James David Dykes

Co-Chair, USCG/BOEMRE Joint Investigation
Into the Deepwater Horizon/Macondo Well Blowout

Formerly with the U.S. Department of Interior,
Bureau of Ocean Energy Management, Regulation
and Enforcement

Testimony on "BOEMRE/Coast Guard Joint Investigation (JIT)
Final Report"

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Opening Oral Summary Statement

Ladies and Gentlemen of the Committee, my name is James David Dykes. For the last 17 months, I served as co-chair for the Joint Marine Board of Investigation. My written testimony and my oral testimony here today are given from my best recollection of the facts as I remember them. In preparing the written testimony, I had very limited access to the evidence due to my resignation from federal employment back in September of this year. The information presented has been gleaned from the final published report, my own recollection, and from published information available on the web. My written testimony attempts to address the investigation as it was conducted, what was discovered during the investigation, and what the findings of the investigation show.

On the morning of April 21, 2010, Investigator - Kirk Malstrom, Houma District Manager - Bryan Domangue and I were in Houston when we learned of the Deepwater Horizon incident. Upon hearing of the incident, we immediately began both the investigation and MMS response phase in BP's Houston office while other MMS personnel were ramping up in our New Orleans office. The Coast Guard was preparing to dispatch investigators to the offshore location to start interviewing and gathering witness statements from the surviving crew members. We dispatched MMS investigators to Houma, LA to rendezvous with the Coast Guard investigators and travel to the offshore location. The investigators intercepted the M/V Damon Bankston enroute to BP's Fourchon, LA dock and began conducting interviews and collecting statements

Within the first few days, MMS was coordinating with the Coast Guard on areas that needed to be explored. I met with Coast Guard personnel from the Morgan City, LA Marine Safety Office and representatives of the Republic of the Marshall Islands to determine what information was in hand and what information needed to be collected. At this time, preservation orders were issued to both BP and Transocean.

The JIT issued more than 90 subpoenas and collected over 400,000 pages of evidence over the course of this investigation. These documents encompassed everything from company safe work

practices and drilling program procedures and permits to employee performance reviews and master service agreements.

The JIT held seven public hearings and called over 80 witnesses. Some witnesses refused to testify, however, perhaps due in part to the announcement of a criminal investigation by U.S. Attorney General Eric Holder on June 1, 2010.

Outside experts were retained to conduct focused studies and analyses in areas where the JIT did not possess the necessary experience and skill sets.

In closing, the findings from this investigation revealed that additional barriers are needed to reduce the probability of similar events of this magnitude from happening again. Recommendations for additional research and regulatory revisions as well as rig design revisions, along with changes to well control and emergency response training will add these additional barriers; however, they cannot guarantee that the human element in the equation will perform as intended. This specific issue will haunt the oil and gas industry and every other industry where personnel are required to make decisions based on raw data.

Thank You.

Personal Background

At the time of the event, I was Chief of the Office of Safety Management for the Minerals Management Service (MMS), Gulf of Mexico OCS Region. I have approximately 27 years of combined industry and regulatory experience in the oil and gas arena. I started out as a roustabout in 1984 working production operations for Diamond Shamrock Exploration and Production Co. I was fortunate enough that Diamond Shamrock had an education tuition assistance program which allowed me to obtain my college degree at Nicholls State University while working offshore. Over the next fifteen years and several mergers, acquisitions, and downsizes, I worked my way up through the ranks to the Safety Manager position with Taylor Energy Company. I joined the MMS in 1999, and worked as a safety and environmental management specialist, civil penalty reviewing officer, and accident investigator before becoming the Chief of the Office in 2007. My career has allowed me to obtain a wealth of knowledge in accident investigation techniques including root cause and causal factor analysis. I have attended Conger & Elsea's "Mishap Analysis and Prevention System" safety training as well as System Improvements "TapRooT"® Root-Cause Analysis training. For a brief period, I also taught accident investigation and causal factor/root cause analyses. During my tenure as an accident investigator, I served as the MMS lead investigator in the MMS/USCG joint investigation of BP's Thunder Horse facility's ballast control failure incident following the passage of Hurricane Dennis in 2005; and I also served as the MMS lead investigator in the MMS/USCG joint investigation of Chevron's Typhoon facility's mooring failure incident following the passage of Hurricane Rita in 2005.

