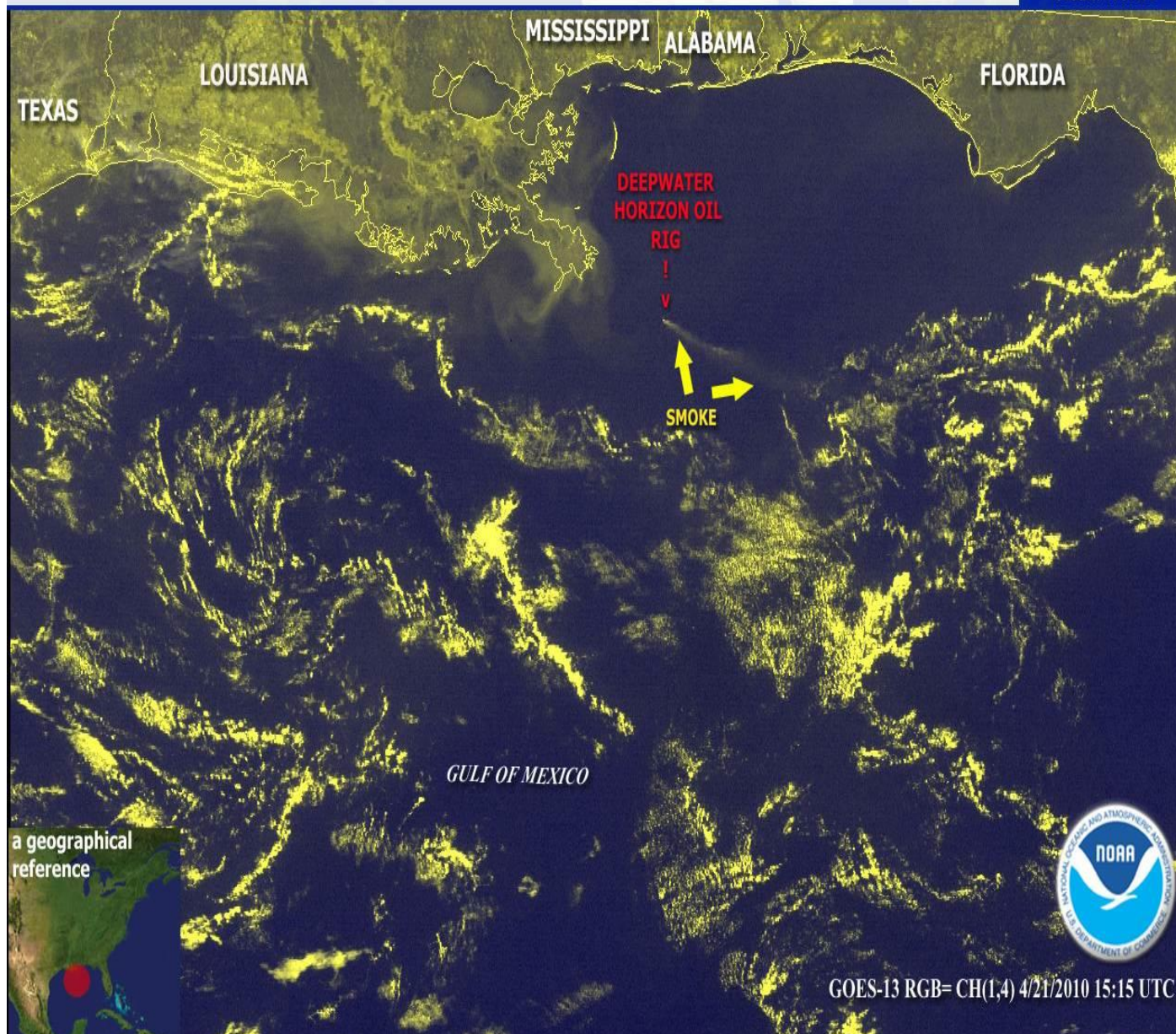


Sinking of the Deepwater Horizon

11 perish and 115 survive

The Rig

- Rig cost about \$500,000 per day to contract
- With all the drilling spread, helicopters, support vessels, other services cost about \$1,000,000 per day
- 2001 the rig cost about \$350,000,000 to build
- It is a semi-submersible rig capable of working in 10,000 feet of water
- To keep it on location Dynamic Positioning is used
- 2009 DWH drilled the deepest oil & gas well in the world – 35,050 feet (6 miles +)





