Harnessing the lessons of Deepwater Horizon

Contributing to a new era of deepwater response

Mobile, AL - August 10, 2010

Introduction – Harnessing New Capabilities for Future Deepwater Response

The MC252 response was unprecedented in terms of **scope**, **scale**, **technology** advancement and application, and **stakeholder** and **management complexity**

Working with many stakeholders, BP has **built** and **applied** a unique and wide-ranging response capability which has significantly advanced “the state of the art”

As you’ve asked, today we’d like to highlight the capabilities we’ve built in **containment** and **spill response**, the lessons learned from this experience, and the benefits this learning can bring for future deepwater response

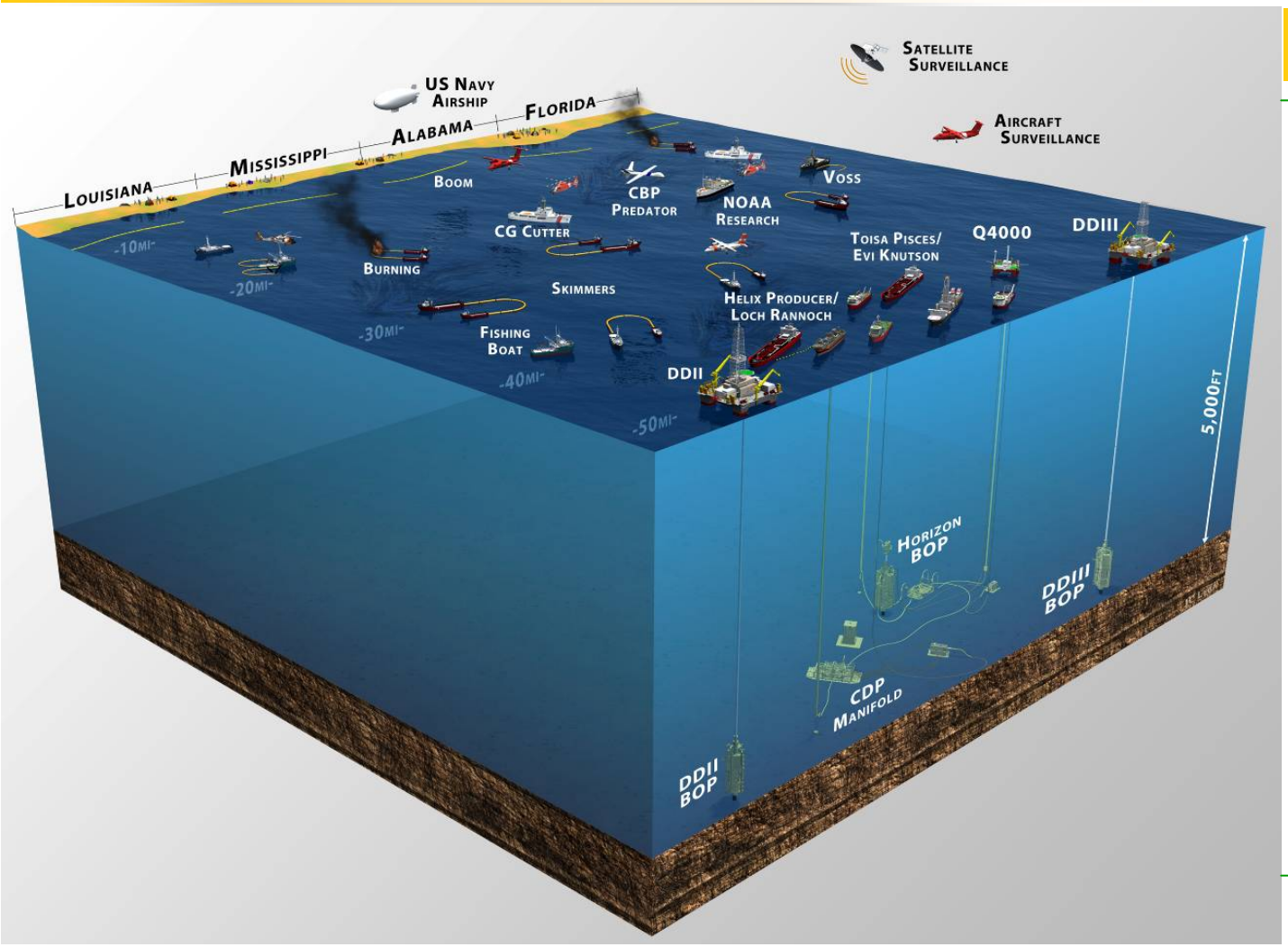
Overview of today's discussion

Focus for today

1. **Overview and key lessons** learned from the last 112 days, focusing on containment and spill response
2. **Highlights of the enhanced response capability** in containment, openwater, and nearshore/shoreline
3. **Concluding observations**

Integrated response from source to shoreline of unprecedented scale

Theater of response



Highlights

1. 45,000+ people
2. Over 7,000 sea vessels, 150 airplanes, 6 deepwater drilling rigs, 2 FPSOs, etc.
3. Engineering, management, and process innovations (including over 400 newly developed procedures)
4. Dramatic acceleration of planning, design, testing, and deployment

Integrated effort across many stakeholders for largest deepwater response ever undertaken