Initial Investigative Actions

On the morning of April 21, 2010, Investigator - Kirk Malstrom, Houma District Manager - Bryan Domangue and I were in Houston when we learned of the Deepwater Horizon incident.

We were already in Houston conducting a whistleblower investigation into allegations that BP did not have proper drawings necessary for the safe operation of its Atlantis facility. We immediately began both the investigation and agency response phase in BP's Houston office while other agency personnel were ramping up in our New Orleans office. The Coast Guard had been conducting search and rescue operations since the night before and was preparing to dispatch investigators to the offshore location to start interviewing and gathering witness statements from the surviving crew members. We dispatched MMS investigators, Randy Josey and Glynn Breaux, to Houma, LA to rendezvous with the Coast Guard investigators and travel to the offshore location. The investigators intercepted the M/V Damon Bankston enroute to BP's Fourchon, LA dock and began conducting interviews and collecting statements from everyone. Approximately 115 statements were collected from both the DWH crew and the crew of the Damon Bankston. Attorneys for Transocean later complained that we should not have delayed the Damon Bankston in its journey to the shorebase and further, that we should not have interviewed the witnesses without company legal representation present. Those allegations aside, these witness statements were critical to the investigation in that they provided the basis for identifying fact witnesses because of their location on the rig at the time of the events and they also helped to determine the location of those crewmembers who did not survive. Additionally, several of these statements were the basis for our conclusions regarding timing of certain events and the most probable ignition sources of the hydrocarbons.

Within the first few days, the agency was coordinating with the Coast Guard on areas that needed to be explored. I met with Coast Guard personnel from the Morgan City, LA Marine Safety Office and representatives of the Republic of the Marshall Islands to determine what information was in hand and what information needed to be collected. Preservation orders were issued to BP and to Transocean. Facility and equipment tours were scheduled with Cameron (manufacturer of the BOP stack) to get personnel up to speed with what we would be dealing with. Visits were made to BP's Fourchon, LA dock to begin inventorying and cataloging debris and any other evidence as it was recovered from the offshore site.

The Convening Order

The joint investigation was formally established with the signing of the Joint Statement of Principles and Convening Order, by USCG Commandant Allen, MMS Director Birnbaum, and Secretaries Salazar and Napolitano on April 27, 2010. The scope of the Deepwater Horizon investigation was to determine the cause of the fire, pollution, and sinking of the mobile offshore drilling unit, Deepwater Horizon. The convening order identified Captain Hung Nguyen and myself as co-chairs of the joint investigation; outlined the process and procedures by which the investigation would be conducted; designated the Republic of the Marshall Islands (flag state of the vessel) as a "Party In Interest and afforded all rights associated with such status; and stated a deadline for the final report. This deadline was nine months from the date of the convening order. The fact that the well was still flowing uncontrollably rendered witnesses who were devoted to containment efforts and some witnesses unavailable for months, and the original deadline became impossible to meet. Most of the information as to why the blowout preventer (BOP) stack did not seal the well was with the BOP stack 5000 feet beneath the surface of the Gulf of Mexico. Until the BOP stack could be pulled, certain questions could never be

answered. On April 29, 2010, Chris Oynes – Associate Director for Offshore Energy and Minerals Management, designated the following MMS personnel to the JIT:

Glynn Breaux, Office of Safety Management, GOM OCS Region
John McCarroll, Lake Jackson District, GOM OCS Region
Jason Mathews, Accident Investigation Board, Office of Regulatory Programs
Kirk Malstrom, Regulations and Standards, Office of Regulatory Programs

The MMS/BOEMRE members concentrated on the well-related activities. These activities included the source and path of the hydrocarbons causing the blowout, the practices on the Deepwater Horizon leading to the blowout, the cause of the explosion, and the failures of the blowout preventer stack.

