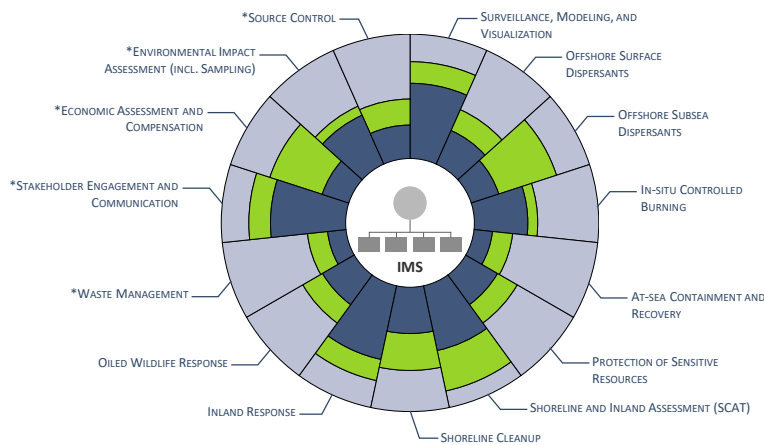


# Future application of marine autonomous systems – linking response and environmental monitoring

Rob Holland, OSRL  
Liam Harrington-Missin, OSRL

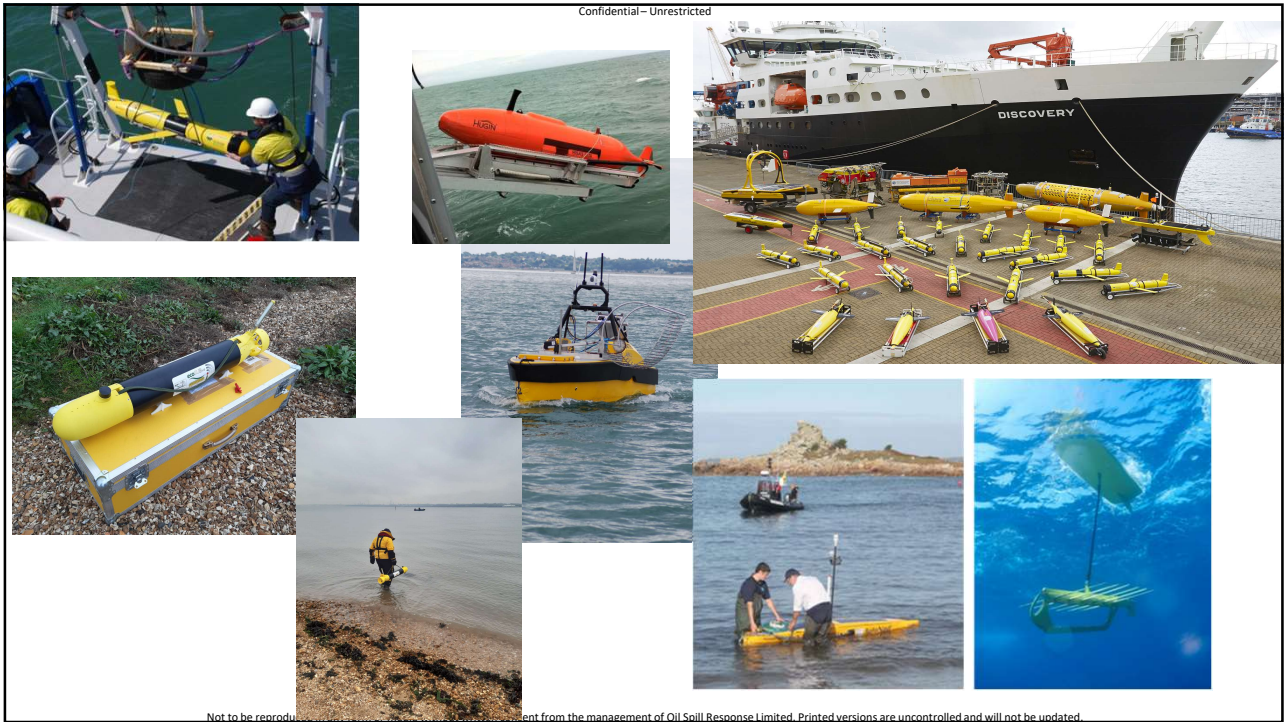
1

## THE FOLLOWING 15 CAPABILITIES ESSENTIALLY REPRESENT THE SCOPE OF TIERED PREPAREDNESS AND RESPONSE:



\*THESE CAPABILITIES MAY NOT BE PROVIDED BY OIL SPILL RESPONSE ORGANIZATIONS OR MUTUAL AID BUT MUST BE CONSIDERED BY OPERATORS IN PLANNING. OPERATORS MUST COMBINE INTERNAL AND EXTERNAL RESOURCES TO MEET THE CAPABILITY REQUIRED TO RESPOND TO POTENTIAL INCIDENTS.

