

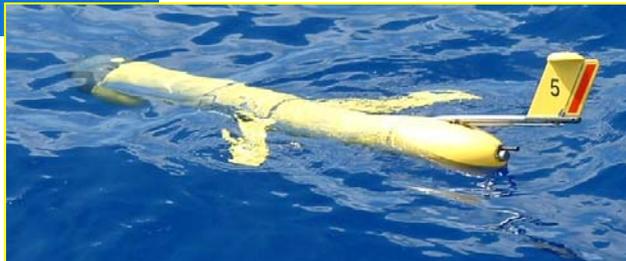
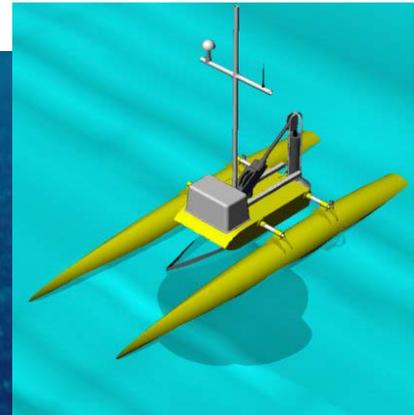
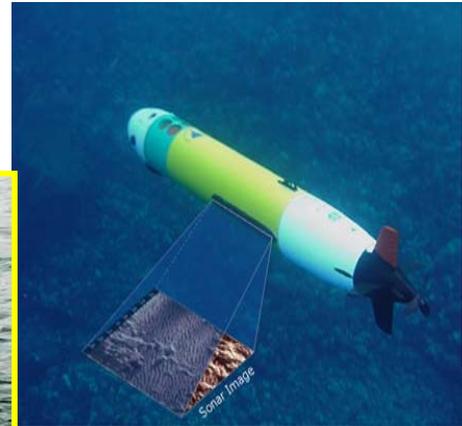
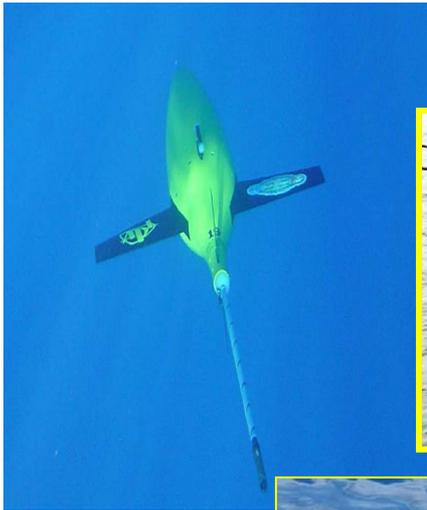
Naval Oceanography

Experimenting into the future...

