MSRC
Remote Sensing Capability
The Next Significant Enhancement in Spill Response

OSPR-Chevron Response Technology Workshop
February 25, 2015

MSRC Background

- **Extensive Response Experience**

  - **Over 850 spills post-Exxon Valdez**

  - **1996 Portland, Maine tanker spill**

  - **Katrina/Rita -- 36 responses for 22 customers**

  - **Deepwater Horizon -- largest surface response contractor**

    - ✓ **12 Responder Class vessels**

    - ✓ **Over 11,000 employee man days offshore**

    - ✓ **Post event interviews with employees for continuous improvement**

MSRC DWH Observations/Continuous Improvement

- **Operations**

  - ➤ **Skimmer effectiveness/efficiency**

  - ➤ **Encounter rate tactics**

  - ➤ **Debris handling**

  - ➤ **Offloading of recovered product**

  - ➤ **Sustainability and redundancy (human element)**

- **All of the above are downstream of the most critical observation:**

  - ➤ **Efficiently putting resources in the right position (day and night) to recover the oil**

Historical **Perspective** -- Oil Spill Surveillance in U.S.
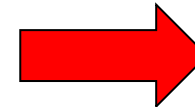
Exxon Valdez

Gulf Hurricanes of mid-2000 period

Deepwater Horizon

Strategic Tools
- **Satellite**
  - **Optical**
  - **Radar**

Strategic – COP
- **Added satellite sophistication**
- **Added aerial sophistication (Ocean Imaging multi-spectral/TIR)**
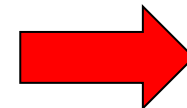
Oil Migration

Not real time
- **Limited tactical value**

Tactical Tools
- **Visual Spotting**
  - **Aerial**
  - **Eye**
  - **Photography**
  - **Video**

Tactical
- **Not much change**
- **Reliance on eye**
- **Limited ship-mounted TIR**
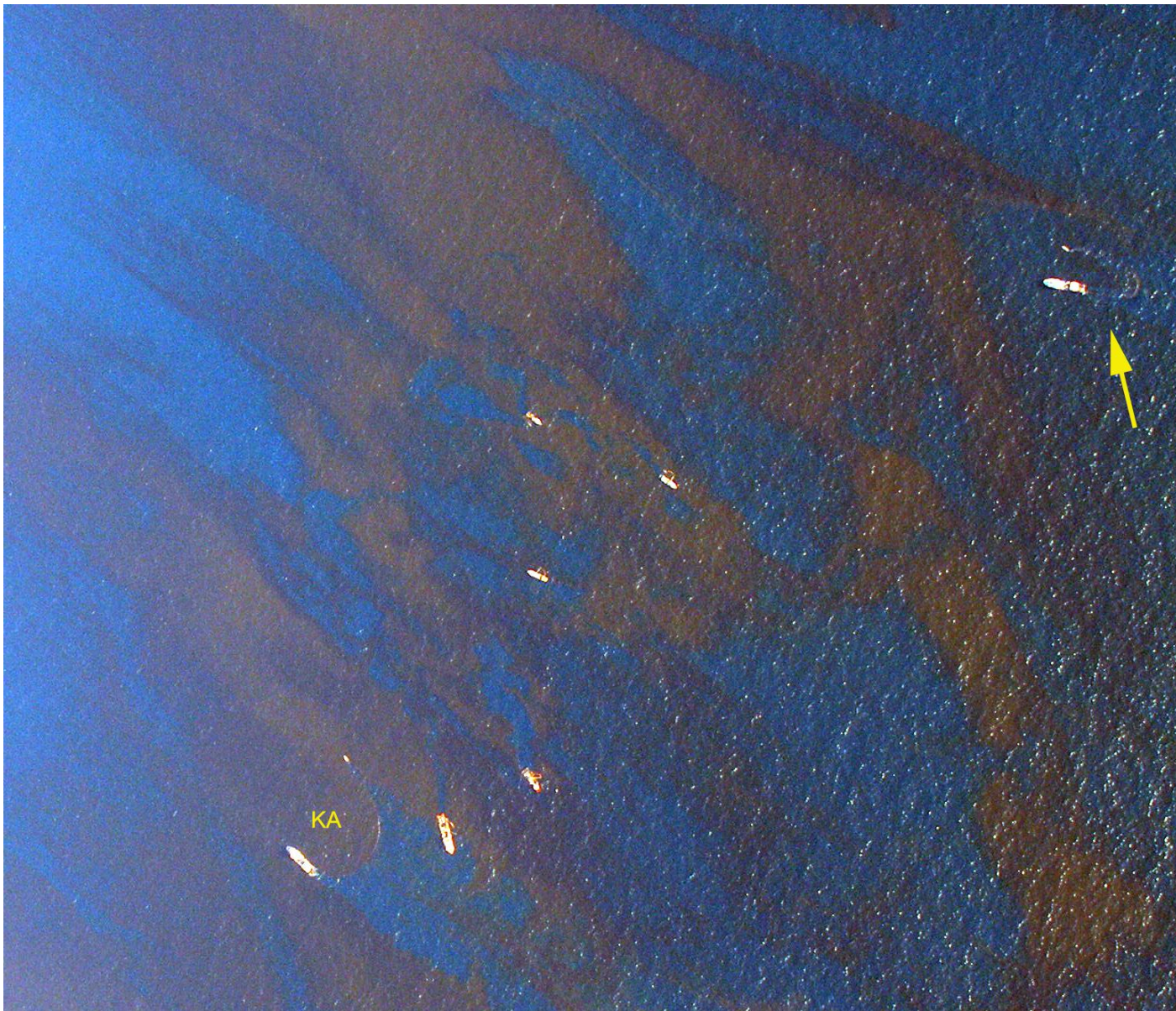- **Day light only**

