



Technical Developments In The Application Of Oil Spill Response Strategies  
2017 PAJ Oil Spill Workshop

# Technical Development

► A lot has changed in 20yrs



► The majority of development has been associated with Information Technology, where;

- Smart technology replaces less advance
- Technology is added to augment existing systems
- New technology provides new solutions

# Technical Development

► But many things have also stayed the same

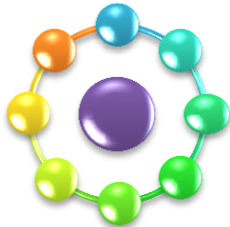


# The People Element



- ▶ People are still the most important asset in a response, they;
  - Manage the incident
  - Make decisions
  - Implement actions
- ▶ Therefore we need to ensure Responders are competent

CMS



Occupational Standard



Assessment & Verification



# How Technology Helps Decision Making - From An Art To A Science

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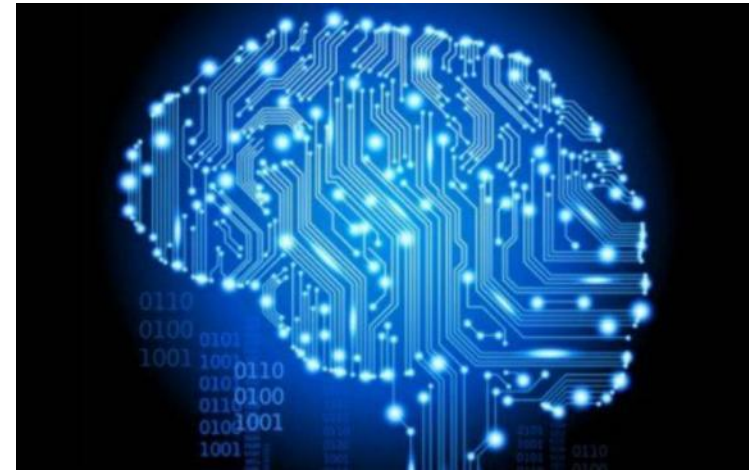
- ▶ Many decisions in a response are ‘**non-structured decisions**’ where there can be several “right” answers
- ▶ These decisions need to be made by people
- ▶ People rely on technology for decision support, which helps people by;
  - Collecting and processing data e.g. Aerial Surveillance/ Fluorometry
  - Computational tools e.g. modelling
  - Presenting information e.g. GIS
  - Telecommunications e.g. email

# What Will Technology Do For Us In 20yrs?

► A decision involves;

- **Intelligence:** Find or recognize a problem, need, or opportunity.
- **Design:** Considering possible ways of solving the problem, filling the need, or taking advantage of the opportunity. Develop all possible solutions you can.
- **Choice:** Examine and weigh the merits of each solution, estimate the consequences of each solution, and choose the best one.
- **Implementation:** Carry out the chosen solution, monitor the results and make adjustments as necessary.

Today technology informs us



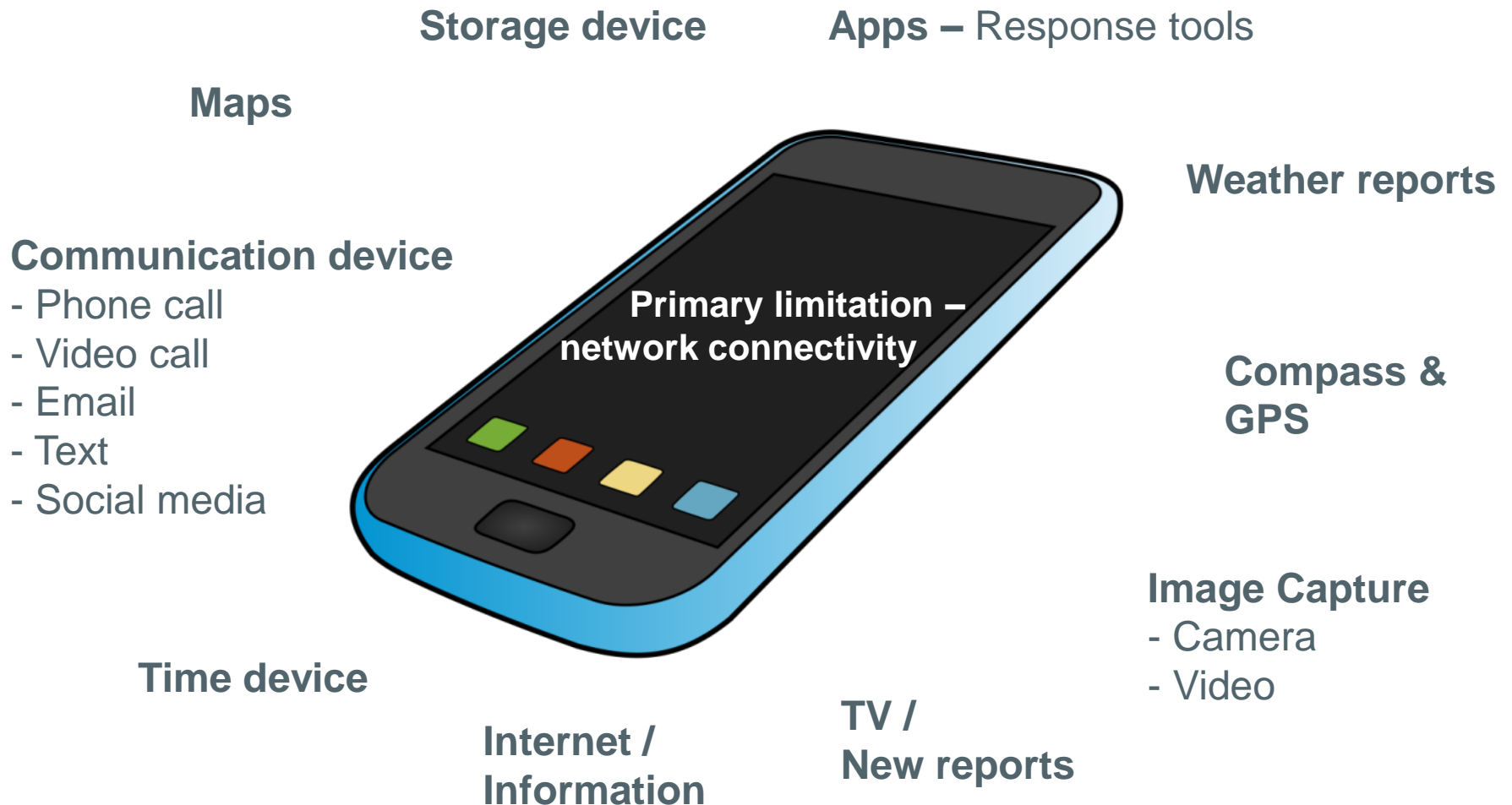
Will it one day provide recommendations?  
Or make decisions for us?