Operator

US Government

State Government & institutions

Industry Producers

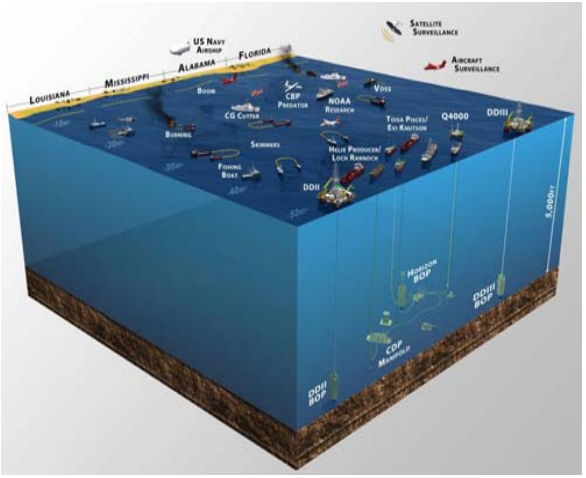
Industry Suppliers

Key lessons learned for effective containment and spill response

Lessons learned

1. **“Know your oil”** – fast identification of oil type and how it changes over time is essential for speedier solutions
2. Appreciate that **spill response becomes local** quickly – only a decentralized set of local sites can respond effectively
3. Build in **long term planning capacity** from the outset – need team outside the daily firefighting to think days and weeks ahead
4. Pursue **multiple parallel efforts** and solutions – **flexibility** needed when you can’t be sure how situation may evolve
5. **Be nimble** – continuous learning that integrates all relevant expertise under fire accelerates progress

Highlights of our lessons learned: Subsea



1. Subsea

Well containment
Dispersants
Relief wells

2. Open Water

3. Near-shore and Shoreline

Foundation to our subsea containment approach: mission and boundary conditions

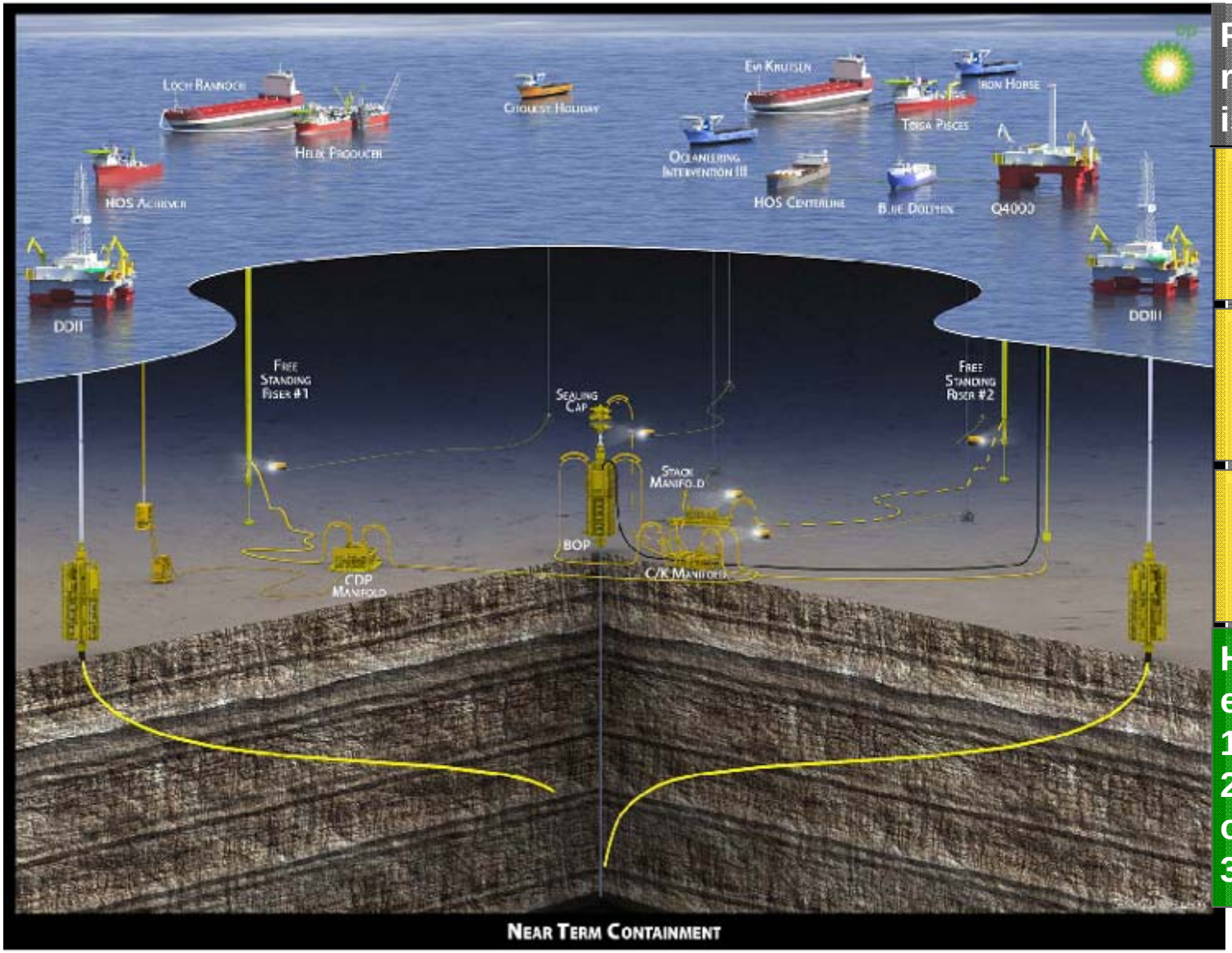
Our mission:

Contain as much hydrocarbon at the source as possible until the leak is stopped

Boundary conditions to our approach

- **Don't make it worse:** Ensure actions will not create a greater leak
- **Maintain path for growing containment:** Keep plan for increasing containment ability intact
- **All actions must complement relief well:** Preserve development of relief well in parallel with other activities

Integrated solution requires much more than equipment—must have expertise and know-how