The Coast Guard members focused on the fire-fighting, life-saving, and evacuation efforts onboard the Deepwater Horizon, the search and rescue efforts by the USCG and assisting vessels, the International Maritime Organization (IMO) compliance areas, the fire-fighting efforts of the assisting vessels, and the stability of the Deepwater Horizon.

Potential Flow Paths

The investigative team began reviewing all well information that the agency had in hand. The team quickly narrowed down the potential flow path of hydrocarbons to three possible scenarios;

- The first possibility is that the casing cement shoe at the end of the production casing at 18310 feet failed and allowed the flow from the bottom of the wellbore.
- The second possibility was that the production casing leaked or the casing collapsed at the crossover joint within the wellbore.
- The third possibility was that the production casing moved or "floated" inside the wellbore causing the production casing seal assembly to fail.

Hearings

The JIT issued more than 90 subpoenas and collected over 400,000 pages of evidence over the course of this investigation. These documents encompassed everything from company safe work practices and drilling program procedures and permits to employee performance reviews and master service agreements.

The JIT held seven public hearings and called over 80 witnesses. Some witnesses refused to testify, however, perhaps due in part to the announcement of a criminal investigation by U.S. Attorney General Eric Holder on June 1, 2010. The BP drilling engineers responsible for the design of the Macondo drilling program and one of the BP Wellsite Leaders exercised their Constitutional rights and refused to speak with the JIT.

The JIT held the first hearing the week of May 10, 2010, in New Orleans. This hearing solely concentrated on search and rescue efforts, fire-fighting responses, and the industry oversight of MMS, U.S. Coast Guard, and the Republic of the Marshall Islands.

The second hearing was held the week of May 24, 2010, in New Orleans. The JIT wanted to better understand the prior surveys conducted on the DWH by ABS and DNV. The JIT also wanted to get a foundation of the events on the rig during the blowout. Based on the written witness reports we called most of the rig crew who had the best recollection of the incident and surrounding events.

The third hearing was held the week of July 19, 2010, in New Orleans. This hearing focused on reviewing the activities a few hours prior to and through the incident by analyzing the Sperry-Sun that had been subpoenaed from BP. The JIT wanted to better understand the operational and design specifics for the well, including BP's procedures for running the Lock-down sleeve, and the down-hole equipment and design. We also wanted to know the details and involvement of the wells team leader, John Guide.

The fourth hearing was held the week of August 23, 2010 in Houston. This hearing was to find out the circumstances surrounding BP's upper management and their interactions/decisions with contracting companies, other management teams, and rig personnel. Witnesses also included VIP persons who were on the rig and their actions.

The fifth hearing was held the week of October 4, 2010 in New Orleans. This hearing focused on gathering facts about salvage plans, bridge activities, DPO alarm systems, rig logistics – flight manifests, and supplies – centralizers. We also questioned John Guide again.

The sixth hearing was held the week of December 6, 2010 in Houston. This hearing focused on collecting information regarding international safety management systems, BP's AFE budget for the Macondo well, and Transocean's command center involvement and response.

The seventh and final hearing held the week of April 4, 2010, in New Orleans. This hearing focused on gathering information and feedback related to the recently released BOP stack forensic report completed by Det Norske Veritas (DNV).

BOP Stack Recovery and Forensics

In July 2010, the JIT began a search for a third party expert capable of performing a forensic examination of the BOP stack. Because the BOP stack was oilfield equipment and not a marine apparatus, the JIT determined that BOEMRE, in coordination with the Department of Justice (DOJ), would take the lead on identifying experts qualified to perform this forensic work. The contracting team prepared a statement of work and circulated it for review by JIT members, BOEMRE and Coast Guard personnel and counsel, and DOJ representatives from both the civil and criminal divisions. BOEMRE also conducted market research into potentially qualified forensic examiners.