# The Responder's Best Friend

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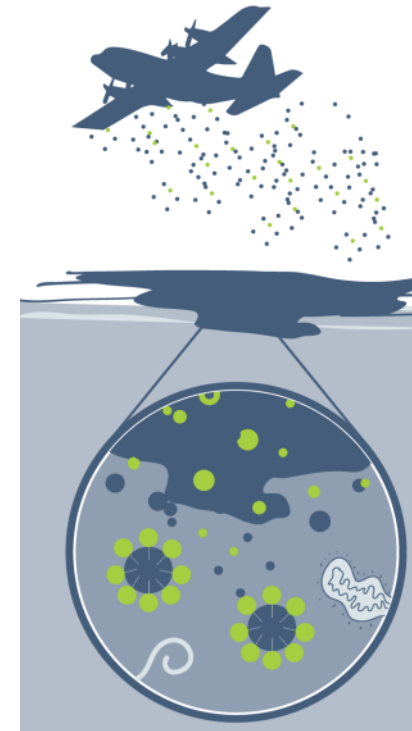
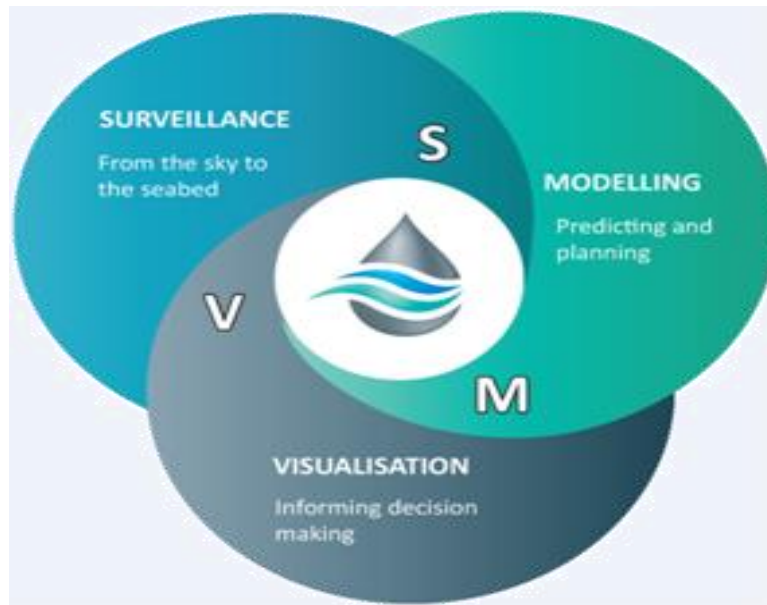
# The Responder's Best Friend





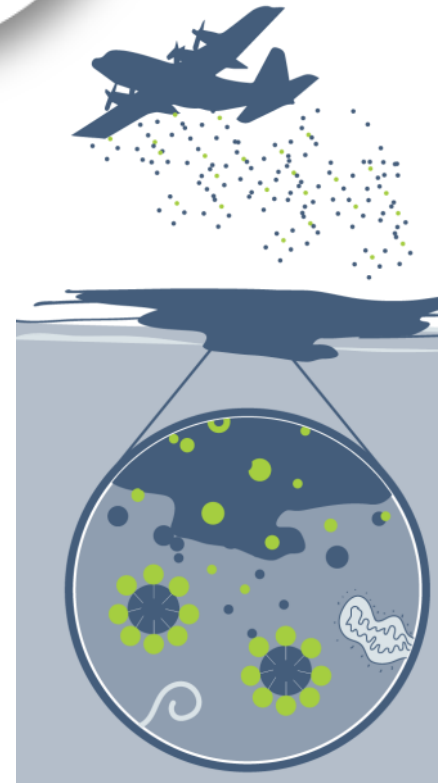
# Three Key Areas Of Technological Progress

- Dispersants
- Surveillance, Modelling and Visualisation





# Dispersants



# Post Macondo Oil Spill Research

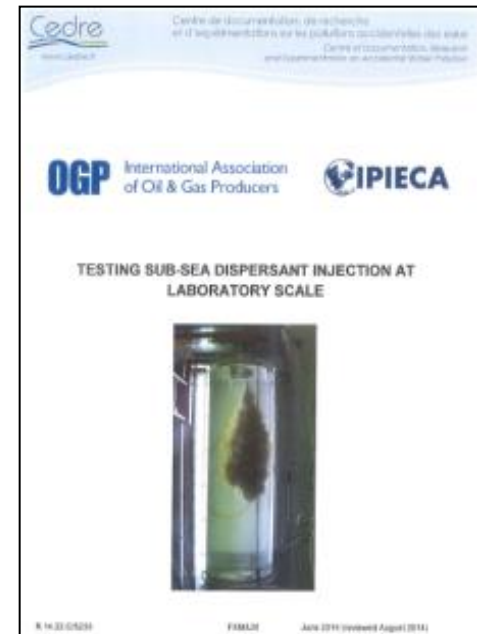
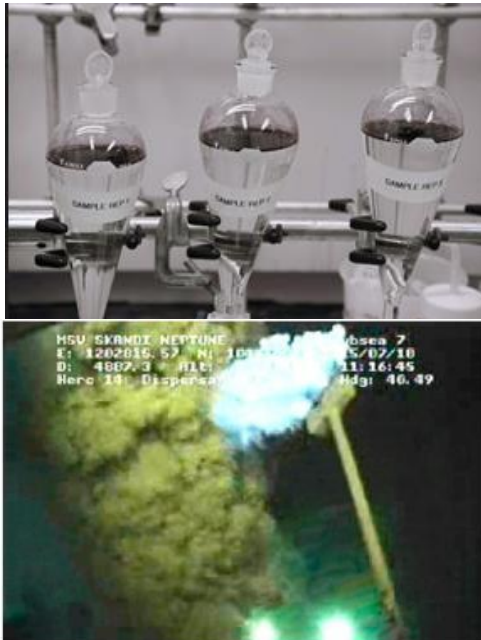