Mr Ed Gough

Deputy Commander

Naval Meteorology and Oceanography Command

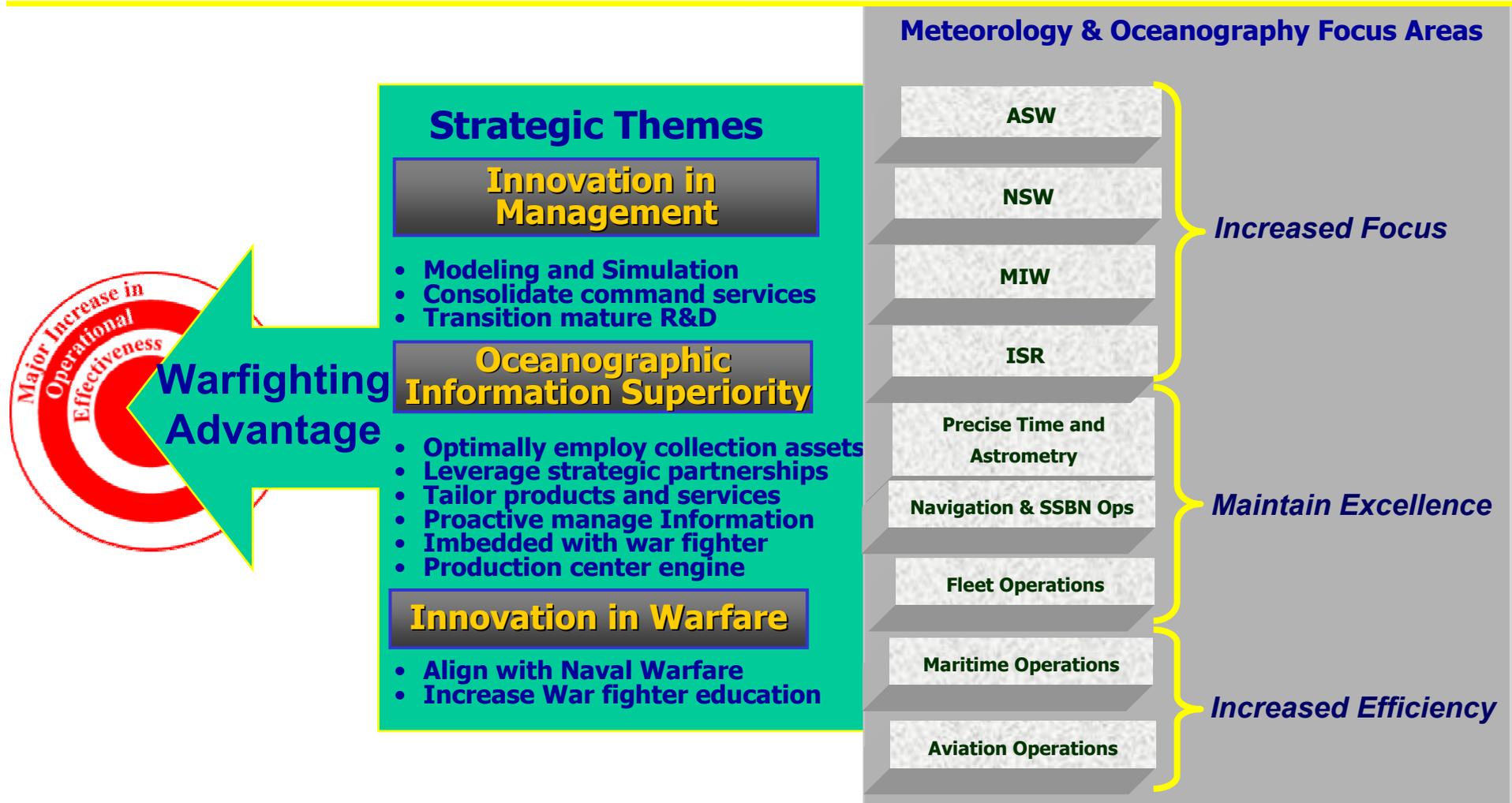


After

Before



Meteorology & Oceanography Strategic Plan



Mission: To provide an asymmetric war fighting advantage through the application of Oceanographic sciences.

Oceanography

Levels of Engagement

Strategic

- White Hull Surveys
- Environmental Database Population
- OPLAN Timelines
- Campaign Analyses
- War game Support
- S&T Partnerships with ONR for future technologies

Operational

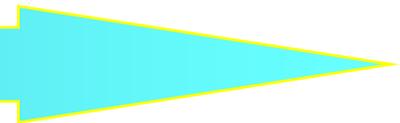
- Oceanographic Modeling
- Experimentation for driving CONOPS and TTPs
- Readiness Evaluation Measurement (SHAREM/MIREM)

Tactical

- EIPB for sensor effectiveness and efficiency
- All aspects of planning and execution
- On-scene tactical METOC support
- Go-No Go criteria
- TTS collection and value added product generation



Combat Effectiveness



REACHBACK...Continually revise prosecution plan based on in-situ collected information

