efforts could not interfere with the ongoing response efforts.

So, the investigation team embedded a liaison at the incident command post in Houston, Texas, whose purpose was to coordinate evidence collection efforts and leverage the response structure and assets. To that end, the incident commander established the investigations planning group, made up of representatives from the Coast Guard, MMS, the FBI, and the EPA.

This group developed evidence collection, preservation, and transportation procedures for all subsea evidence, and these procedures were integrated into all relevant operations plans. The group also coordinated with the JIT representatives who were offshore to witness and document evidence retrieval efforts. With multiple response vessels and ROVs on scene, choreography of the operations and the personnel was no simple task.

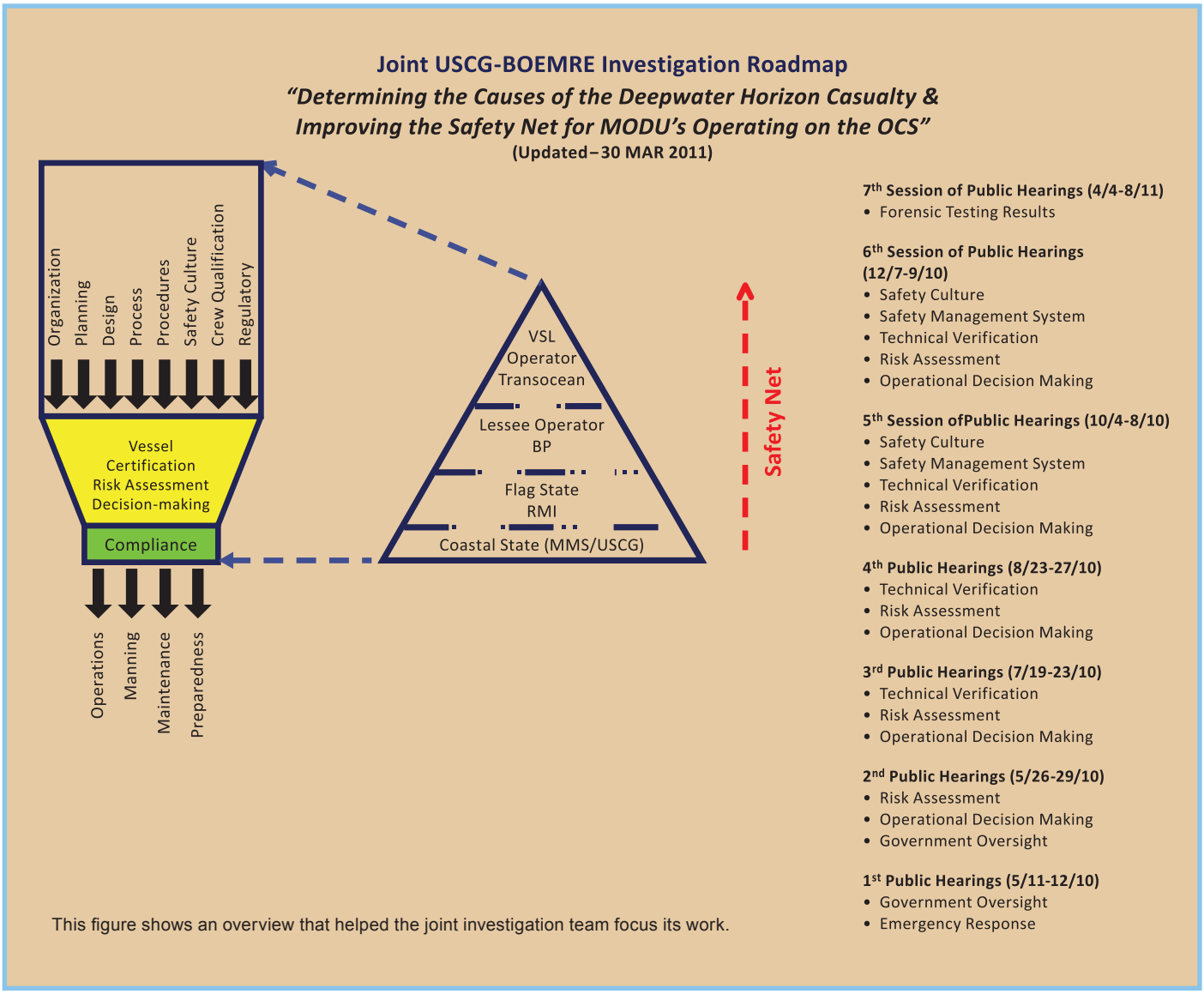
Forensic Analysis

As the condition of the blowout preventer from the Macondo well was of particular interest, and the federal government did not possess the expertise and specialized equipment to dismantle and analyze this and other key pieces of physical evidence, the MMS hired the engineering service firm Det Norske Veritas (DNV).