- Four Program Areas
  - Dispersant Advocacy
  - Subsea Dispersant Effectiveness
  - Dispersant Logistics & Preplanning
  - SMART/Post-Spill Monitoring Protocols
- Additional focus on Dispersant Regulatory Approval

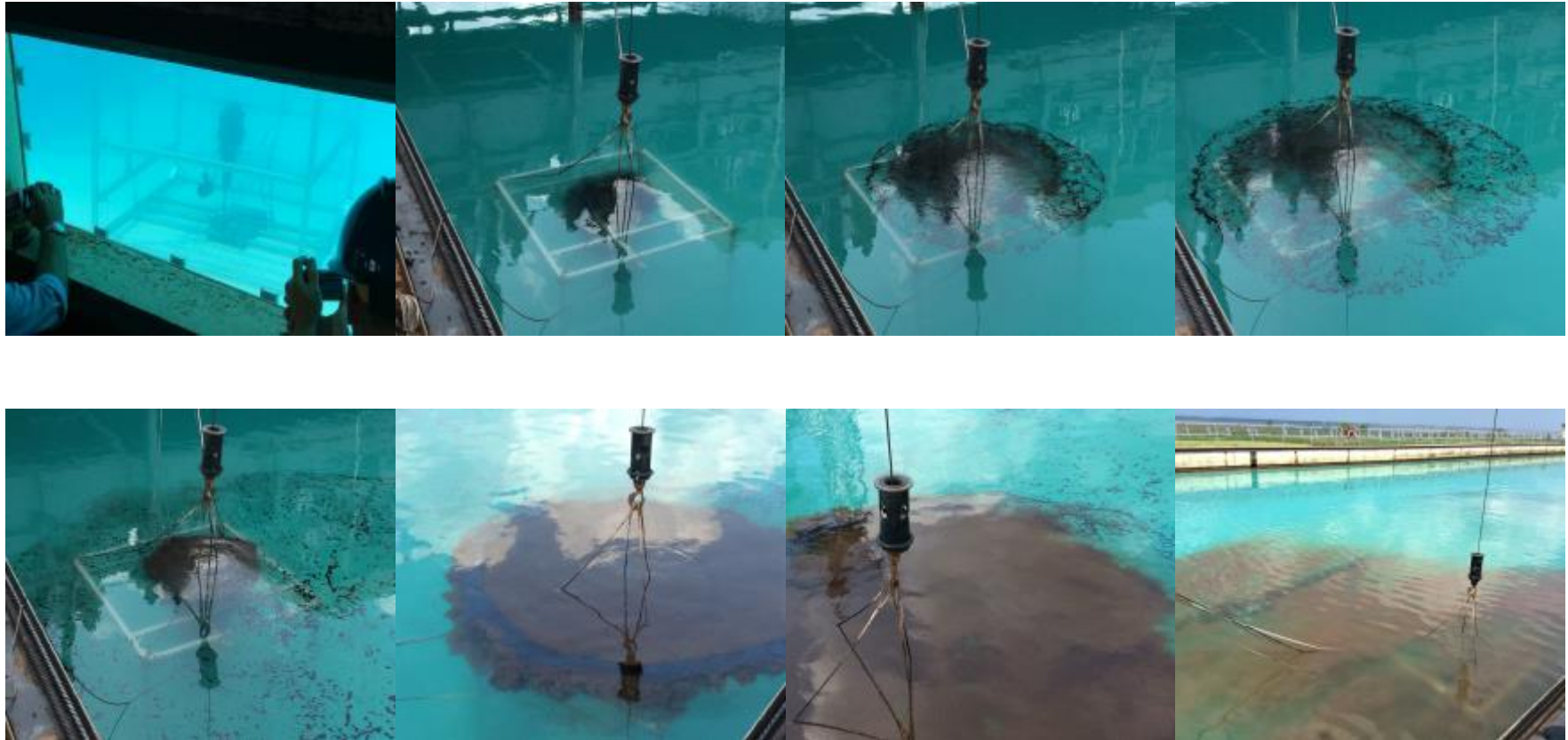
- Four Work Streams
  - Improving Dispersant Communication Tools
  - Assessing Research Efforts and Needs
  - Subsea Injection of dispersants
  - Review of Surface Application Techniques

# Development of Bench Scale Subsea Dispersant Effectiveness Test (IPIECA / IOGP)

- ▶ SINTEF (Norway) & Cedre (France) ran parallel testing programs
  - A goal was to bridge the gap between real world and existing tests



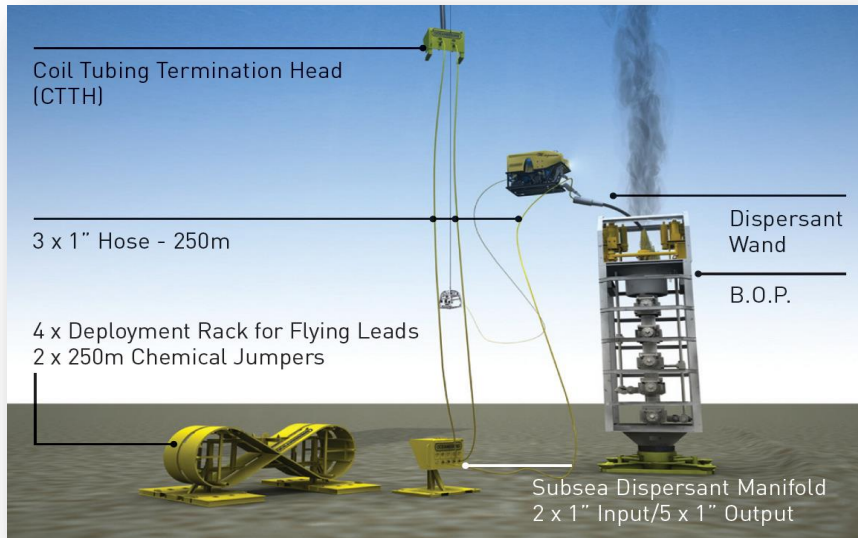
# Demonstration of Subsea Dispersant Effectiveness (API)



OHMSETT Facility, New Jersey, July, 2014

Funded by API Joint Industry Task Force

# Subsea Dispersant Application



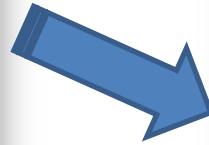
- ▶ Subsea application of dispersant at the wellhead is an integral part of capping operation
  - Creates safer working conditions for response personnel
  - Enhances the degradation of the oil