AUVFest05 Environmental Support

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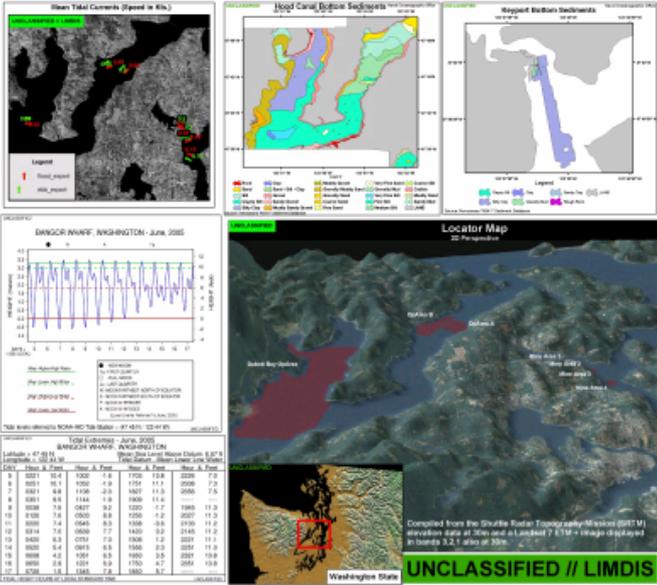
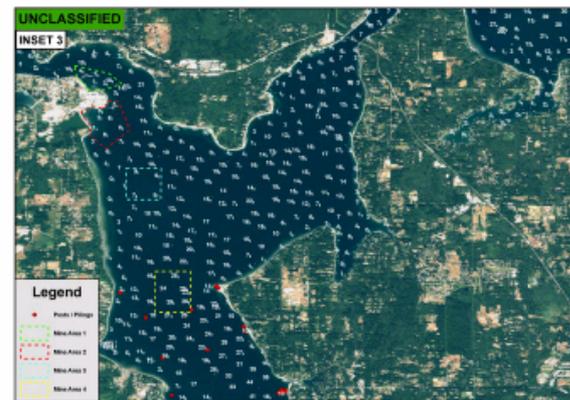
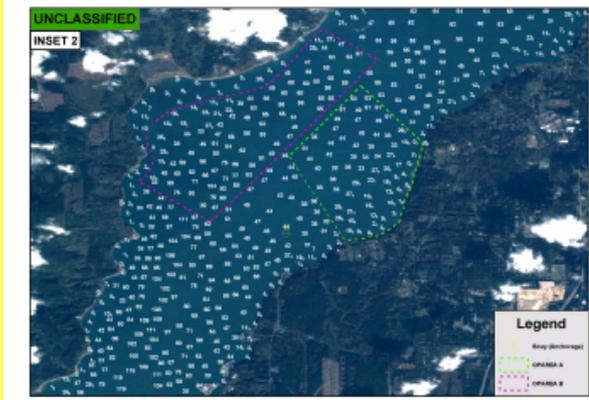
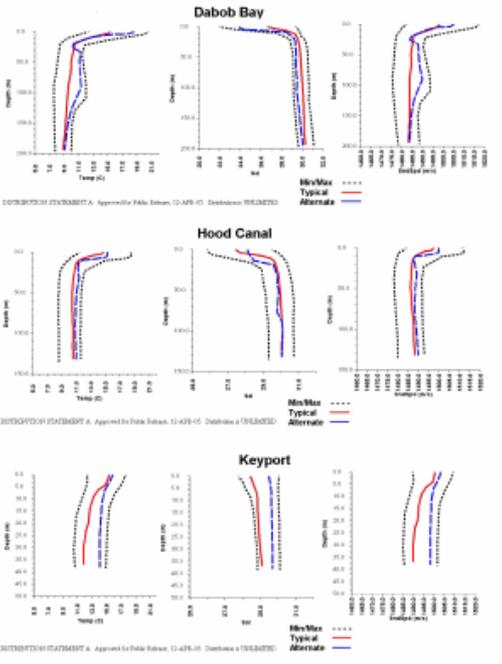
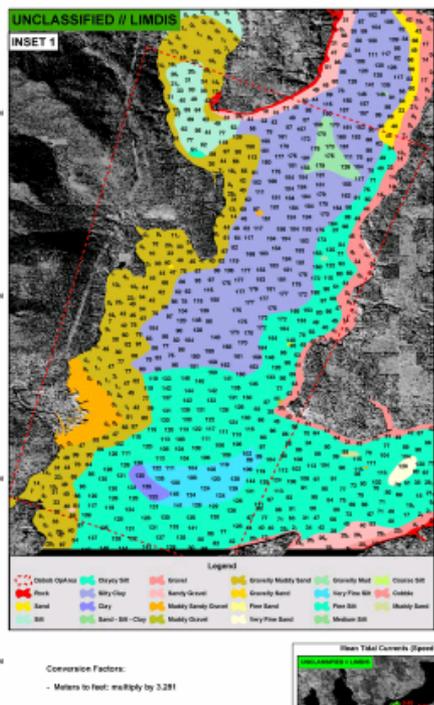
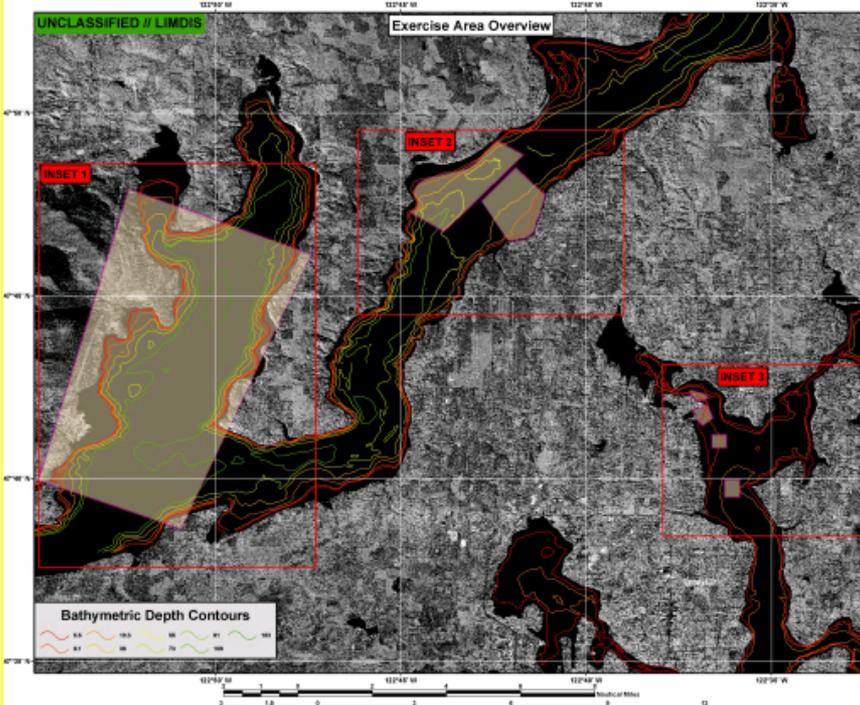
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Autonomous Underwater Vehicle Fest 2005 Bangor Canal and Keyport OpArea's (U) Product ID # 250992