From October 2010 to July 2011, DNV personnel disassembled the BOP and documented the condition of every part as well as the drilling equipment trapped inside it. The FBI evidence response team worked alongside DNV and documented every item as well. When needed, fluid and material samples were sent to labs for analysis. In the end, DNV representatives used laser scanning to develop three-dimensional models of the evidence, then used animations to show how all of the pieces went together and how the blowout preventer failed.

Endnote:

1. There are two basic types of blowout preventers (BOPs): ram and annular. They come in a variety of styles, sizes, and pressure ratings. The *Deepwater Horizon* BOP stack included seven individual BOPs.



This figure shows an overview that helped the joint investigation team focus its work.

needed to determine the feasibility of accessing the internal parts of the vessel as well as the feasibility of salvaging the wreckage in whole, or in part. However, both efforts were deemed unfeasible.

While there was hope that the survey would also help bring closure to family members of the deceased by locating the remains of crew members, the team found no evidence of them. In the end, the underwater survey provided valuable information and helped narrow down the plausible scenarios that led to the vessel's sinking.

The Results

The JIT final report of investigation consisted of two volumes and is available online. Coast Guard members wrote volume 1, which focused on the events on the vessel. MMS members wrote volume 2 and focused on the subsea events and deepwater drilling. The Commandant of the Coast Guard endorsed the report and its recommendations, which represents final agency action and defines a way forward for the Coast Guard to improve safety on the U.S. outer continental shelf.

In addition to supporting future Coast Guard safety initiatives, the joint investigative team's work also benefitted the National Commission on the BP *Deepwater Horizon* Oil Spill and Offshore Drilling,[3] the Chemical Safety and Hazard Investigation Board, and the National Academy of Engineering investigation into the *Deepwater Horizon*/Macondo well blowout.[4]

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Fire-boat response crews battle the blazing remnants of the offshore oil rig *Deepwater Horizon.* Multiple Coast Guard helicopters, planes, and cutters responded to rescue the 126-person crew. U.S. Coast Guard photo.

The U.S. Coast Guard expended thousands of man hours and nearly $4 million on the joint investigation. Amid this unprecedented effort and expense, the JIT team members kept focus and maintained the time-tested marine investigations process.

About the author:
CDR Michael Simbulan is the enforcement program manager in the Office of Investigations and Analysis at Coast Guard headquarters. He has 17 years of marine safety experience, and has served as a marine investigator in San Juan and Honolulu. He was awarded the Coast Guard Meritorious Service Medal for his efforts in support of the joint investigation into the loss of the Deepwater Horizon. *CDR Simbulan holds a bachelor's degree in civil engineering from the U.S. Coast Guard Academy, and a master's degree in ocean engineering from Virginia Tech.*

Endnotes:

1. The USCG and MMS (now BSEE) enter this agreement under authority of 14 U.S. Code (USC) §141—Coast Guard Cooperation with other Agencies; 43 USC §1347, 1348(a)—the Outer Continental Shelf Lands Act (OCSLA), as amended; 33 USC § 2712 (a)(5)(A)—the Oil Pollution Act of 1990 (OPA); 43 USC §§1301-1315—the Submerged Lands Act (SLA), as amended; and the Energy Policy Act of 2005 (EPAct), Pub. L. 109–58.
2. A remotely operated vehicle (ROV) is designed to meet deep ocean salvage requirements down to a maximum depth of 20,000 feet of seawater. This vehicle is loaded with a host of new technologies and was built as a direct replacement for CURV-III but with a smaller overall system footprint. More information is available at www.navy.mil/navydata/fact_display.asp?cid=4300&tid=50&ct=4.
3. The final report is available at www.oilspillcommission.gov/final-report.
4. The National Academy of Engineering report is available at www.nae.edu/53926.aspx.

For more INFORMATION:

The USCG report and its supporting documents on the *Deepwater Horizon* incident are available at **https://homeport.uscg.mil/** under investigations.