2



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## Applying Autonomous Systems – air and sea

- The Oil & Gas industry is stretching the limits of what can be achieved with current technology
- Autonomous systems represent an emerging new system category that can provide solutions to meet these challenges
- There are challenges in oil spill response that could be solved with similar solutions
- Within the Oil and Gas industry and Oil Spill Response Organisations (OSROs) the application of Marine Autonomous Systems (MAS) for in-water surveillance in emergency oil spill response is still being evaluated

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# Potential Benefits of Autonomous Systems in oil spill response

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- **Reduced risk:**
  - Reduced human exposure to danger i.e. reduce or eliminate people working on-site
- **Reduced cost:**
  - Less need of costly human supervision
  - Increased up-time (no illness)
  - Reduce dependence on resources required to support humans i.e. expensive vessel time (require limited resources to deploy and recover)
- **Optimal operations:**
  - Increased situational awareness = improved decision making i.e. near real time and long term datasets, large spatial resolution datasets
- **Simultaneous operations:**
  - Co-operating robot teams i.e. joint asset integrity and environmental compliance surveys, pipeline day to day monitoring and spill response
- **New areas:**
  - Enables surveys of previously inaccessible areas



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# SMART monitoring

## Fluorescence readings

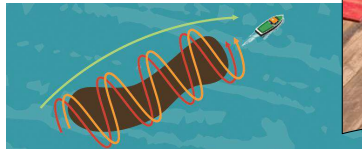
- Background
- Natural dispersion
- Chemical dispersion

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SPECIAL MONITORING of APPLIED RESPONSE TECHNOLOGIES

Developed by:

U.S. Coast Guard  
National Oceanic and Atmospheric Administration  
U.S. Environmental Protection Agency  
Centers for Disease Control and Prevention  
Minerals Management Service



Smoke rising from the New Carissa, February 1999. Photo by USCG

**Dispersant Monitoring Summary Tier II & III [DATE]**

Incident: [Incident name]	Observation photo prior to dispersant application	Raw fluorescence units C1 at 5m depth
Date: [DD/MM/YYYY]		
From: [Vessel Name]		
<b>Details</b>		
Wind		
Sea state		
Weather chart	Observation photo during dispersant application	Raw fluorescence units C1 at 20m depth
Dispersant used		
Oil condition	Observation photo post-dispersant application	Raw fluorescence units C1 at 30m depth
Application method		
		<b>Recommendations:</b> [Specify recommendations such as, the dispersant appears to be effective on float oil. Continued application should be beneficial.]