Nautilus, being transported on a Heavy-Lift vessel



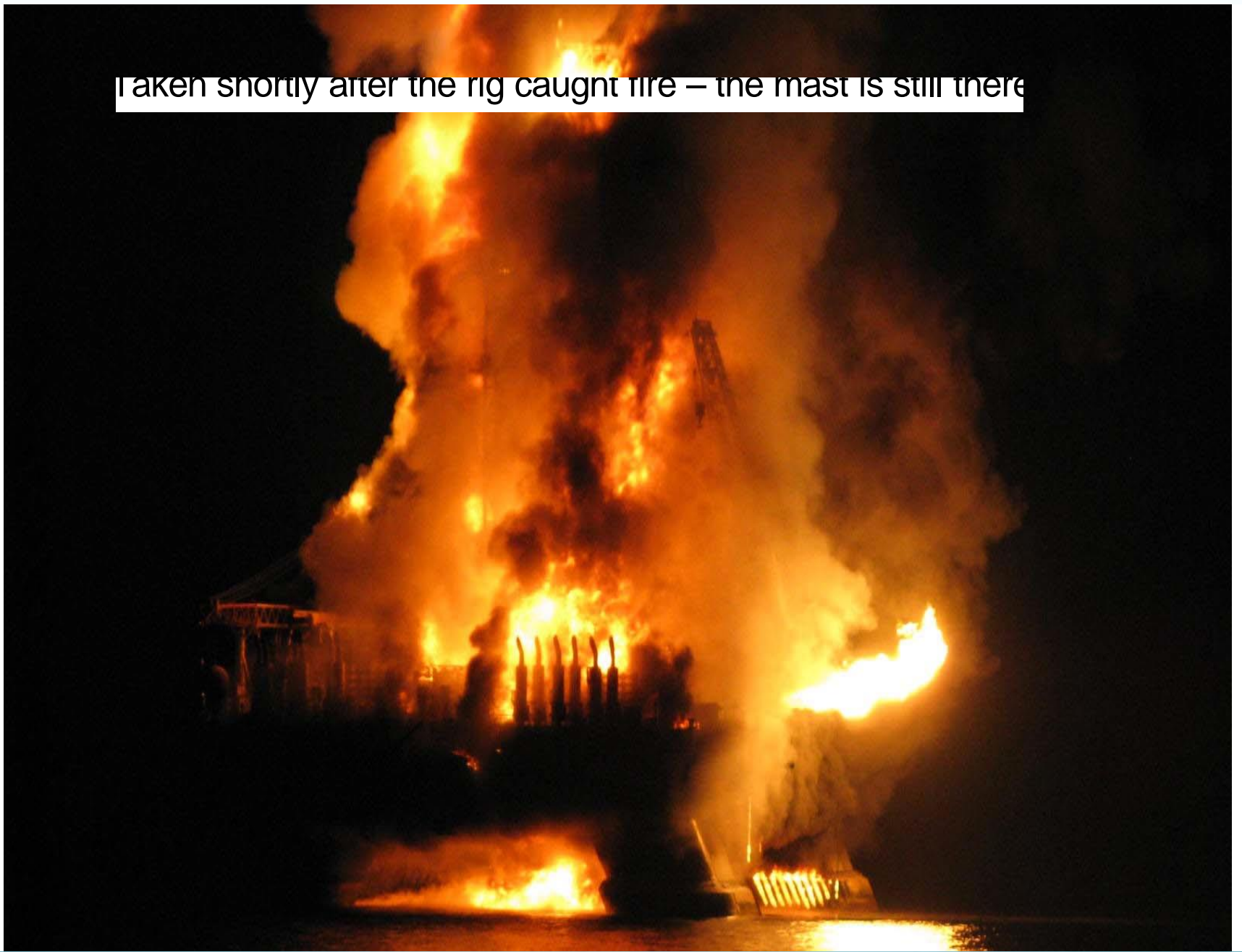
L and R, the Deepwater Horizon on location in better days







taken shortly after the rig caught fire – the mast is still there





The drilling mast has toppled over here – they usually melt pretty fast when fire breaks out