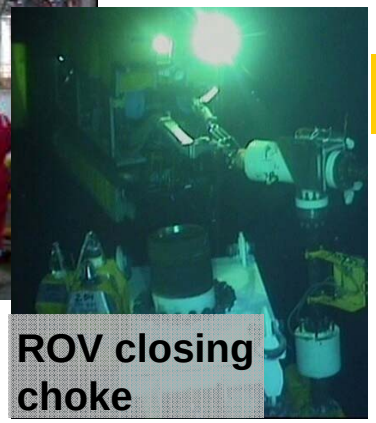
Fully integrated response capability is a combination of:

1. **Equipment and technology**
2. **Protocols and know-how**
3. **Experts**

Highlighted examples for today:
1.) 4D planning
2.) "Hat for every occasion"
3.) Yellow Pod

Subsea containment example 1: 4D planning

Capping stack


ROV closing choke

SimOps marine vessels

Specific equipment

- Technical modeling to reflect vessel and ROV position at snapshots in time, used for storyboarding critical procedures
- Multiple applications including Capping Stack, SimOps, Yellow Pod removal/reinstatement, subsea manifold and jumper installations, and flowline installations

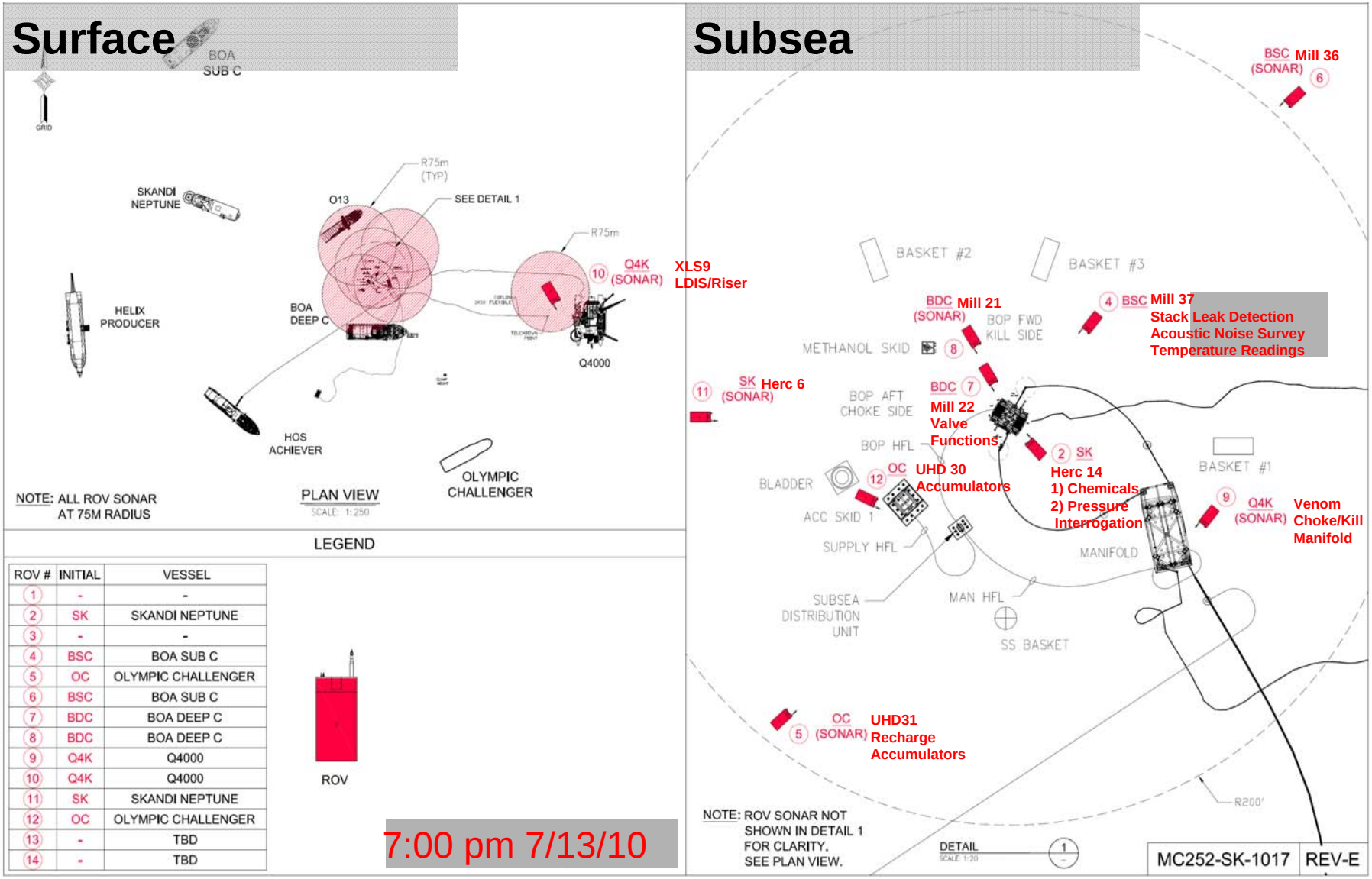
Unique processes and know-how

- Surveying vessel positioning and efficiency adjustments
- Using simulation to clarify roles and responsibilities, subsea & surface tooling requirements, operational & resource planning
- Modeling scenarios for contingency planning
- Building crucial skills within the team through experiential learning
- Forcing of multidisciplinary interaction and definition of interfaces

Subject matter experts involved

- 50 across Engineering, Field Ops, ROV & Marine specialists, Component manufacturing, Construction, & Planning

Subsea containment example 1: 4D planning—Capping Stack (ROV activity for Pressure Integrity test)