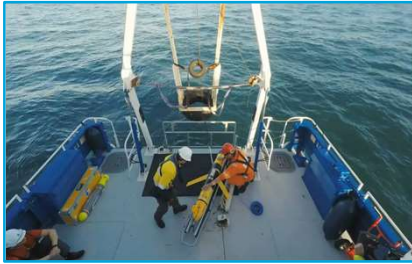
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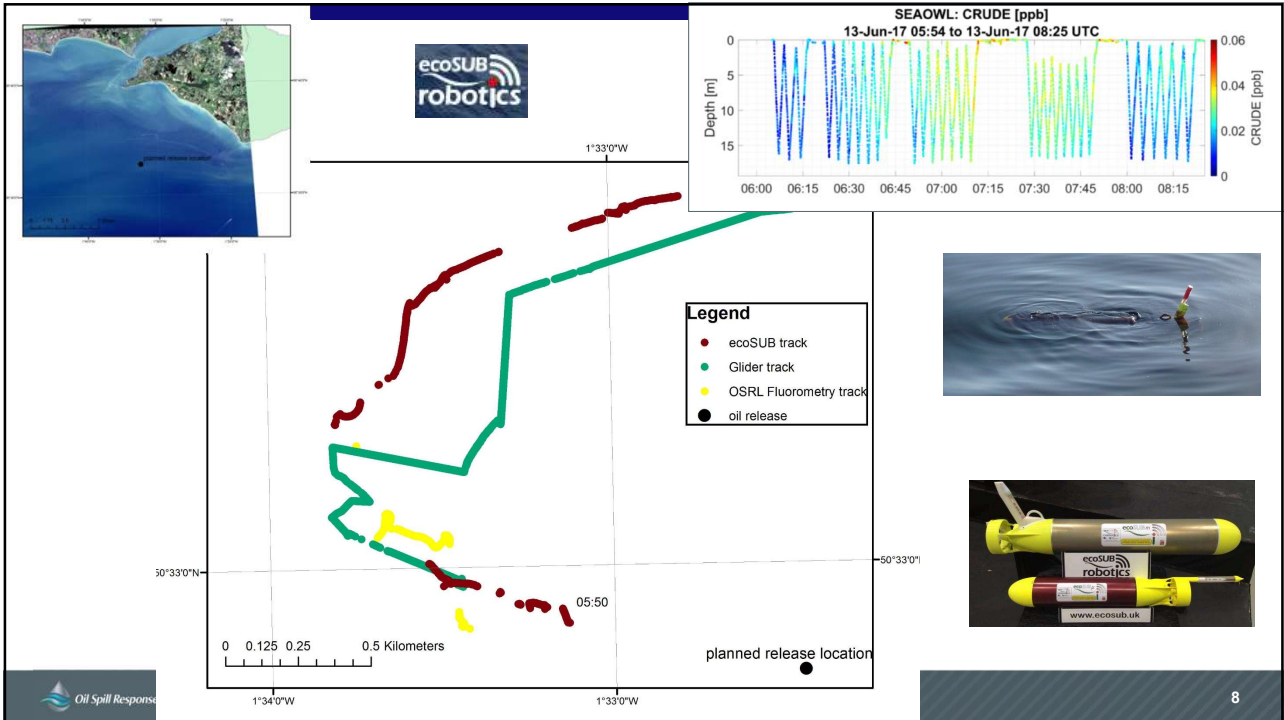
# “Oil on Water” Exercise 2017



- Testing the effectiveness of surface dispersant using fluorometry sensors in AUVs in direct comparison to the fluorometry equipment traditionally used by OSRL on spills (towing a fluorometer from a vessel)
- 2 x companies, 2 x AUVs
  - EcoSUB – prototype
  - Slocum G2 Glider

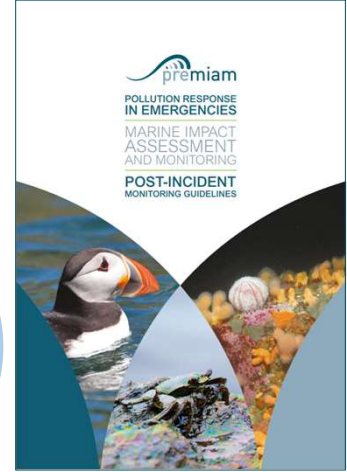
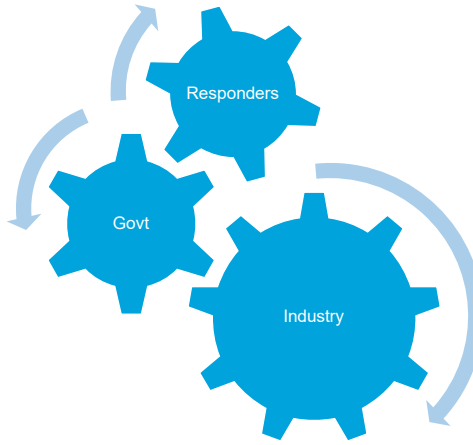


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# Environmental monitoring linkages

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Help operators navigate the steps and good practices involved in planning for, and implementing, a monitoring and sampling (M&S) programme

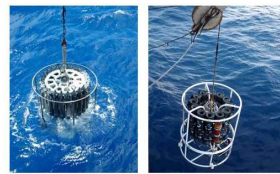


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# MAS in monitoring / impact assessment

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- What do we want to measure?
- What do we want to collect?
- What technology exists already?
- How can we adapt it?
- What new technology could be developed?
- Working together in a spill = leveraging
- Industry & PREMIAM....