SOUNDINGS IN METERS
 Reduced to the level of Mean Lower Low Water (MLLW)

WARNING: Not to be used for Navigation or Targeting



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 Naval Oceanographic Office
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 DSN 828 5176 Convo 220 688 5176
 NGA Support by:
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Image References:
 Landlot 7 235E908
 Overview: Landlot 7 235E908
 Currents: SM CB (Radar)
 Inset 1: SM CB (Radar)
 Inset 2: Quickbird MSI 23C0705 (Bands 3,2,1 see R03E)
 Inset 3: Quickbird MSI 23LUL02 (Bands 3,2,1 see R03E)

- Overview and inset images are orthorectified but should not be used for targeting or navigation.
 - Soundings are in meters and reduced to the level of Mean Lower Low Water (MLLW).
 - White grid and ticks are representative of Geographic Lat/Long and are referenced to WGS-84.
 - Bathymetric depth contours, sounding points, bouys, and pilings derived from NOAA's Digital Nautical Chart # 26, Copvices / Atlas Areas provided by NAVIC support division, special projects (Code 2201).
 - Bottom sediments provided by NAVOCEANO (M832).
 - Water temperature, salinity, and sound speed provided by NAVOCEANO (P32).

Compiled from the Shuttle Radar Topography/Mission (SRTM) elevation data at 30m and a 1:250,000 7.5M x 7.5M displayed in bands 3,2,1, color of 30m.