## ▶ Global Dispersant Stockpile

- Total stock of 5000 m<sup>3</sup> to serve the initial phase of a major offshore incident (~30 days)



# Aerial Application - From Turboprop to Jet



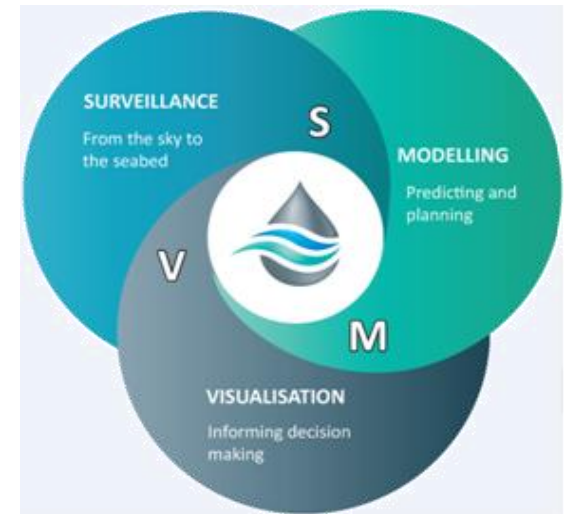
## ► Advantages of Jet platform

- Faster transit times
- Greater range
- More costs effective
- Less demand on personnel resources

## ► Added technology

- Data capture of
  - Time/ date sprayed
  - GPS Location sprayed
  - Quantity sprayed

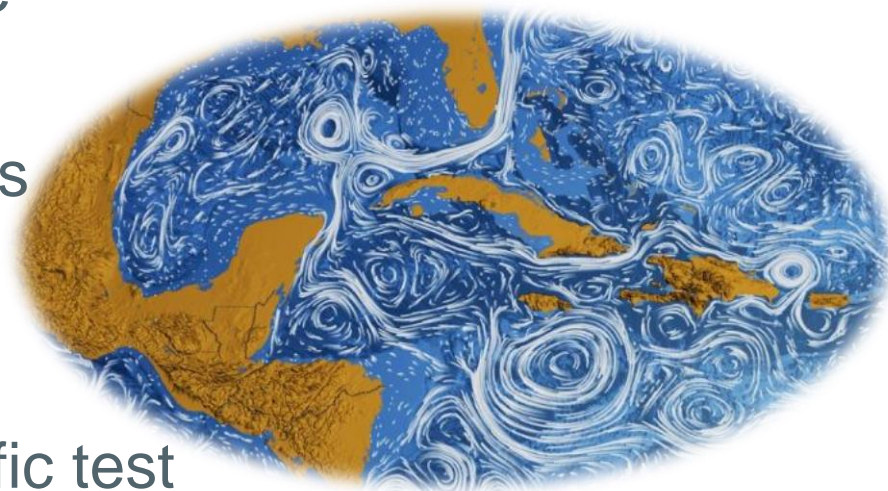
# Advances in Oil Spill Modelling





# Advances in Oil Spill Modelling

- ▶ Massive increase in computational power
  - Faster modeling
  - Greater number of complex calculations
- ▶ More advance modeling software
  - Not just 2D surface anymore
  - More input parameters
  - Inclusion of response options
- ▶ Better source data
  - Met-ocean data
  - Dispersion data from scientific test
  - Tweak with actual field data