On September 2, 2010, Det Norske Veritas (DNV) was contracted to undertake a forensic examination of the blowout preventer stack (BOP), its components and associated equipment used by the Deepwater Horizon drilling operation.

The objectives of the forensic examination were to determine the performance of the BOP system during the well control event, any failures that may have occurred, the sequence of events leading to failure(s) of the BOP stack and the effects, if any, of a series of modifications to the BOP stack that BP and Transocean officials implemented.

The set of activities undertaken by DNV included:

- Establishing a base of operations at the NASA Michoud facilities for receiving and testing the BOP stack and associated equipment;
- Building a temporary enclosure to house the BOP stack to facilitate the forensic examinations;
- Recovery of and assessment of drill pipe, rams, fluids and other material from the BOP stack and recovered drilling riser;
- Function testing of the hydraulic circuits, mechanical components and control systems of the BOP stack;
- Visual examination of evidence and additional analysis using laser profilometry;
- Mechanical and metallurgical testing of pieces of drill pipe;
- Coordination of activities with other stakeholders through the JIT and the Technical Working Group (TWG);
- Review of documents and Remotely Operated Vehicle (ROV) videos;
- Mathematical modeling of the mechanical damage and deformation of drill pipe; and,
- Developing possible failure scenarios.

The BOP stack consists of the BOP and lower marine riser package (LMRP). The stack can be separated into the two individual components with each weighing approximately 360,000 pounds. The components, when combined, are contained within a framework that is approximately 14 feet square and stands approximately 60 feet tall and can only be transported by a marine vessel. The sheer size of the BOP stack limits the availability of facilities that can handle anything of this magnitude. After extensive efforts to locate an acceptable facility to host the examination that was both secure and accessible to marine transport, the JIT, in close consultation with DOJ, determined that the NASA Michoud facility in New Orleans was the best option. The Michoud facility provided a secure location with marine transport access; however, the dockside facility could not handle the weight of the BOP and LMRP without additional preparations. Site preparation activities included constructing a test pad capable of supporting the 360-ton BOP stack, mobilizing a heavy-lift crane to transfer the BOP and LMRP to the dock, obtaining environmental containment equipment, and the erection of a temporary structure to house the BOP and LMRP. Additionally, other accident evidence was already being stored on site at Michoud under an ongoing lease between the Coast Guard and NASA.

Security measures for the BOP stack were developed and implemented in close coordination with DOJ and the FBI Evidence Recovery Team (ERT) to preserve the integrity of the forensic work and evidence.

On September 4, 2010, the BOP stack was retrieved from the Macondo well by Helix Energy's mobile offshore unit, the Q4000. JIT personnel, along with DOJ, FBI –ERT, were on location with DNV personnel to oversee the retrieval and the execution of the short-term preservation

procedures in preparation for transfer to the NASA Michoud facility. The BOP and LMRP were then transported by barge to the Michoud facility.

The JIT, in consultation with DOJ and DNV, formed a technical working group to provide DNV with technical support and expertise as DNV conducted the forensic examination. On November 1, 2010, the JIT selected a six-member technical working group which included one expert each from Cameron, Transocean, BP, DOJ, CSB, and an expert representing the plaintiffs in the multi-district litigation suit. Additionally, a controlled access file transfer protocol site was established for the purpose of sharing photo, video, and other documentary media that was being captured during the forensic examination, with the technical working group members.

Contracted Services

In addition to DNV, the JIT also needed experts to conduct focused studies/analyses in areas where the JIT did not possess the necessary experience and skill sets. The following outside entities were retained:

- Dr. John Smith was contracted to review the Sperry-Sun log data and the IADC reports to identify key issues during the last 24 hours on the rig.
- Keystone Engineering was contracted to conduct a casing buoyancy analysis to determine the potential for the casing to "float" inside the wellbore.
- Oilfield Testing and Consulting was contracted to conduct the Macondo well cement blend analysis. This work was similar to the cement analysis conducted by Chevron for the National Commission.