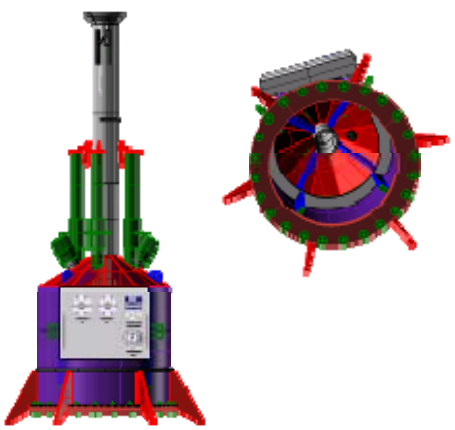


ROV #	INITIAL	VESSEL
1	-	-
2	SK	SKANDI NEPTUNE
3	-	-
4	BSC	BOA SUB C
5	OC	OLYMPIC CHALLENGER
6	BSC	BOA SUB C
7	BDC	BOA DEEP C
8	BDC	BOA DEEP C
9	Q4K	Q4000
10	Q4K	Q4000
11	SK	SKANDI NEPTUNE
12	OC	OLYMPIC CHALLENGER
13	-	TBD
14	-	TBD

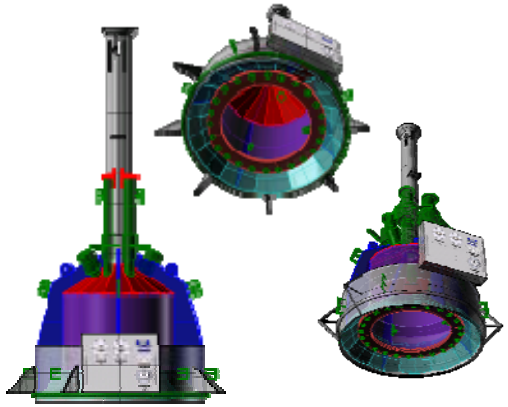
7:00 pm 7/13/10

Subsea containment example 2: Hat for every occasion

Top Hat #3 – 'LMRP hat' - Modified



Top Hat #10 – 'LMRP Top Hat'



Specific equipment

- 10 customized devices to collect hydrocarbons at specific leak points—built for installation, quick deployment, and long term use

Unique processes and know-how

- Statement of requirements and purpose-built components, including
  - Passive sealing to help keep seawater out
  - Protection of adjoining component
  - Vents maintaining visibility for installation and flow / device centering
  - Standardization of J-latch assembly
  - Plumbing hat to inject methanol or other hydrate inhibitor
- Plans for storage and strategic location for use
- Procedures for quick installation and removal

Subject matter experts involved

- >20 across Engineering, Fabrication, and Operations, as well as Flow Assurance Specialists and Downhole Tool Specialists

Subsea containment example 3: Yellow Pod repair

Specific equipment

- Brain that controls the BOP, converting electric signal to hydraulic power to open, close, and manipulate various valves in the BOP stack

Unique processes and know-how

- Creating procedures to unlock and pull pod at 5K without damaging the BOP stack or pod
- Assembling experts to execute series of diagnostics to repair and reinstate pod functionality
- Assembling necessary equipment to reinstate control umbilical and deploy pod via Q4000 vessel
- Reinstalling repaired pod and confirming functionality

Subject matter experts involved

- ~10, including 3 Offshore Subsea Control Specialists, 3 Subsea Engineers, as well as Technical Specialists

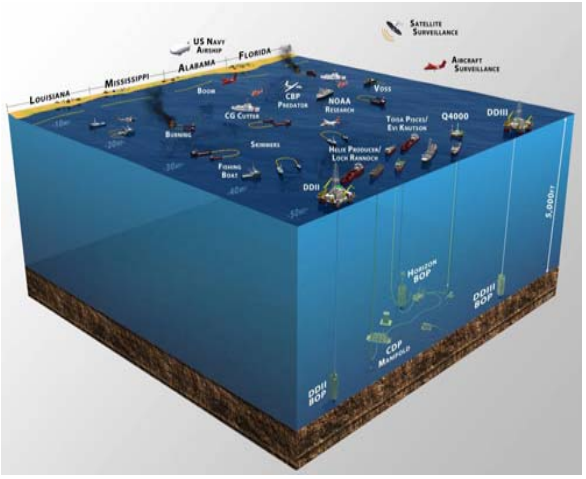
Potential benefits for future deepwater containment

We have gained significant knowledge in deepwater containment, both in equipment and knowledge advancements as well as real-time integration of these into a full containment capability

These capabilities can form the basis of a future deepwater containment response

For future readiness, we will retrieve, inspect, and preserve the tools we have, and we look forward to contributing additional lessons learned as we progress