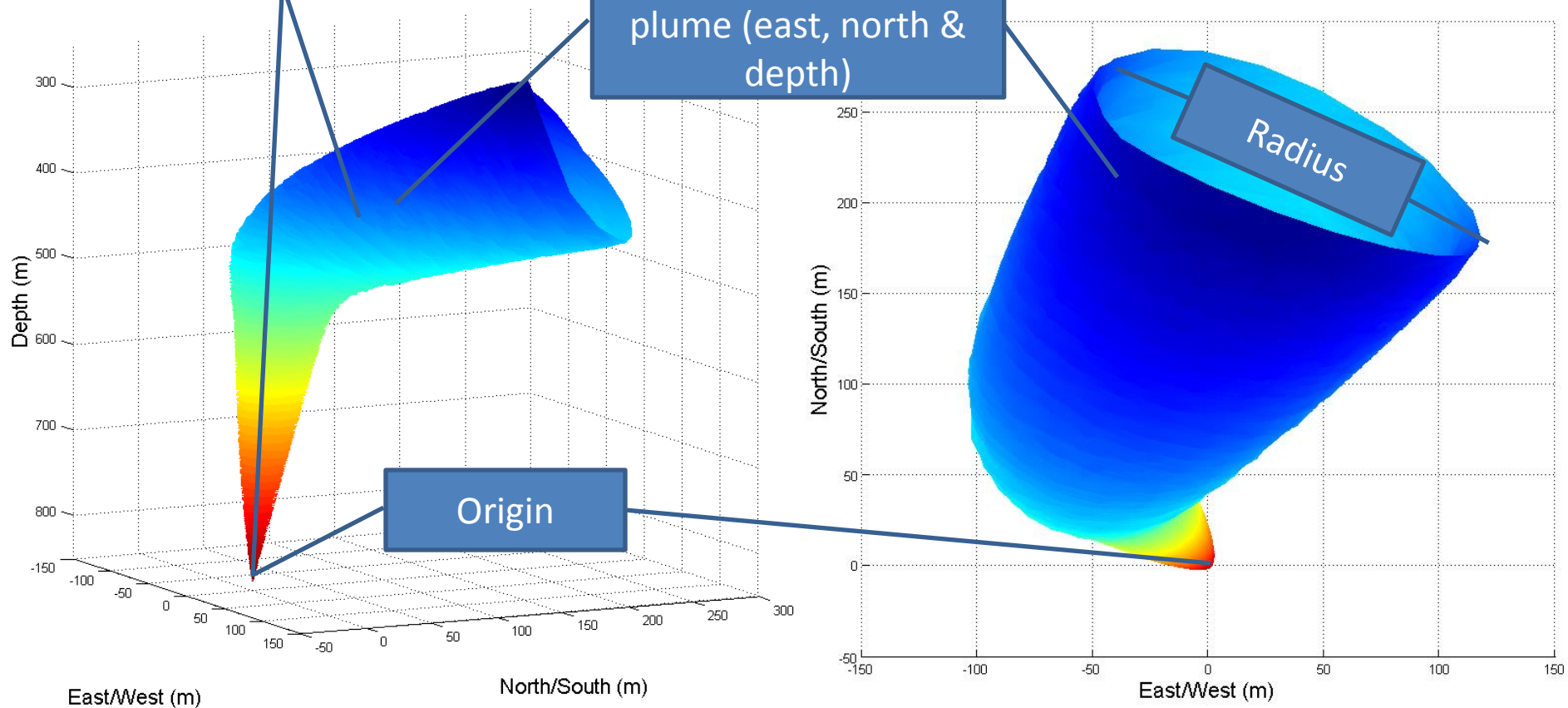
# 3D Operational Plume Modelling

The time taken to travel from origin to any point

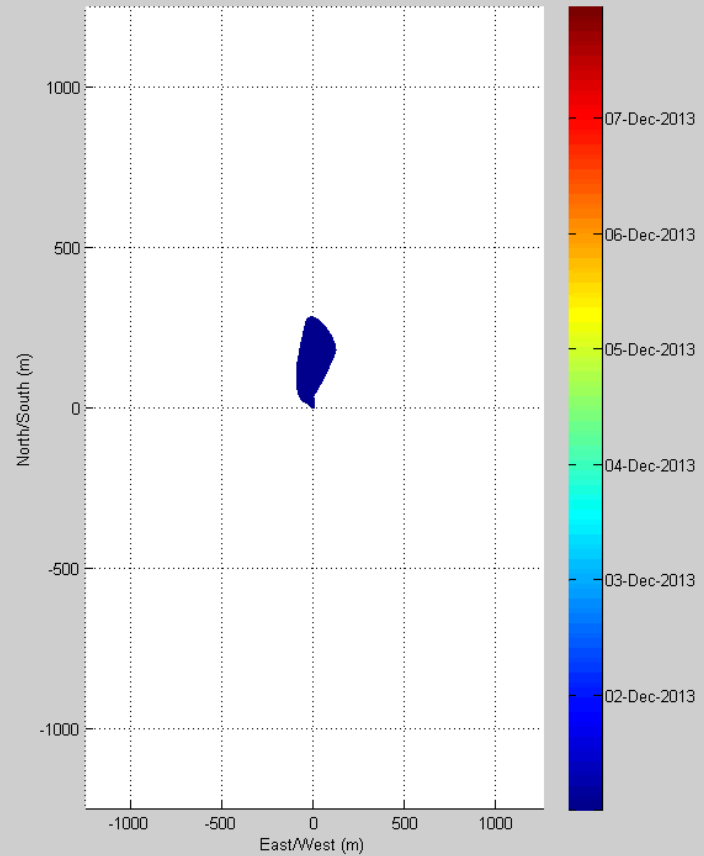
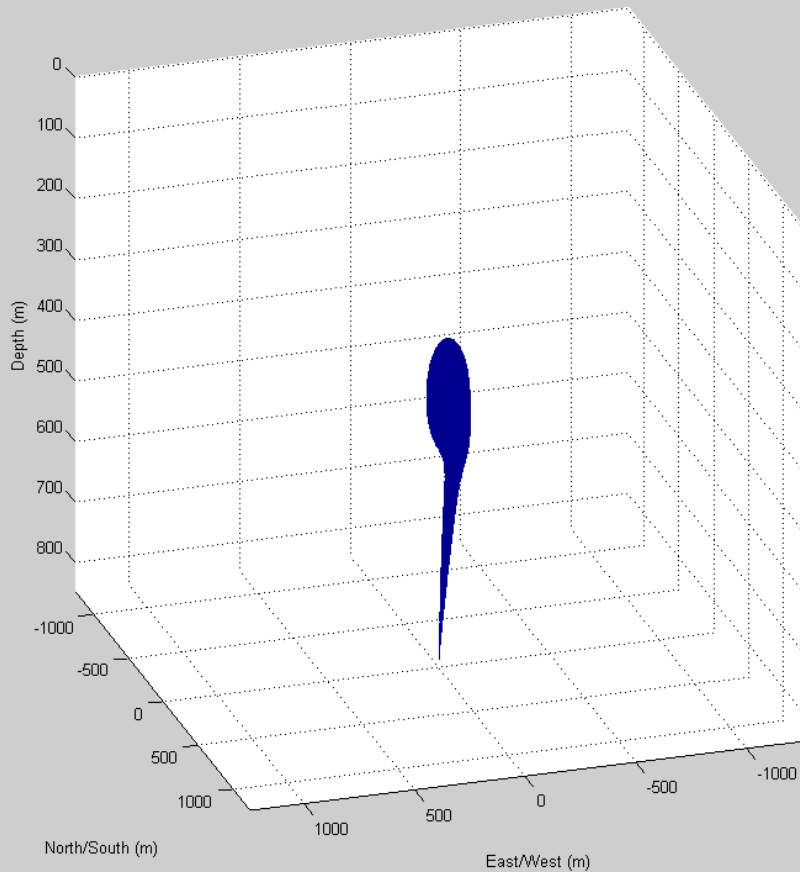
3D Co-ordinates of the plume (east, north & depth)

Origin

Radius



# 3D Operational Plume Modelling



# Example Of Advancements In Modelling

- ▶ Improved understanding of the way dispersants work
  - Able to predict the impact of different dispersant strategies
  - Better Decision support



Surface Oil Thickness

Thick Medium Thin

Sensitivities

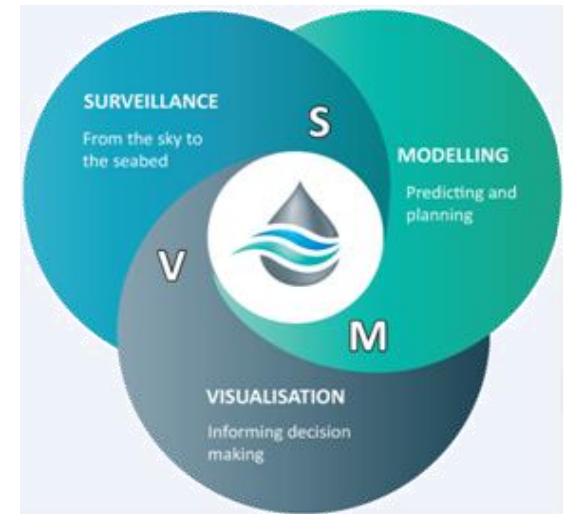
Birds Fish Turtle nesting Whales Marine Protected Area