Oil Migration

Boat positioning challenges
- **Thickest Oil**
- **False Targets**
- **Compressed Window (Day light positioning)**

Inefficient recovery

Maximal recovery

KA

MSRC Surveillance Objectives -- Post DWH

- **Real Time Tactical Information Besides Visual Spotting**

  - ➢ **Classification of oil targets as Recoverable or Non-recoverable (i.e. sheen)**

  - ➢ **Tracking moving oil**

  - ➢ **Staying in the recoverable oil as it moves**

  - ➢ **Expanding the operating window to low-light conditions (with safety always of highest priority)**

  - ➢ **MSRC Strike Team Experts**

   - ✓ **Versed in operationalized remote sensing**

Key Criteria for MSRC's New Remote Sensing Tools

- **Multiple sensors/platforms since one does not do all**

- **Multiple platforms given importance of height of eye**

- **Portability given span of U.S. coastline and lack of dedicated surveillance planes**

- **Real time information for tactical use**

- **Provide "feed" to customer Common Operating Picture (COP)**

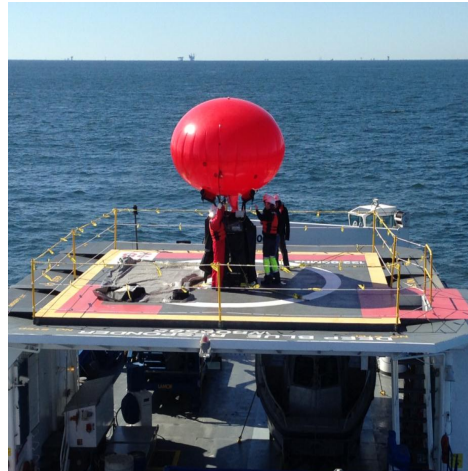# MSRC Level ABC Remote Sensing For Tactical Oil Spill Surveillance

Level A -- Aircraft
Ocean Imaging Corporation
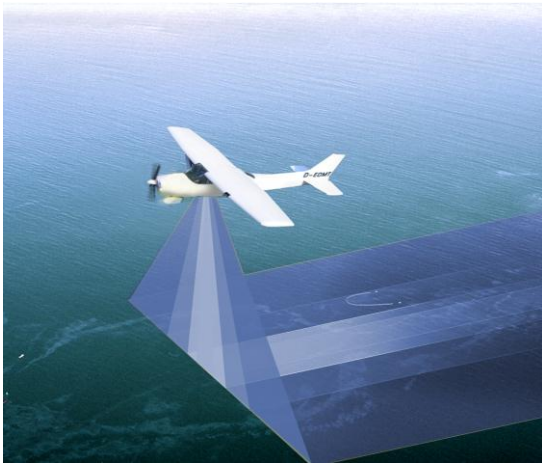
Provides wide-area spill detection, thickness interpretation, and oil distribution mapping