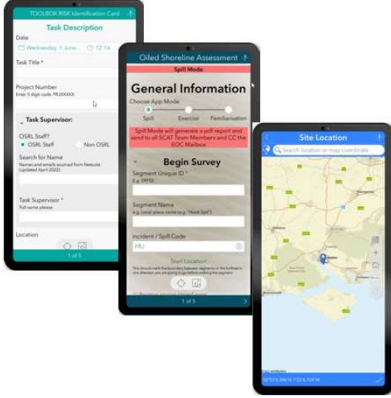


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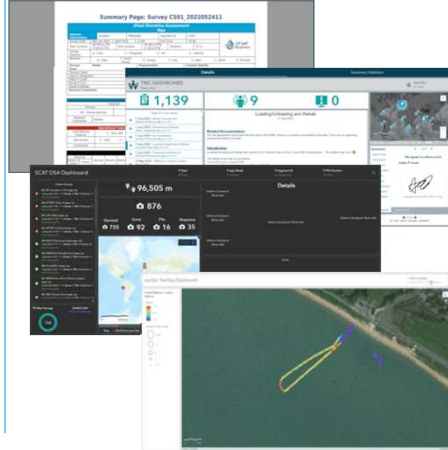
# Visualisation – Turning Data into Value

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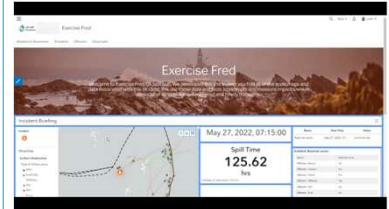
## Transformational Data Capture Tools



## Transformational Data Analysis Tools



## Transformational Decision-Maker Experience



Access OSRL Data, Information Products & Apps from one place

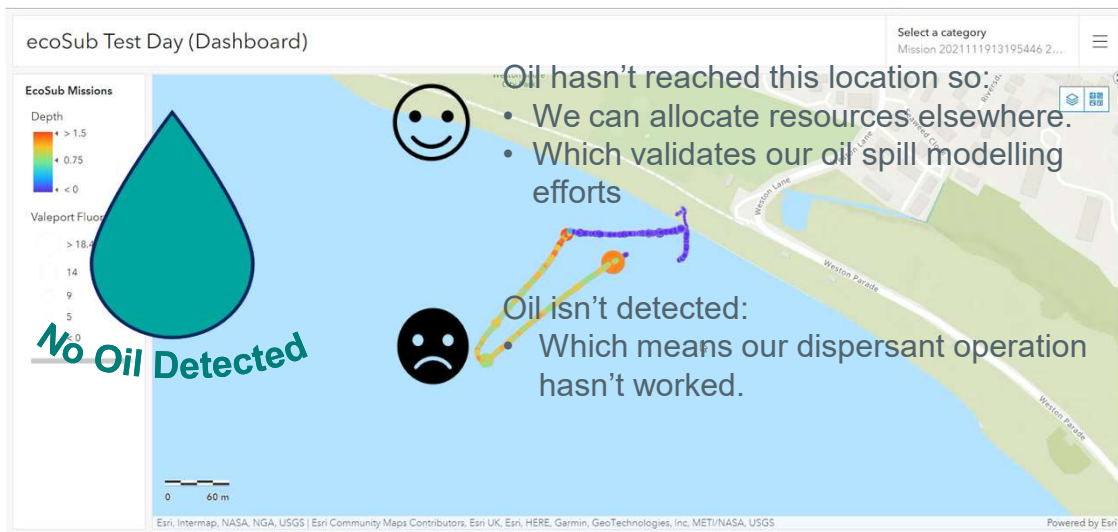
- Secure & Administrated Access
- Able to stream data to your C.O.P.



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# Visualisation – Turning Data into Value

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# Questions?

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# Additional information....

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**IPIECA** **ICP**

**In-water surveillance of oil spills at sea**  
Good practice guidelines for incident management and emergency response personnel

Report  
**Capabilities and Uses of Sensor-Equipped Ocean Vehicles for Subsea and Surface Detection and Tracking of Oil Spills**  
OGP-IPIECA Oil Spill Response Joint Industry Project Surveillance, Modelling & Visualization Work Package 1: In Water Surveillance  
November 2014

**Battelle**  
The Business of Innovation

**Three-Dimensional Mapping of Dissolved Hydrocarbons and Oil Droplets Using a REMUS-600 Autonomous Underwater Vehicle**  
Final

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