Highlights of our lessons learned: Open water



1. Subsea

2. Open Water

Oil surveillance
In situ burning
Skimming
Dispersants

3. Near-shore and shoreline

Open water highlight areas

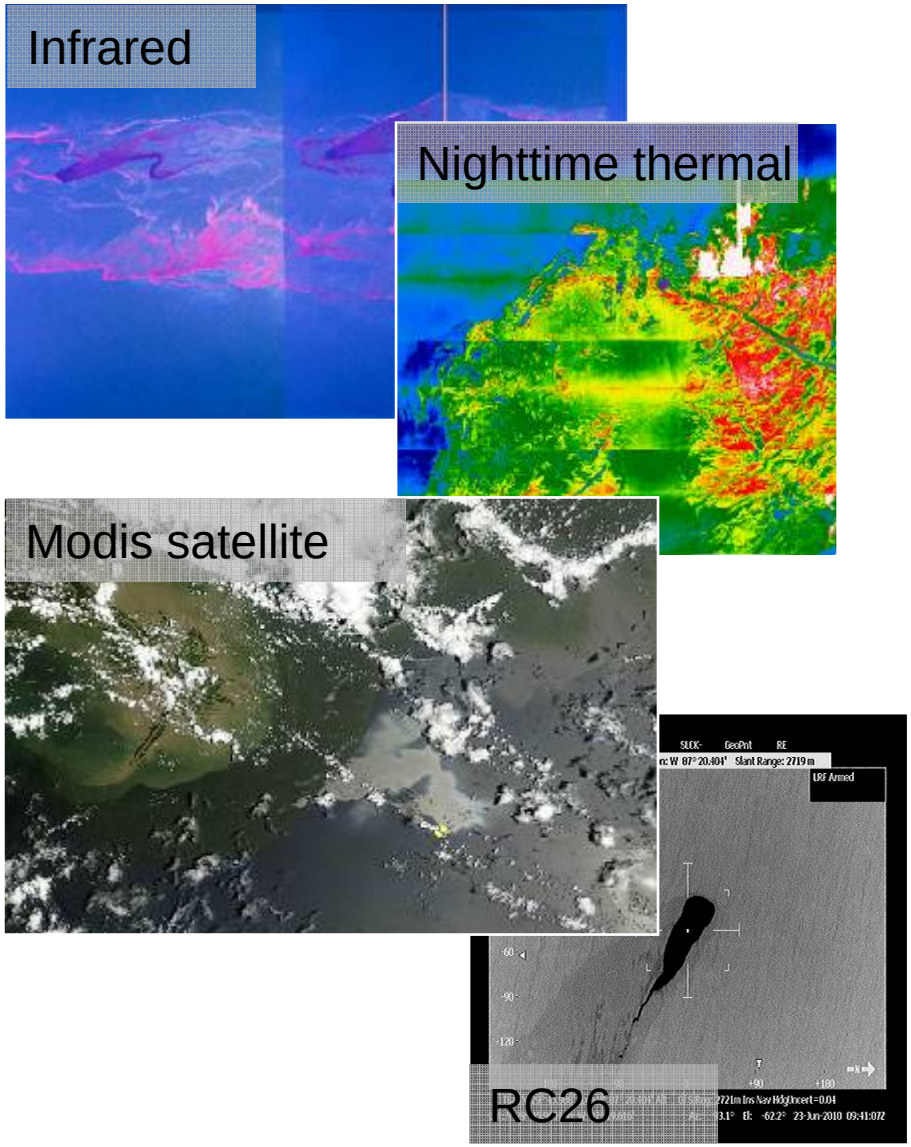
Surveillance and imaging

Open water skimming

Controlled in-situ burning

Dispersants

Openwater > Surveillance and imaging



From

- Daytime only, fixed wing helicopter fly-over with spotters (~4 flights per day)

To

- Integrated, day-and-night, satellite, multi-spectral photography, new application for satellite imagery, and aerial radar (~100 flights per day capability)

Benefit for the future

- Faster, more reliable, more accurate identification and assessment of oil type, location, and extent

Openwater > Open-water Skimming

From

- Skimming capacity of 450,000 barrels/day
- 16 purpose-built responders (on day 5)

To

- Total skimming capacity of >1,200,000 barrels/day with over 60 open water skimmers (at peak) developed through retrofit, international exchange, and other innovations

Benefit for the future

- Vastly expanded skimming capability ready to deploy
- New capability to convert active fleet of OSVs and PSVs to skimmers
- New "surge know-how" to address peak demand

Openwater > Controlled In-situ Burn (ISB)

From

- Only US in-situ burn was 3 minutes long and conducted in Alaska in mid-1980's

To

- 411 controlled burns ranging from 5 minutes to 12 hours by 14 burn teams
- Achieved through improved identification of oil type, newly designed "dynamic" burn process, significantly enhanced fireboom technology, and significant expanded human capability (from <10 to >50 experts)

Benefit for the future

- Controlled burn is now proven technique
- Significantly enhanced supply chain for fireboom production (from 250'/wk to 7,000'/wk)
- Well-documented protocol, process, and procedures for any future events

Openwater > Aerial and Subsea Disperants

From

- EPA-approved dispersant products with general usage guidelines
- 2 hour sortie turnarounds
- No prior subsea dispersant application

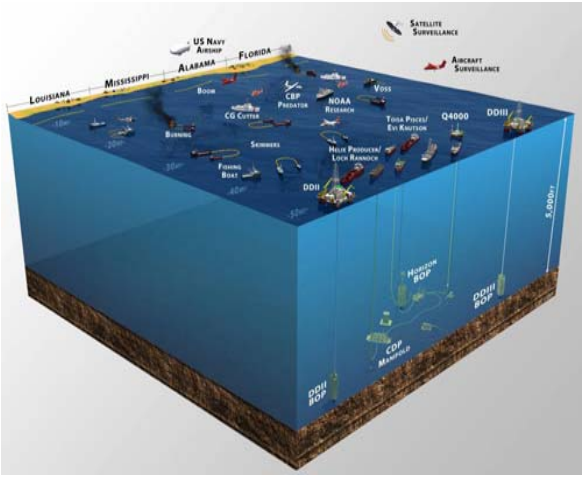
To

- Far more precise identification and application to minimize dispersant through innovative use of imaging and other technologies
- 30 minute sortie turnarounds through improved and streamlined process
- Detailed sampling and monitoring programs now in place
- Direct dispersant injection at the source

Benefit for the future

- Enhanced supply chain capacity to produce specific dispersant
- Minimize oil on surface