# There Is No Better Way To Predict How An Oil Spill Will Evolve Than Oil Spill Models – But!

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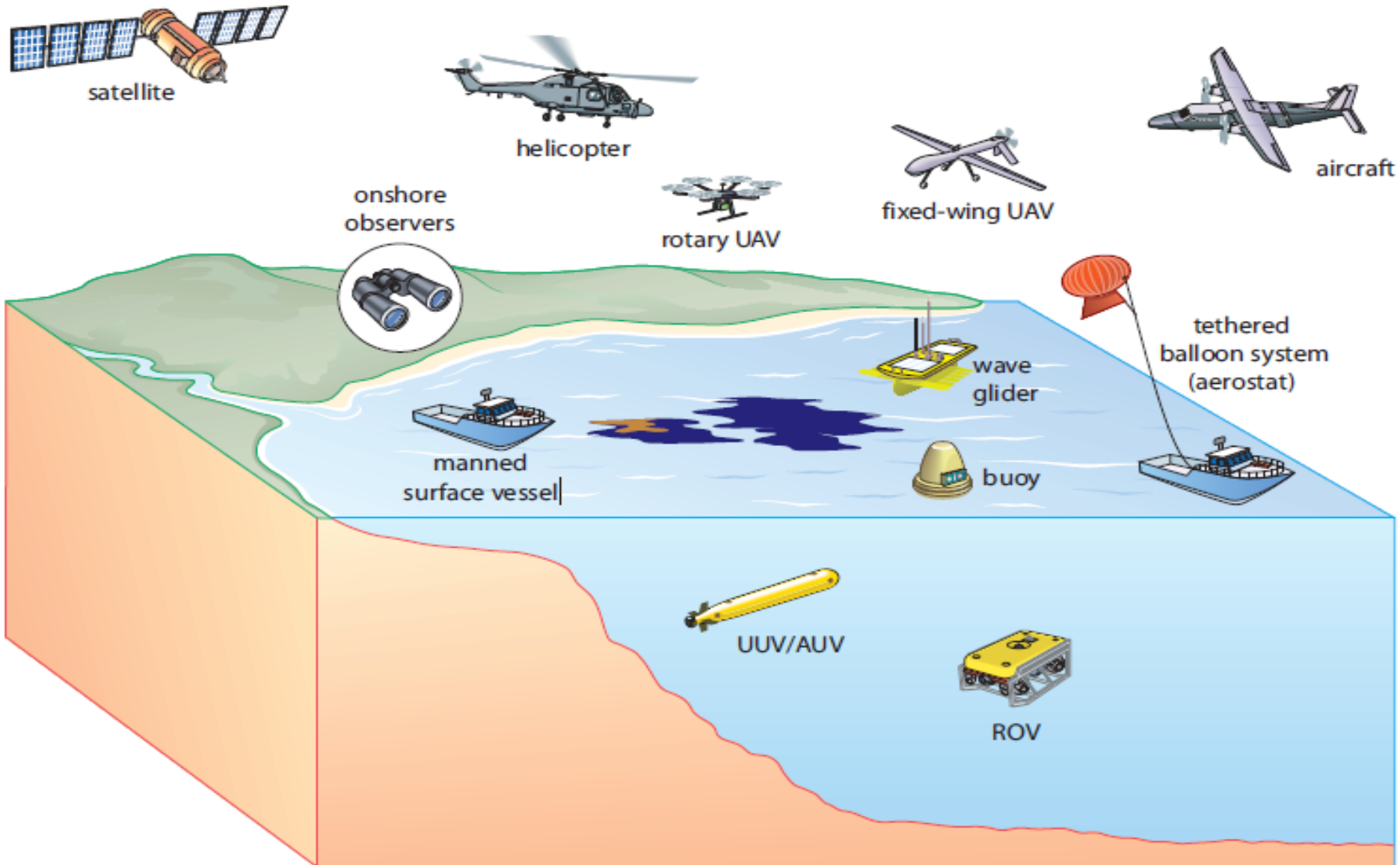
- ▶ Oil spill modelling is NOT a solution. It is a tool for providing information to support decisions
  - The biggest errors in oil spill modelling are caused by bad input data
    - Ocean current forecasts are very challenging due to being so complex
    - If the ocean current forecast is wrong, then an oil spill forecast will also be wrong
  - For sophisticated modelling you need specialist modellers

# Advances in oil spill surveillance



# Overview of surveillance tools

## Surface and Subsurface



# Surface Surveillance Aerial - OSRL UKCS Aircraft



The interface displays a map of Halifax, NS, with several target markers. A yellow circle with a magnifying glass icon is positioned over a target, and a blue line connects it to a green crosshair symbol. Other markers include a red square labeled '001' and a yellow square labeled '002'. A scale bar indicates 2000 yards.

**Video**

**EOW**

BF.843

**Track Inspector**

● 001 1/1 16:50:58 - EOW

ID 001  
 Position 44 37.889N 063 33.309W  
 Elevation 0 ft  
 Course 000  
 Speed 000  
 AC Position 44 38.952N 063 33.690W  
 AC Altitude 3281 ft  
 Time 03/29 16:50:58Z