Multispectral/TIR Cameras

Level B -- Balloon
Maritime Robotics

Tethered up to 500 ft. Medium range coverage with long "hang' time

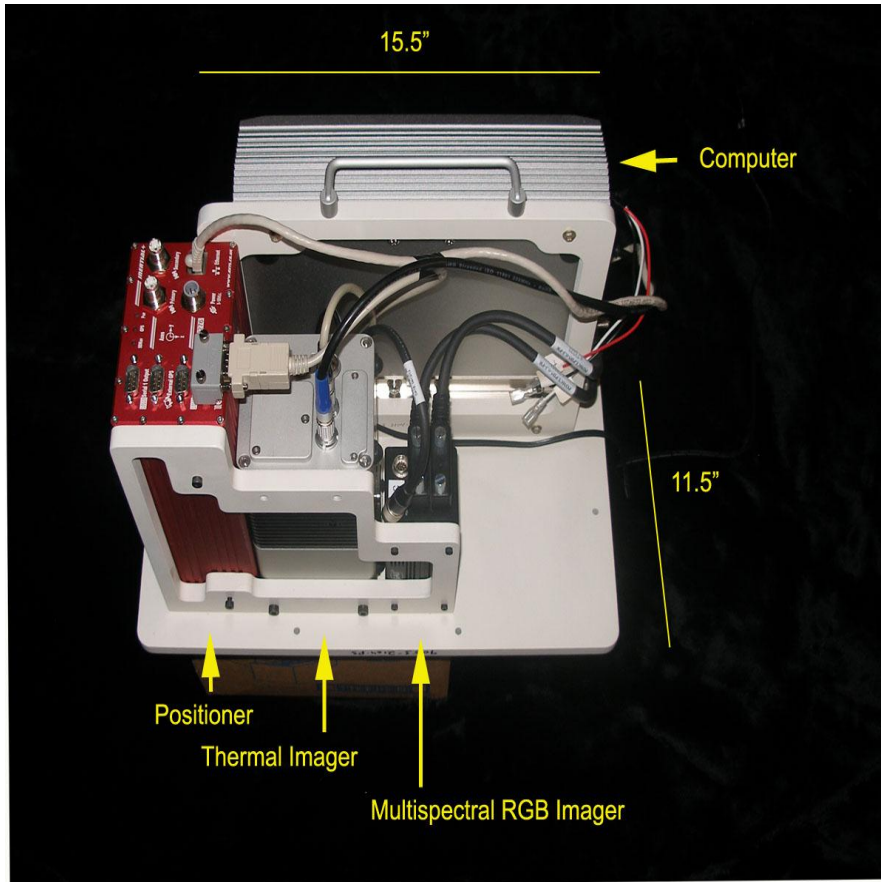**TIR and HD Cameras**

Level C -- Close-In

Optimizes close-in recovery techniques

**X Band Radar and TIR Camera**

Level A – Aircraft Using Ocean Imaging System TRACS

- **Use pre-identified Aircraft of Opportunity (AOO)**
- **Systems operated by trained MSRC personnel**
  - ➤ **Staged on each coast (NJ, TX, CA)**
- **Tactical use**
  - ➤ **Capture images that can be pre-processed on-board to identify oil as recoverable and direct response resources into thickest oil**
- **Common Operating Picture (COP) oil mapping**
  - ➤ **Capture images over entire spill (or parts) that can be transferred to OI technologists for detailed oil thickness maps**
- **Available as post-hurricane assessment tool**