22 14:50





Early morning Day 2 – Note the hole burned through the aluminum helideck



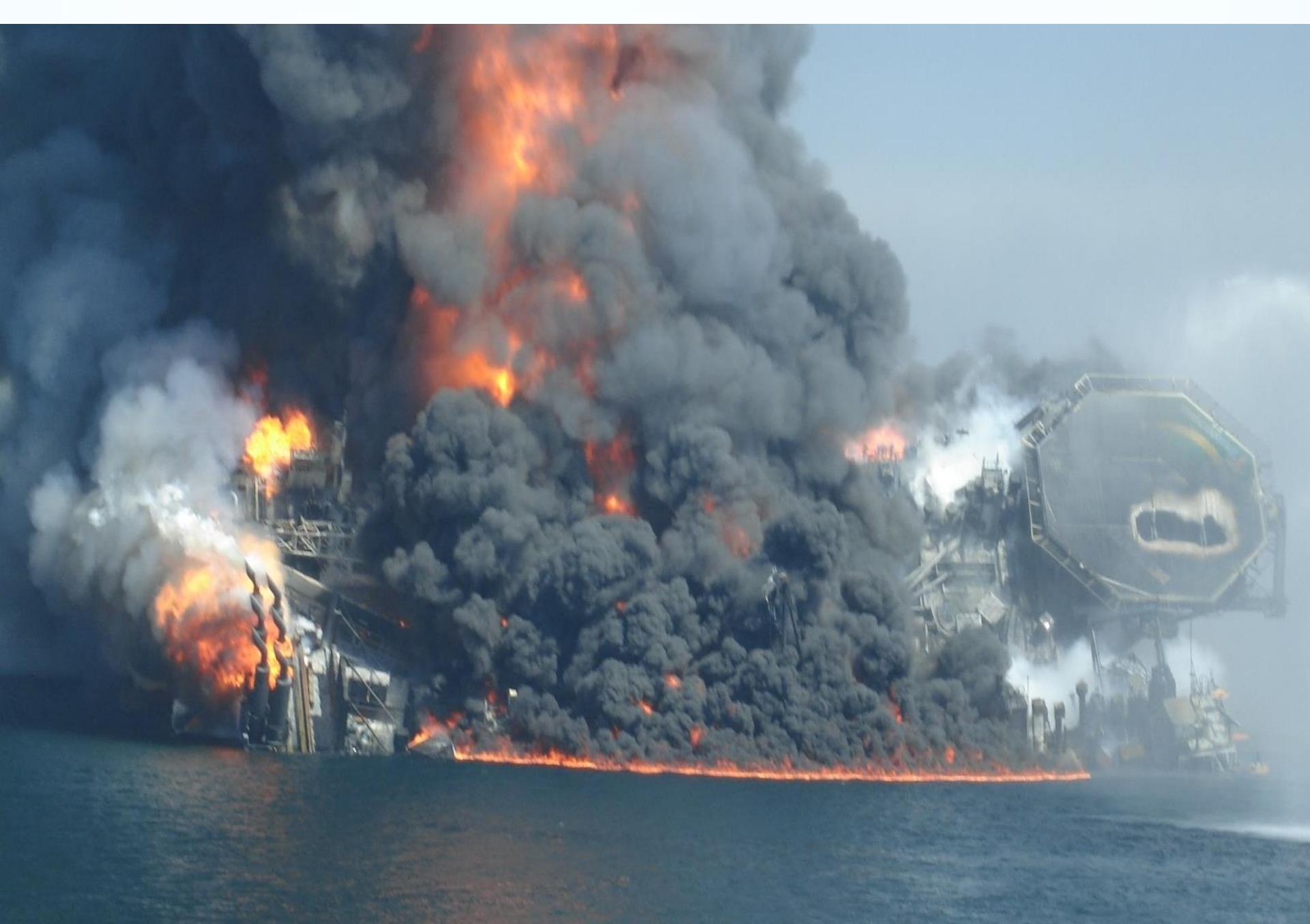
Day 2, morning – settling quite low in the water now – fuel and oil slick forming



Support vessels using their fire fighting gear to cool the rig – note the list developing









22 17:21



Investigation Team Mandate

- To gather, review, and analyze the facts and information surrounding the incident to determine causes
- Team was not to speculate in the absence of evidence
- Team was to report on validated factual evidence available

The Team

- Internal to Transocean
- Experts from relevant technical fields
- Specialists in Incident prevention
- Specialists in Incident Investigation
- Legal advisors
- Administration

Team Roles

- Technical experts in drilling, mechanical, BOP functioning, Petroleum engineering
- Accident Prevention Specialists for fire, explosion, emergency response, evacuation
- Accident Investigation Specialists to facilitate the investigation process and methodology, maintain accurate time line of events, validate event documentation, establish the root causes

Team Roles (cont'd)

- Legal advisors to provide the team with legal privileges afforded client lawyer relationship and to provide legal aid assistance for research etc.
- Administration to provide vast array of administration services such as travel, support, documentation control, research documentation for specific points, member living accommodations, etc.