Description  
 Category  
 Status  
 Range 2692 yds  
 Bearing 216.8° T

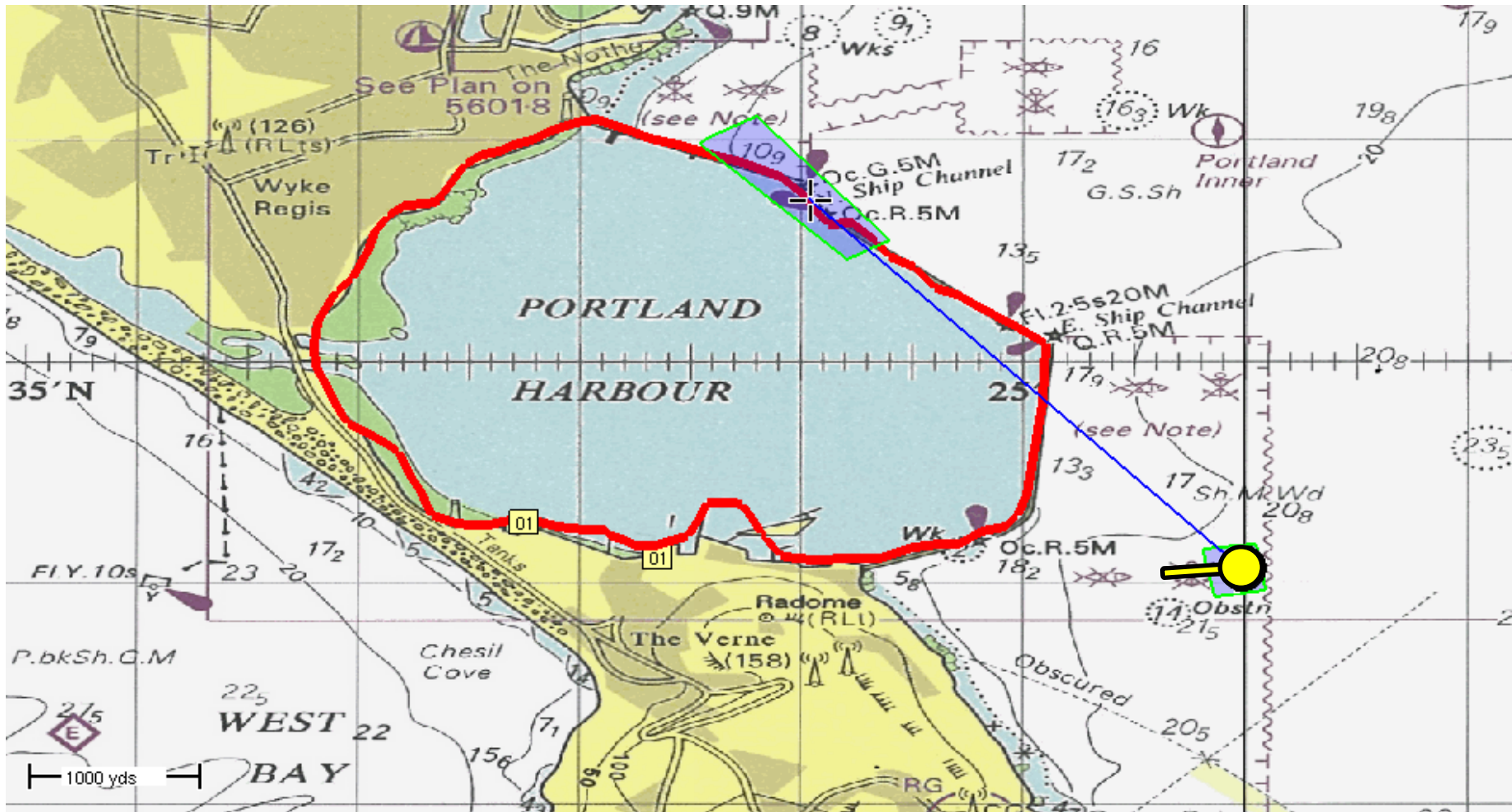
**EO RefMark Target Deck Messages**

ID	Position	MGA	Elevation	Range	Bearing	Symbol	Course	Speed
● 001	44 37.889N 063 33.30...	20 455966E 14942165N	0 ft	2692 yds	216.8° T		000	000
● 002	44 38.420N 063 34.50...	20 454386E 14943159N	0 ft	3521 yds	252.0° T		000	000

70% W [Map Controls] DM yds/nm Status Select Cat EO RefMark



# Surface Surveillance Aerial - Perimeter Mapping

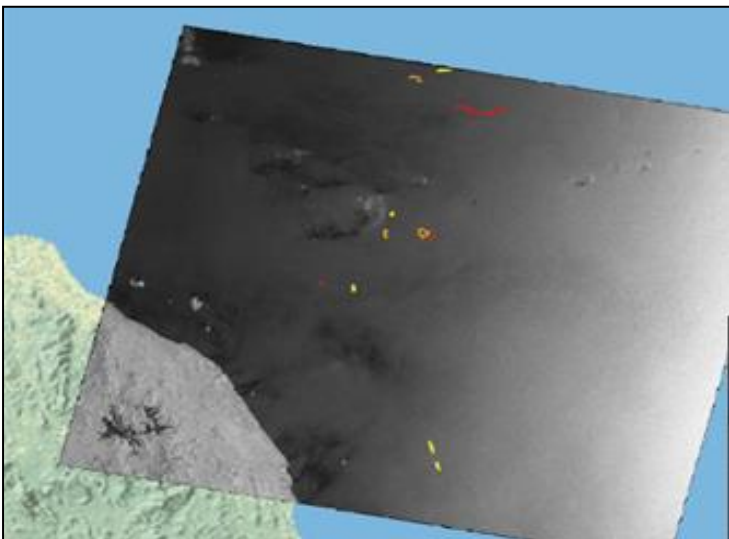


# Surface Surveillance

## OSRL Radar Satellite Imagery Service



- ✓ Wide coverage
- ✓ Weather independent
- ✓ Proven technology
- ✓ Keeps response teams out of harms way
- ✓ Compliment aerial surveillance
- ✓ GIS ready products



- ! Does not discriminate between thin or thick oil
- ! Very low or high wind speed issues
- ! Interpretation requires a skilled analyst
- ! Imagery prone to false positives due to other sea dampening phenomena
- ! Satellites take time to orbit

# Surface Surveillance Unmanned

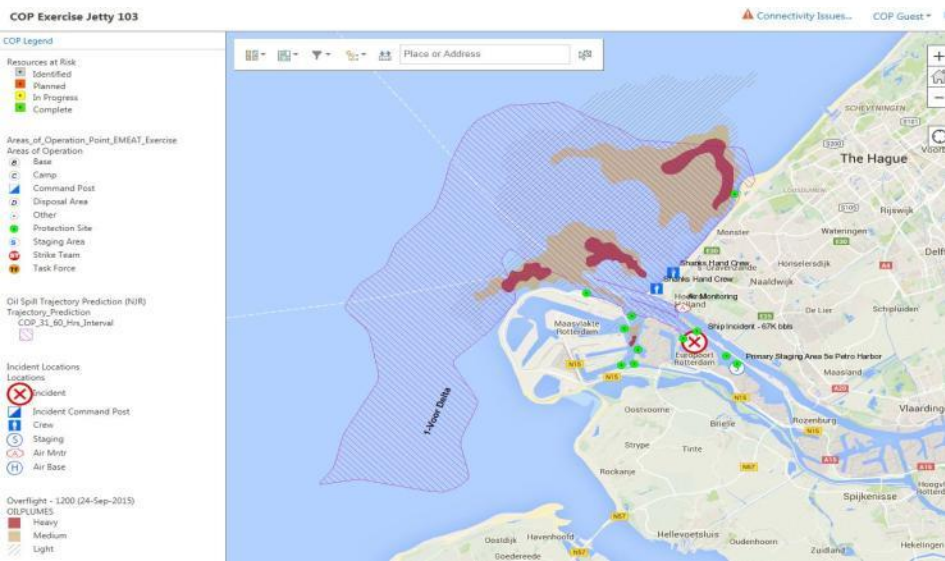
Utilising unmanned platforms i.e. Unmanned Aerial Vehicles (UAVs) and tethered balloons to;