Example: Visual vs. Digital Imaging of a Slick

Visual or Photo

OI Sensor: Visual Multispectral

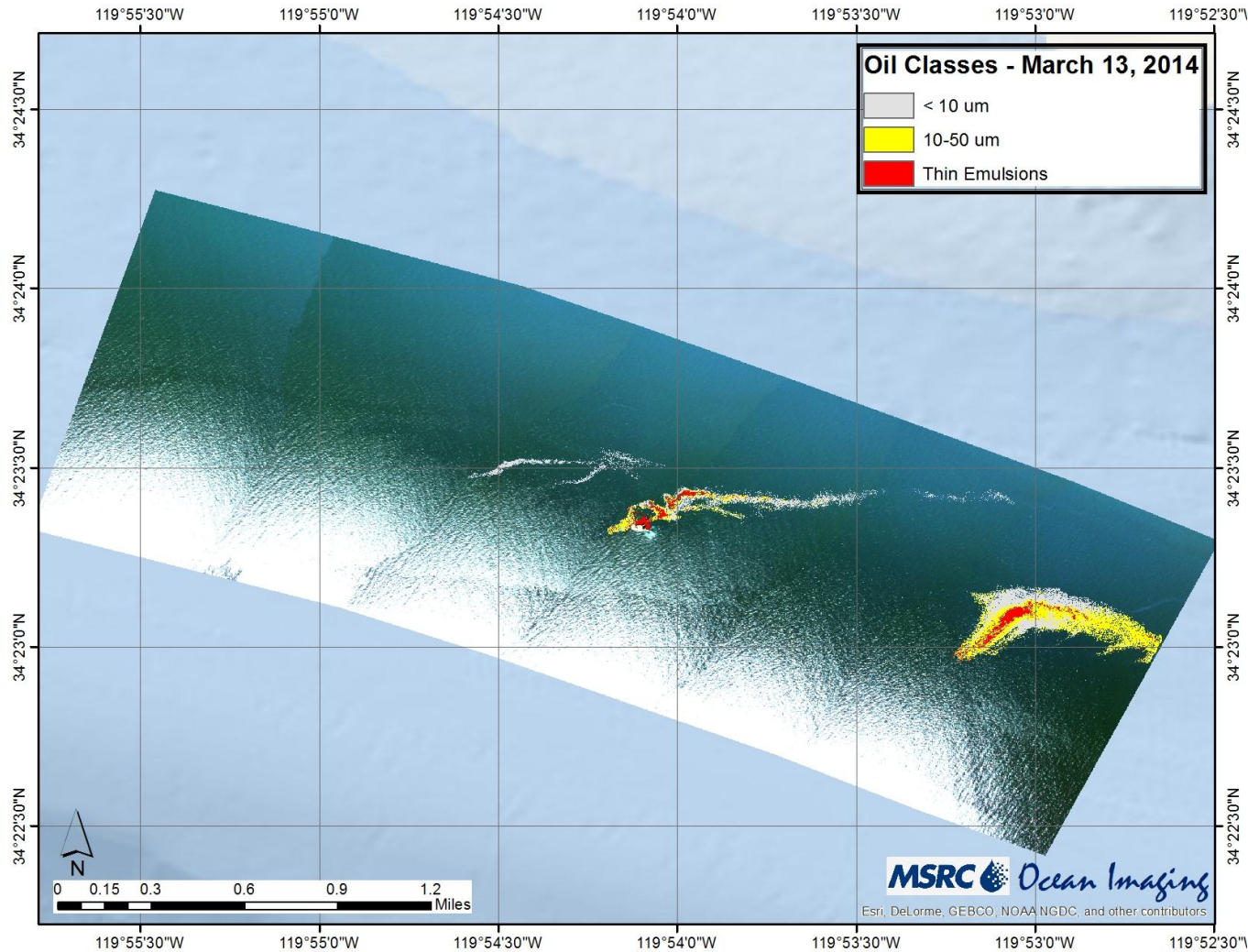**OI Sensor: Thermal**
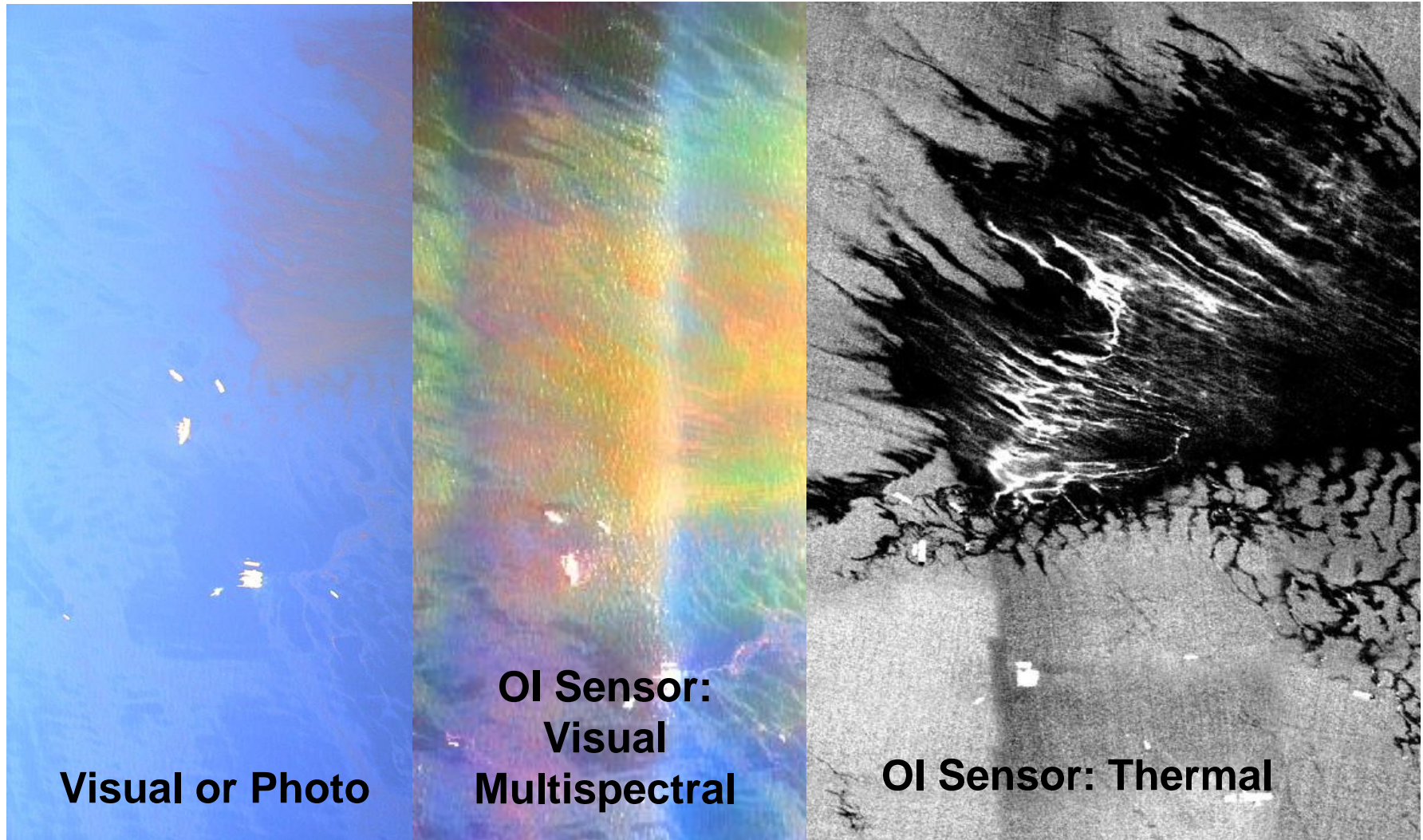
Source: Ocean Imaging, 2010