Findings and Conclusions

As stated earlier in this document, the MMS/BOEMRE members of the JIT focused on determining the root causes/causal factors in three areas:

- How (source and flow-path) and why did the Macondo well blow out?
- What ignited the hydrocarbons once they reached the rig?
- Why did the BOP stack fail to seal the wellbore?

How (source and flow-path) and why did the Macondo well blow out?

As stated earlier, the JIT identified three possible flow paths for the hydrocarbons to travel up the wellbore. Forensic work conducted by the Development Driller II under the direction of the JIT and the Unified Area Command, determined that the casing did not float and there was no failure in the casing string. By the process of elimination, the JIT determined that the only possible path was directly from the bottom of the well through the casing shoe. The JIT concluded contamination or displacement of the shoe track cement, or nitrogen breakout or migration, could have caused the shoe track cement barrier to fail.

Next, during the conduct of the negative test, the rig crew (including BP, Transocean, and Sperry-Sun personnel) failed to detect the influx of hydrocarbons until the hydrocarbons were above the BOP stack. Additionally, the crew's collective misinterpretation of the negative tests

was a critical mistake that would escalate into the blowout, fire and eventual sinking of the Deepwater Horizon.

Once the hydrocarbons reached the rig floor, the rig crew began taking necessary steps to attempt to control the flow. Understand that the most important part of well control is early kick detection. For deepwater operations utilizing a subsea BOP stack, this task becomes even more critical. Once hydrocarbons are above the BOP stack, options become limited for appropriate well control response actions.

What ignited the hydrocarbons once they reached the rig?

The JIT concluded that there were two plausible ignition sources at the time of the blowout: 1) engine rooms number 3 and/or number 6 (including the associated switchgear rooms); and/or 2) the mud-gas separator located near the rig floor. Witness statements and testimony from crewmembers that were in the engine control rooms support the conclusion that the ignition sources were in the engine rooms. Witness statement and testimony from members of the crew of the M/V Damon Bankston and rig crew members on the aft weather deck support the conclusion that it was the mud-gas separator.

Contributing causes of the ignition include the rig's engine air intake design, the operating philosophy of a dynamically positioned rig, the vagueness in the Transocean Well Control Manual regarding use of the mud-gas separator, and the design of the mud-gas separator vent system.

Why did the BOP stack fail to seal the wellbore?

Within moments of the loss of well control, explosions likely damaged the Deepwater Horizon's multi-plex cable and hydraulics, rendering the crew unable to activate the blind shear rams or the emergency disconnect sequence of the BOP stack. These conditions should have triggered the automated mode function (also referred to as the "deadman" function), which should have activated the blind shear rams in the event of loss of communication between the rig and the BOP stack.

The forensic examination concluded that the drill pipe had become trapped in a position between the upper annular BOP component and the upper variable bore ram BOP component. The JIT concluded that either the hydrocarbons that were blowing out of the well through the drill pipe or the weight of the drill pipe had forced the drill pipe into a buckled state against the side of the BOP wellbore. This buckling caused the drill pipe to move off center outside the cutting area of the blind shear rams, thus preventing the complete cutting of the drill pipe and sealing of the wellbore.

Summary of Additional Causes, Contributing Causes, and Possible Contributing Causes

Poor risk management on BP's part was a key contributing cause. BP failed to identify, evaluate, and inform all parties involved in the operation about the associated risks. BP did not fully analyze the cement properties testing results. They did not evaluate the gas flow potential.

Even though everyone within the BP organization stated that they never compromised safety, BP made multiple cost/time saving decisions without subjecting those decisions to a formal risk assessment. Additionally, Both BP and Transocean personnel failed to observe and respond to critical indicators. The rig crew (both BP and Transocean) experienced a kick a month earlier and it took over 30 minutes to identify the kick. The rig crew did not evaluate the anomalies encountered during the float collar conversion.

Recommendations

The JIT made multiple recommendations that encompass regulatory changes, research and collaboration with industry to develop best practices for well control training. Some of the recommendations have already been incorporated; however, BOEMRE will need to evaluate and consider the other recommendations for implementation.

This concludes the written testimony.