- Improve efficiency of shoreline survey teams (SCAT)
- Improve encounter rates offshore



# Visualising Response Data

- ▶ Accepted and integral component of effective oil spill response (JIP)
  - Provides strategic information
  - Presents lots of data in one place
  - Make complex data more accessible, understandable and usable
  - Allows for communication of data to others
  - Bring out trends, patterns and correlations that might go undetected in text-based data
  - Help make robust decisions on the data



**Input 1 – Oil Spill Modeling trajectory**



Image © 2012 TerraMetrics  
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Google earth

**Input 2 – Satellite Imagery**



Image © 2012 TerraMetrics  
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Google earth

**Response Time:**

<i>hr</i>	0	★	★
	1		3

**Input 3 – Aerial Surveillance Over flight #1**



Image © 2012 TerraMetrics

Google earth

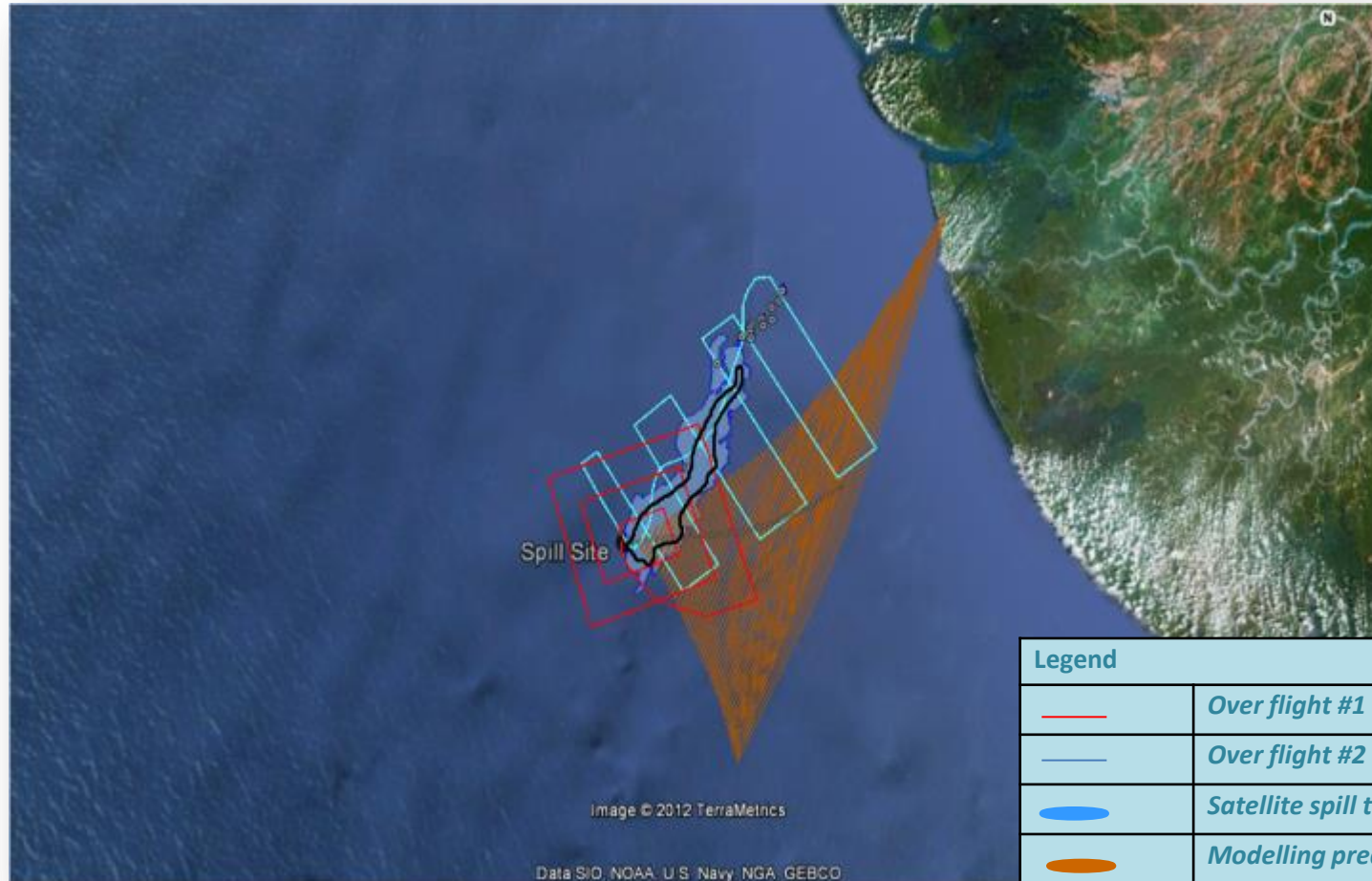
**Input 4 - Perimeter of slick "Traced" by EO/IR Turret**



**Response Time:**

<i>hr</i>	0			★
	1	3	6	

# Visualising Response Data



Legend	
	<i>Over flight #1</i>
	<i>Over flight #2</i>
	<i>Satellite spill tracking</i>
	<i>Modelling prediction</i>
	<i>Perimeter of slick</i>

# Staying in touch

[www.oilspillresponse.com](http://www.oilspillresponse.com)

## Subsea Well Intervention Service

- ▶ [www.swis-oilspillresponse.com](http://www.swis-oilspillresponse.com)  
[subseaservices@oilspillresponse.com](mailto:subseaservices@oilspillresponse.com)

## Training courses

- ▶ [www.oilspillresponsetraining.com](http://www.oilspillresponsetraining.com)  
[training\\_uk@oilspillresponse.com](mailto:training_uk@oilspillresponse.com)  
[training\\_sg@oilspillresponse.com](mailto:training_sg@oilspillresponse.com)

## Spill preparedness (Technical handbooks and other reference materials)

- ▶ [osrl.cotoco.com](http://osrl.cotoco.com)  
[preparedness@oilspillresponse.com](mailto:preparedness@oilspillresponse.com)

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