Potential false positives in visual or multispectral mode: Red tide plankton bloom.

Cross-checking with thermal image (no oil signal) identifies false target

Ocean Imaging/MSRC Level A System

"Fully Processed" (off plane) services that can be generated after data is transferred to OI
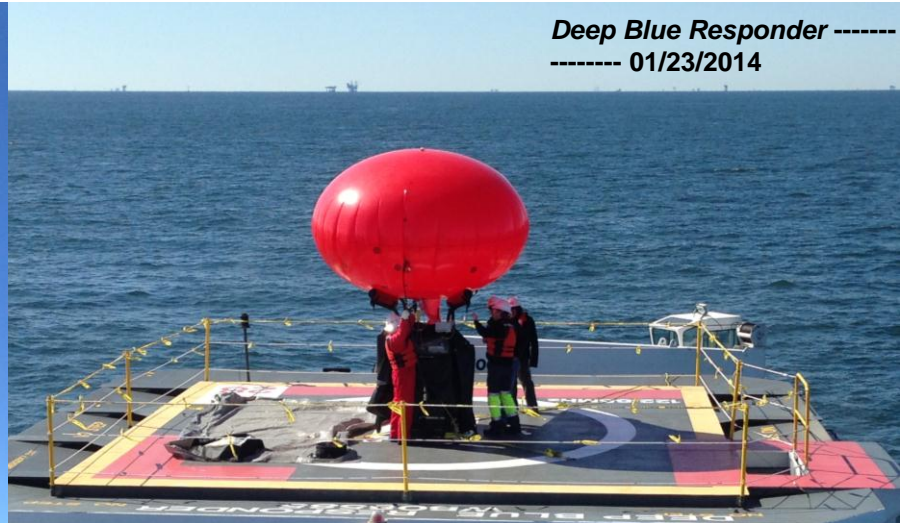
MSRC Level B - Maritime Robotics Aerostat

- **Battery powered, non-wired tether**
  - ➢ **Up to 12-hour "hang time"**
  - ➢ **Rechargeable battery**
- **Package includes:**
  - ➢ **HD Camera**
  - ➢ **TIR Camera**
  - ➢ **AIS Repeater**
- **Small, compact easily transportable package**
- **Proprietary viewing software and gimbal**
- **WIFI transfer to host vessel**
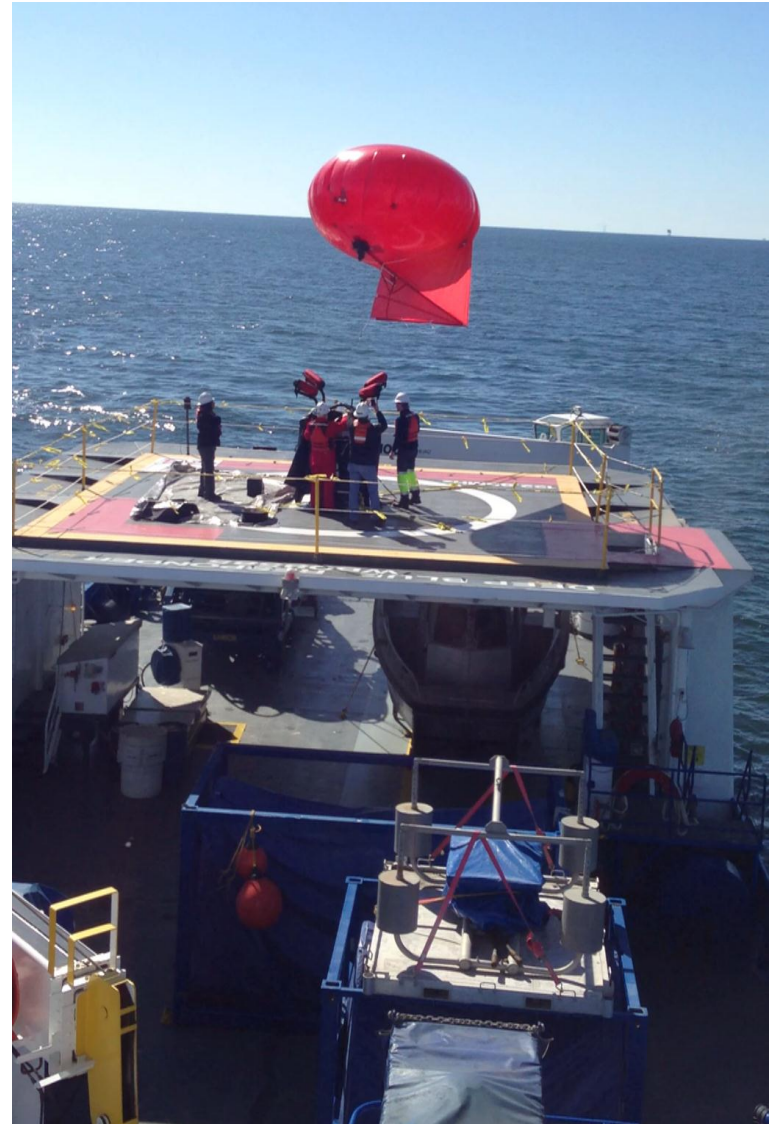
MSRC Level B – Balloons (Aerostats)