Highlights of our lessons learned: Near-shore and Shoreline



1. Subsea

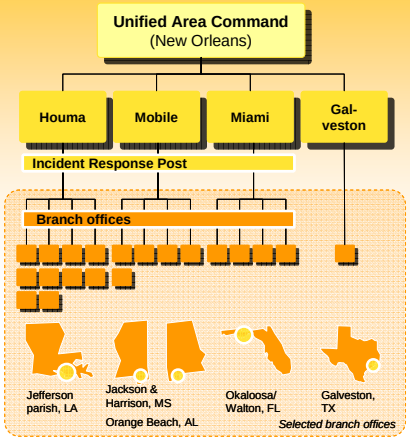
2. Open Water

3. Near-shore and Shoreline

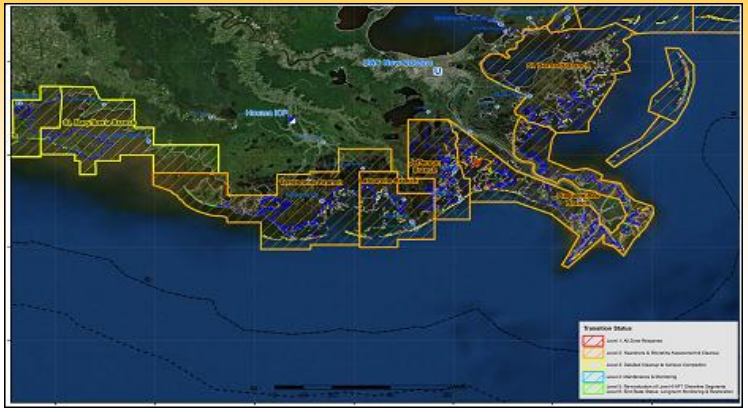
Branch structure
Vessels of Opportunity
Geographic Response Plan
Shoreline Clean-up Assessment Team
Common operating system

Near-shore and shoreline response highlight areas

Branch structure



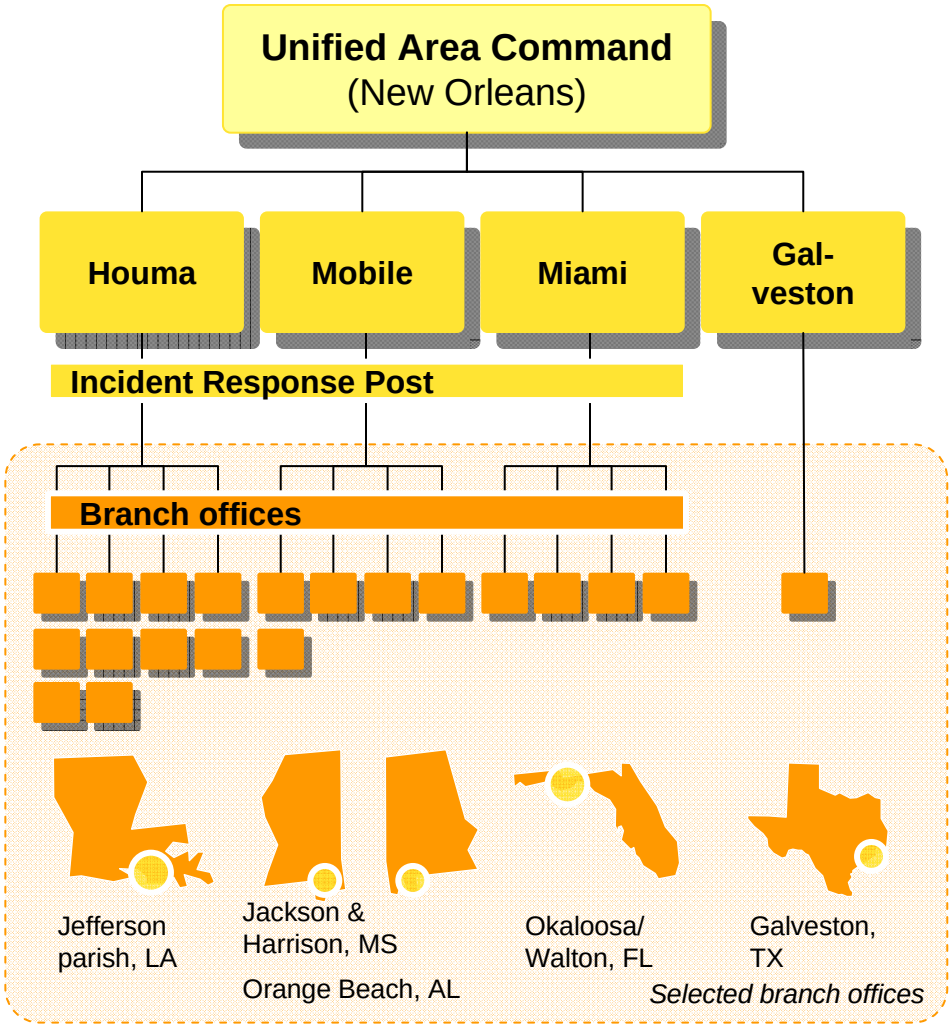
Geographic response plan



Vessels of Opportunity

Shoreline **C**leanup **A**ssessment **T**eam

Near-shore > Branch structure



From

- 4 incident command posts (ICPs) with centrally allocated resources to frontline

To

- 4 central incident command posts and 19 branch offices with clear mission and capabilities to defend a specific stretch of local coastline involving local communities with dedicated staff, equipment, and supplies

Benefit for the future

- Much faster near-shore response capability tapping local knowledge (currents, booms)

Near-shore > Vessels of Opportunity

From

- Vessel of Opportunity (VoO) concept designed to support responders (transporting people and supplies)