Establishing the Team

- Identifying and bringing members together
- Identifying a location that would accommodate long term occupancy that allowed flexibility
- Due to nature of incident effective security was necessary

Initial Challenges

- Investigation Strategy
 - Transocean utilized the Kelvin TOPSET Process
 - Identify the the scope of the investigation
 - Ensure investigation documentation matched Company
 - Develop electronic system to capture event and timeline
 - Develop a system to record events & timelines to match
 - Maintain document control and data input
 - Ensuring all used the same investigative process and methodology

Initial Challenges

- Document Control (thousands of documents)
- Ensure all events were identified as events and not factual statements
- Legal Hurdles

Initial Challenges (cont'd)

- Volume of interviews to conduct
- Setting up IT equipment for team and investigative process
- Organizing the investigation into specialized teams
 - Well Control
 - Mechanical
 - Fire and Explosion
- Establishing an effective reportable root cause analysis system
- Producing the report

Companies Involved in Drilling the Well

- BP
 - Managed the development and operation
 - Provided direction and support to onboard personnel
 - On shore personnel consisted of 4 people
 - Off shore personnel consisted of 6 people
 - Well site leaders on the rig directed ops, coordinated contractors, reported to BP onshore team

Companies Involved in Drilling the Well (cont'd)

- Transocean
 - Provided the rig and people to operate it
 - Drill crews
 - Marine crews
 - Maintenance crews

Companies Involved in Drilling the Well (cont'd)

- Halliburton
 - Provide specialist cementing services
 - 2 specialists on board DWH

Companies Involved in Drilling the Well (cont'd)

- Sperry Sun
 - Sophisticated well monitoring system
 - Monitor
 - Interpret data
 - Detect kicks
 - 2 people on board

Companies Involved in Drilling the Well (cont'd)

- M-I Swaco
 - Provided drilling mud, equipment, personnel
 - 4 on board

Companies Involved in Drilling the Well (cont'd)

- Schlumberger
 - Provided equipment & personnel for well and cement logging

Companies Involved in Drilling the Well (cont'd)

- Weatherford
 - Provided casing accessories
 - 2 people on board

Companies Involved in Drilling the Well (cont'd)

- Tidewater Marine
 - Provided offshore supply vessel which carried
 - Drilling equipment
 - Drilling chemicals
 - Food
 - Fuel oil
 - Fresh water

Key Findings

- BP decisions set the stage for loss of well control
 - Reducing the target depth of the well
 - Considering changes to the well casing
 - Using a lower circulating rate than the parameters specified to convert the float collar
 - Reducing cement density with nitrogen foam
 - Using a lesser quantity of cement than that specified in BP procedures
 - Deciding not to perform a complete bottoms-up circulation before cementing

Key Findings (cont'd)

- Running Production Casing
 - The casing design selected required the development of a minimal and technically complex cement program to avoid damaging the formation during cementing, leaving little margin for error. The risk was increased by failing to adequately test the cement program.

Key Findings (cont'd)

- Converting the float collar
 - The plan was deviated from the original plan to convert the float collar and proceeded despite observations of anomalies.
 - The team determined that it was possible that the float collar did not convert and left a clear path for the flow of hydrocarbons from the formation

Key Findings (cont'd)

- Cementing
 - Cement failed in the shoe track and across the producing formations. This failure allowed hydrocarbons to flow into the well
 - Failed factors include;
 - Complexity of cement program
 - Inadequate cement testing
 - Cement contamination during operation
 - Inadequate cement testing after pumping

Key Findings (cont'd)

- Temporary Abandonment Procedure
 - Final temporary plan contained unnecessary risks that were not subjected to formal risk analysis

Key Findings (cont'd)

- Displacement
 - Initial displacement was planned incorrectly, and the execution did not meet the objective of allowing for a valid negative pressure test
 - Displaced with seawater which analysis determined objective was not achieved:
 - Calculations errors
 - Low pump efficiencies because of spacer materials
 - Down hole losses
 - Spacer moved below closed annular

Key Findings (cont'd)

- Negative Pressure Test
 - Results of the test were misinterpreted/failed. Decision was made to proceed with final displacement.
 - This test is necessary to confirm that the cement will block flow from the reservoir into the well after mud is replaced with seawater

Key Findings (cont'd)

- Sheen Test and Final Displacement
 - Incident analysis indicated that a change in flow path from the well during the final displacement masked the influxes into the wellbore

Key Findings (cont'd)

- Activation of the BOP
 - The BOP functioned and closed but was overcome by well conditions
 - High flow from the well prevented the annular BOP element from sealing
 - The concentrated flow eroded the drill pipe above annular
 - VBRs isolated the annular space temporarily until pressure increased in the drill pipe and ruptured it allowing hydrocarbons to flow to the riser
 - When the DWH drifted off location the drill pipe parted



15.7.2000

Key Findings (cont'd)

- Muster and Evacuation

- All evacuated personnel were successfully evacuated from the forward lifeboat muster station

- 100 evacuated in lifeboats
- 7 evacuated in life raft
- 8 jumped and were rescued from the sea

All evacuees were taken to the supply vessel nearby and then taken to land

QUESTIONS?