Deep Blue Responder ---------------- 01/23/2014

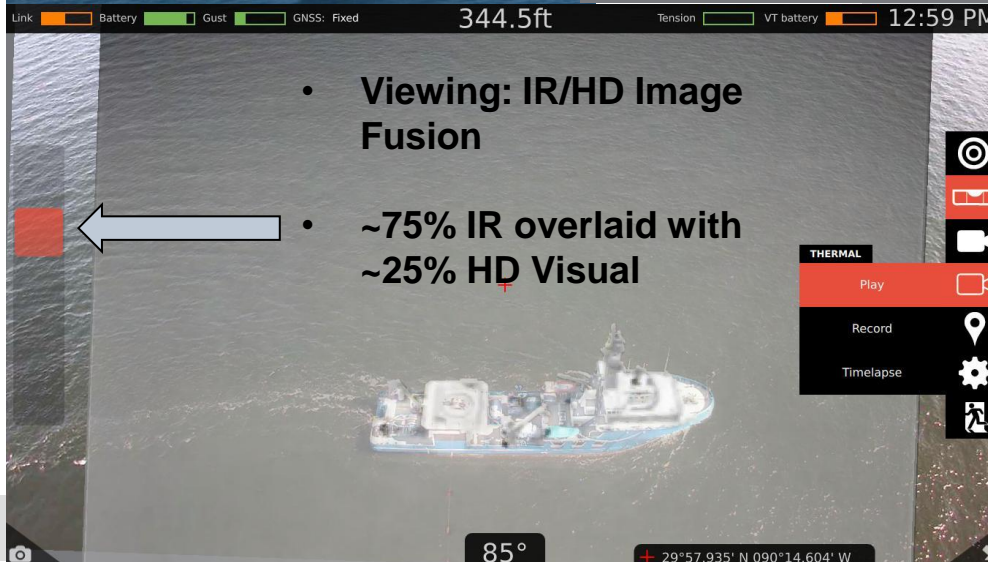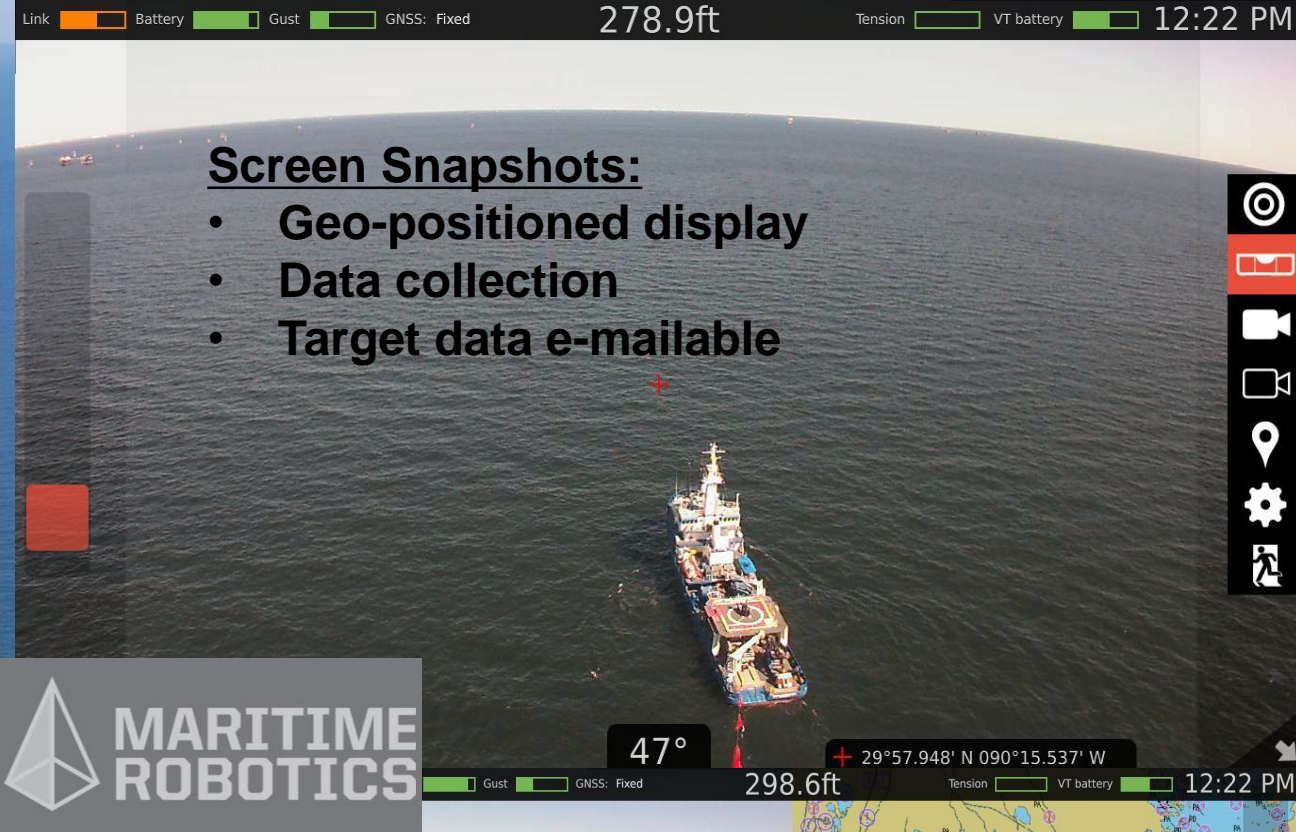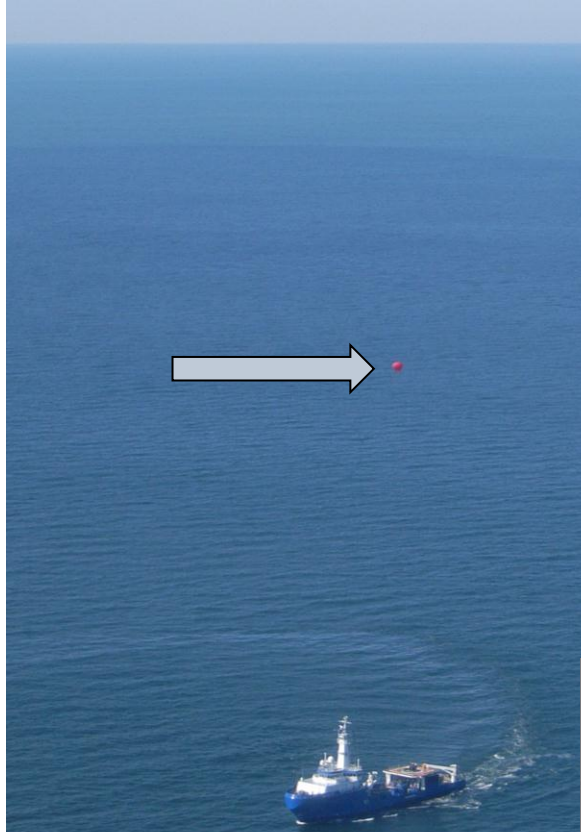# Manufactured by Maritime Robotics: Ocean Eye

NOFO: Oil On Water 2012

Screen Snapshots:
- **Geo-positioned display**
- **Data collection**