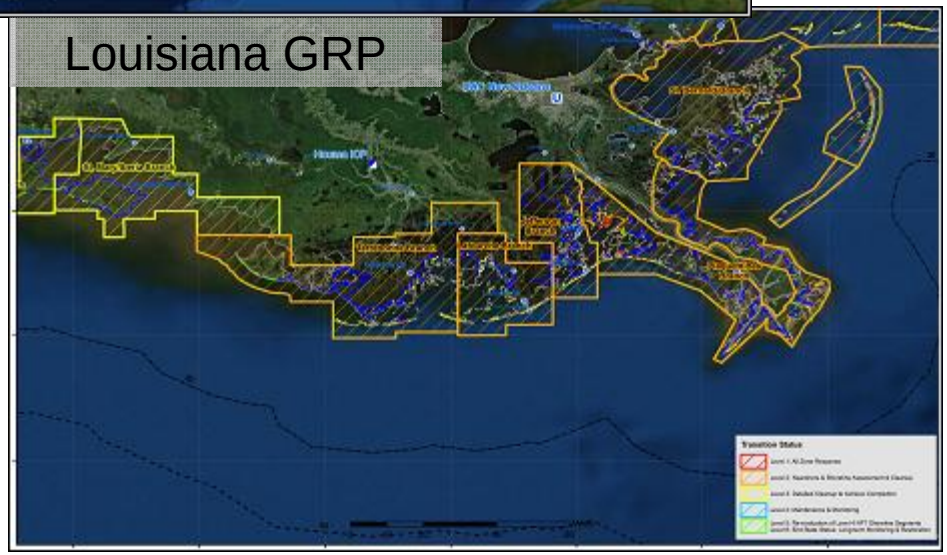
To

- > 5,000 vessel VoO fleet involved not only in transport but also in oil collection and skimming
- Systematic approach to selection, inspection, training, and deployment of commercial fishing vessels
- Fleet organized into taskforces with specific accountabilities for command and control structure

Benefit for the future

- Proven capability to rapidly deploy commercial fishing fleet to participate deeply in response

Near-shore > Geographic Response Plans



From

- State-by-state Area of Contingency Plans, which focus on macro-level response protocol

To

- Parish-by-parish, town-by-town trigger point geographic response plan (e.g. boom deploy schedule) which specifies when and where to deploy resources based on local conditions and oil movement

Benefit for the future

- Faster local response and coordination based on ready-to-deploy, evergreen protocol for local oil response

On-shore > Shoreline Clean-up Assessment Team

From

- Single Shoreline Clean-up Assessment Team (SCAT) who assesses impact and determines clean-up technique and procedures