- **Target data e-mailable**

Viewing: IR/HD Image Fusion

- **~75% IR overlaid with ~25% HD Visual**

MARITIME ROBOTICS

278.9ft
298.6ft
344.5ft
47°
85°
51°

29°57.948' N 090°15.537' W
29°57.935' N 090°14.604' W
29°58.023' N 090°15.429' W
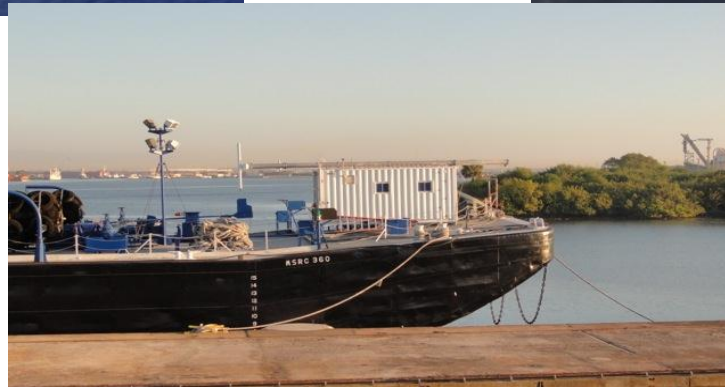
THERMAL
Play
Record
Timelapse

Level C – Close In OSRV Mounted Systems for Tactical Optimization

- **X Band Radar and Thermal Infrared (TIR) on Responder Class Vessels**

  - **Oil detection (X Band Radar)**

  - **Better view of oil**

  - **Stack oil vs. entrainment**

(NOFO OOW'13)

Oil

Infra-Red:
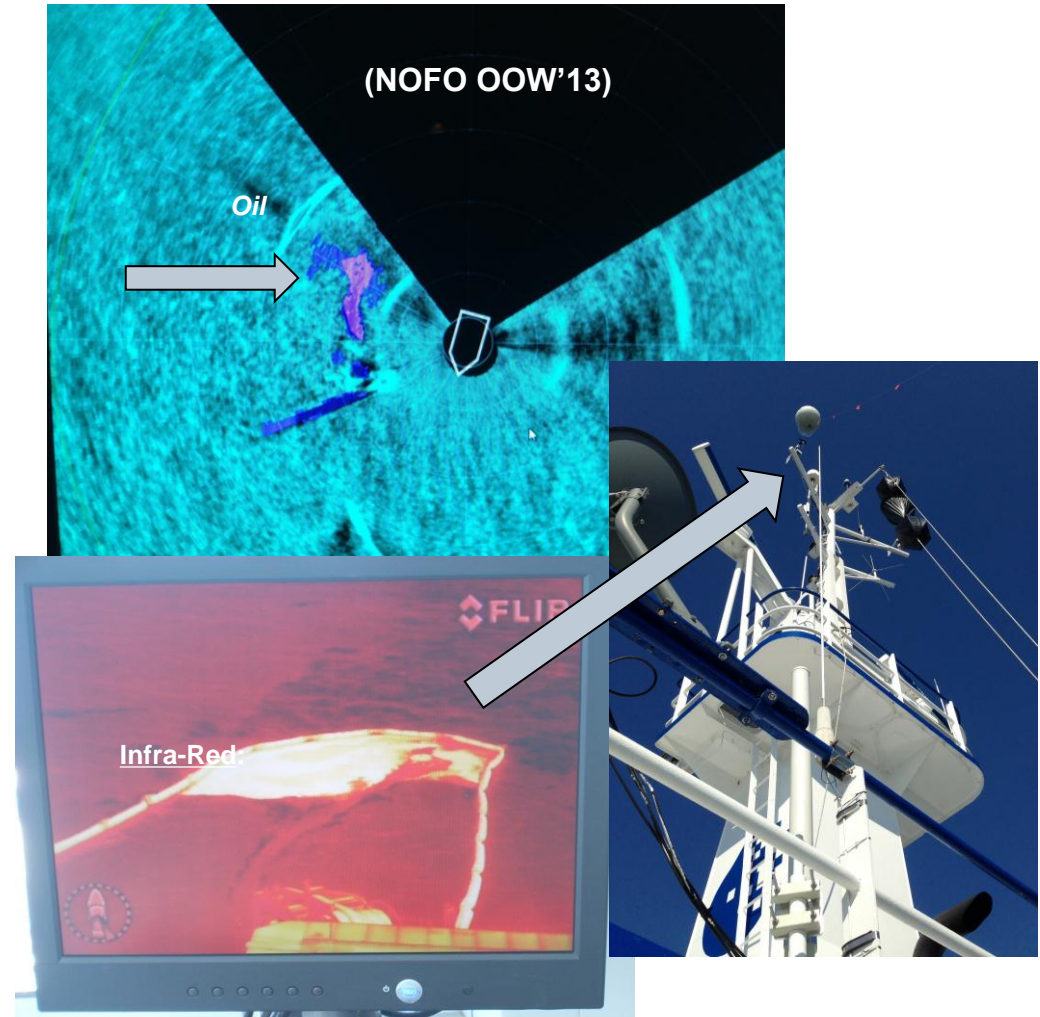
Transportable Containers For Use with Barges and Large Vessels of Opportunity

MSRC Future Considerations

- **Level A Enhancements**

  ➢ **Data file transfer to vessels**

  ➢ **Portable SAR**

- **Level D (Drones)**

- **Level S (Satellites) for tactical use**