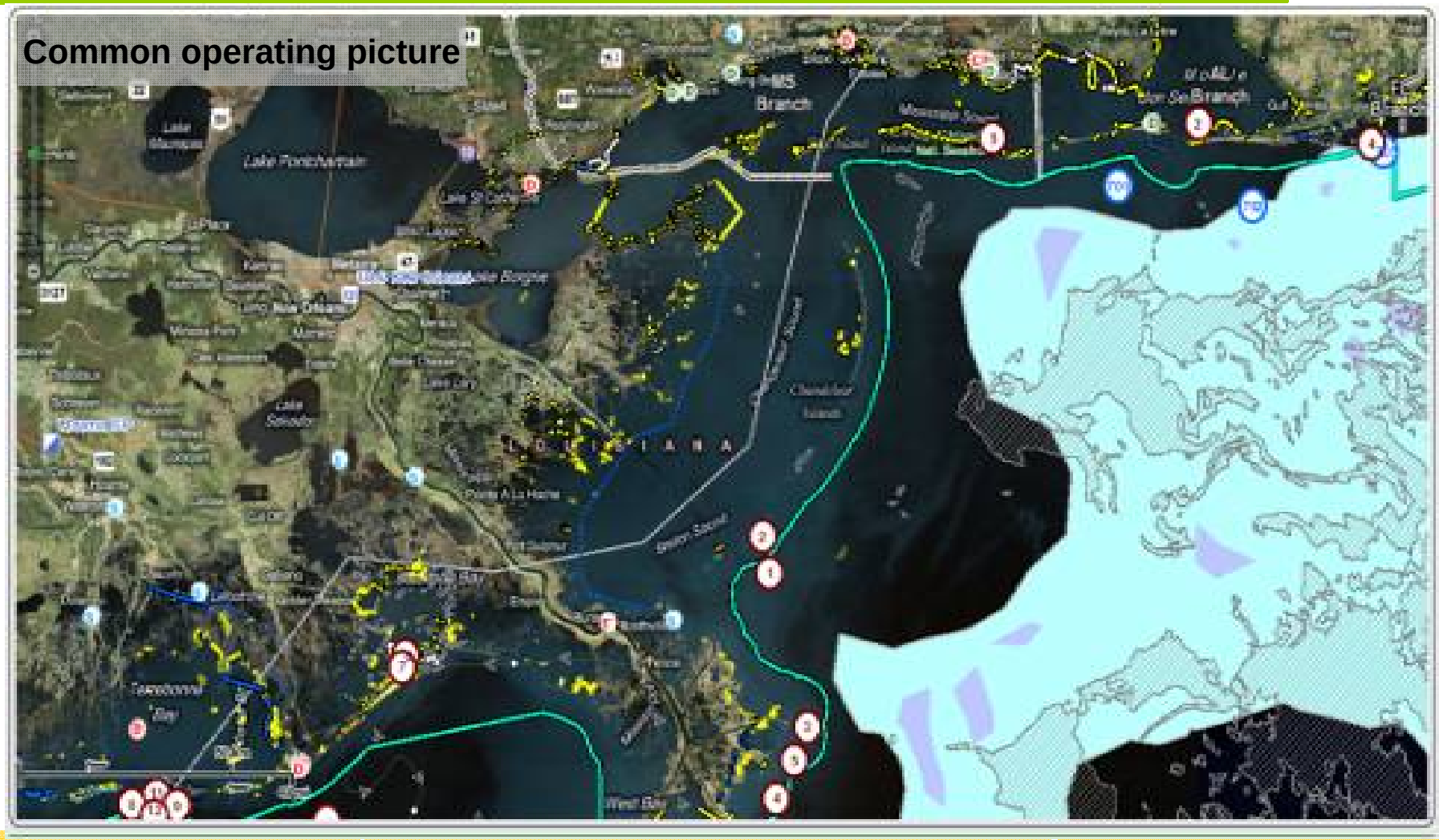
To

- Multiple active SCAT teams facilitating much faster assessment and deployment of response
- Significantly enhanced data management and assessment technologies

Benefit for the future

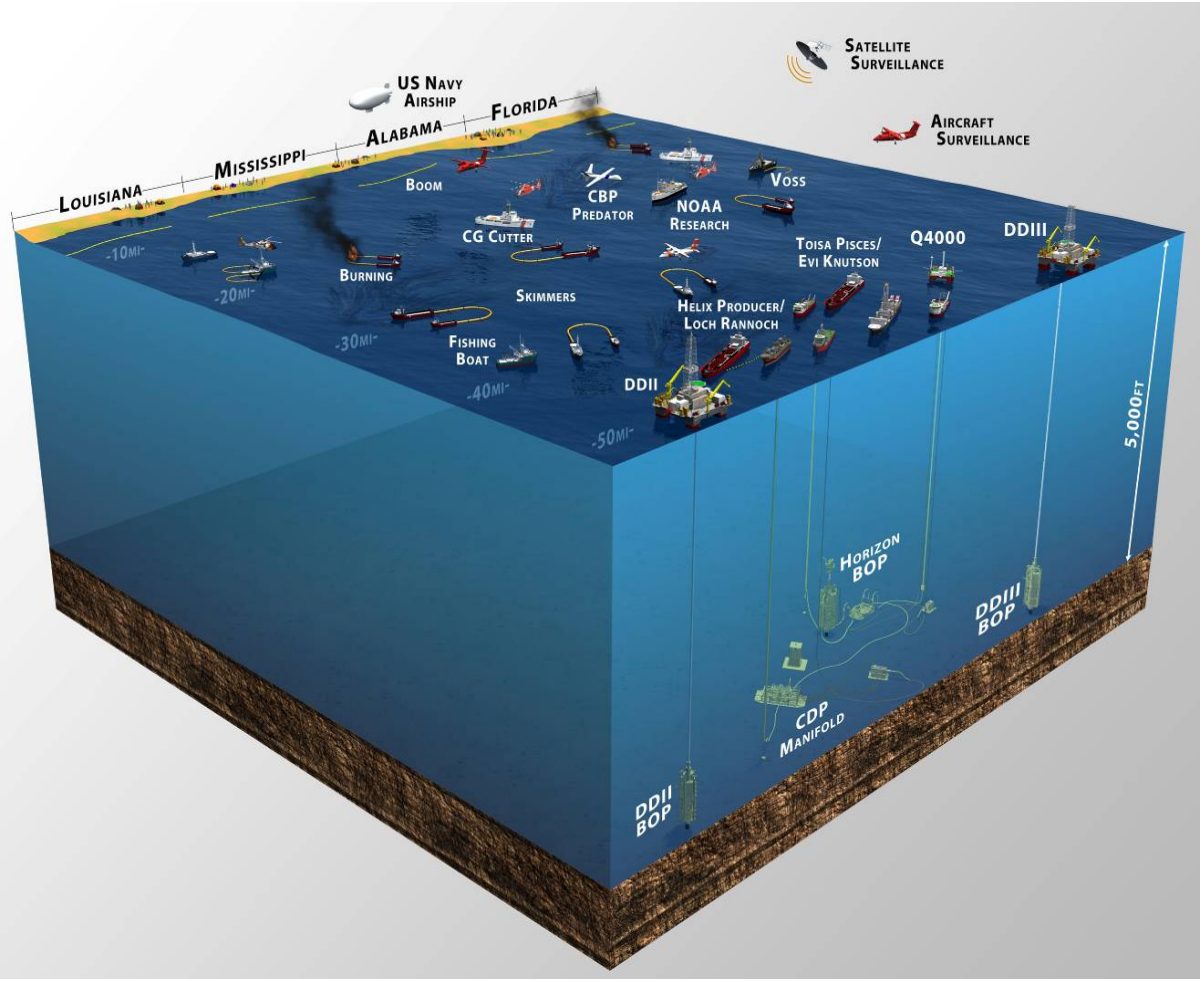
- Deeper bench of trained experts
- Significantly improved deployment capability in case of future events

Integrated system critical to enable common operating picture



From: Fragmented, local user only collection of key operating data	**To:** A single integrated common operating picture for the entire theater with instant access to key databases from multiple sources	**Benefit for the future:** Faster decision making, prioritization, and resource deployment

Takeaways from our efforts in containment and spill response



1. Containment and spill response is **complex but manageable**
2. Response requires **a systematic and integrated approach** across all levels
3. **Know-how, innovation, and expertise** are as important as physical equipment

Concluding thoughts

We hope this presentation provides a sense of the engineering, technical, and management advances developed during this response

These advances, which are available now, can be harnessed to improve deepwater response capability

We look forward to working with government, industry, and other stakeholders to achieve this goal