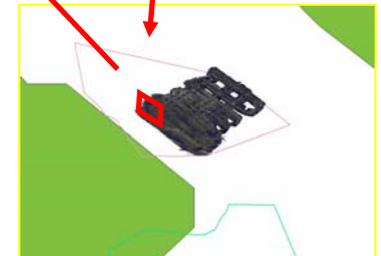
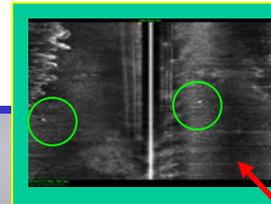
Washington State

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Hydrographic Unmanned Surface Craft

6 months from concept to reality...

- **MISSION:** Autonomous Tactical Hydrographic and Littoral Warfare Environmental Data Gathering in Shallow, Very Shallow Water and Surf Zone Environments in support of:
 - **Surface Navigation**
 - **Sub-Surface Navigation (UUV/ROV)**



Hydrographic Unmanned Surface Crafty

• Hydrographic Sensor Package

- Marine Sonics 300 kHz Side Scan Sonar w/ display
- 235 kHz Sonar Mite Single Beam ES & 215 kHz Single Beam ES
 - Provide sounding depths for hydrographic bathometric charting

• Oceanographic Sensor Package

- RD Instruments 600 kHz Rio Grande ADCP (Acoustic Doppler Current Profiler)
- RBR CTD (Conductivity, Temp, and Depth)
- WetLABs Transmissometer

• Environmental Translation

- Seabed profile and clutter
 - Slope
 - Sand waves
 - Ridges
 - Rock patches
 - “Mine like” objects
- Provide sounding depths for hydrographic bathometric charting
- Gather current data
- Track water mass and reflective properties
 - Sound Speed Profile – set optimal active sonar range for detection
- Water Density -
 - essential for UUV/ROV ballasting or trimming
- Temperature –
 - SSP, diver gear load-out etc.
- Visibility –
 - diver vis or bump detection

UUV In-Stride Battlespace Preparation

UUV Platforms

HUSCy



Sea Lion

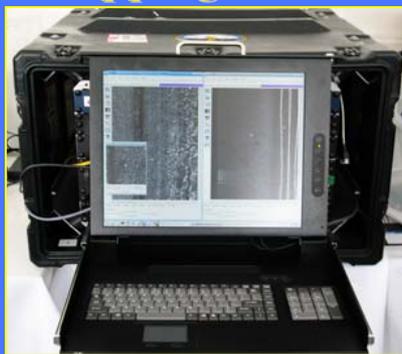


REMUS



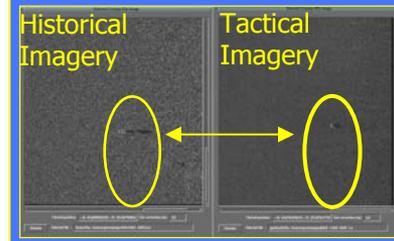
NAVOCEANO Bottom Mapping Workstation

- Multi-sensor processor
- Bottom Mosaics
- Automated Algorithms
 - Clutter Density
 - Bottom Roughness
 - Mine-Like Contacts



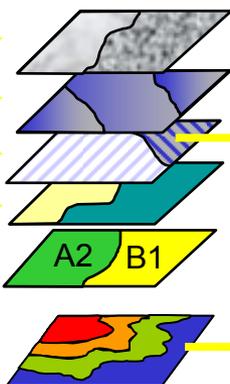
Change Detection

MCM Change Detection is the process of correlating new mine-like contacts found during mine-hunting operations with historical contacts found during peace-time route surveys.

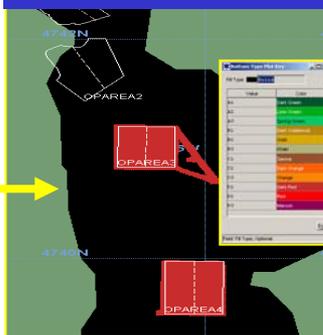


Environmental Products

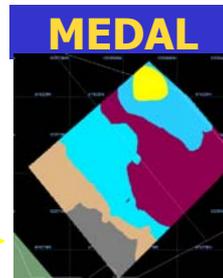
- Sediments
- Burial
- Roughness
- Clutter Density
- MIW Doctrinal Bottom Type
- Bathymetry



MEDAL

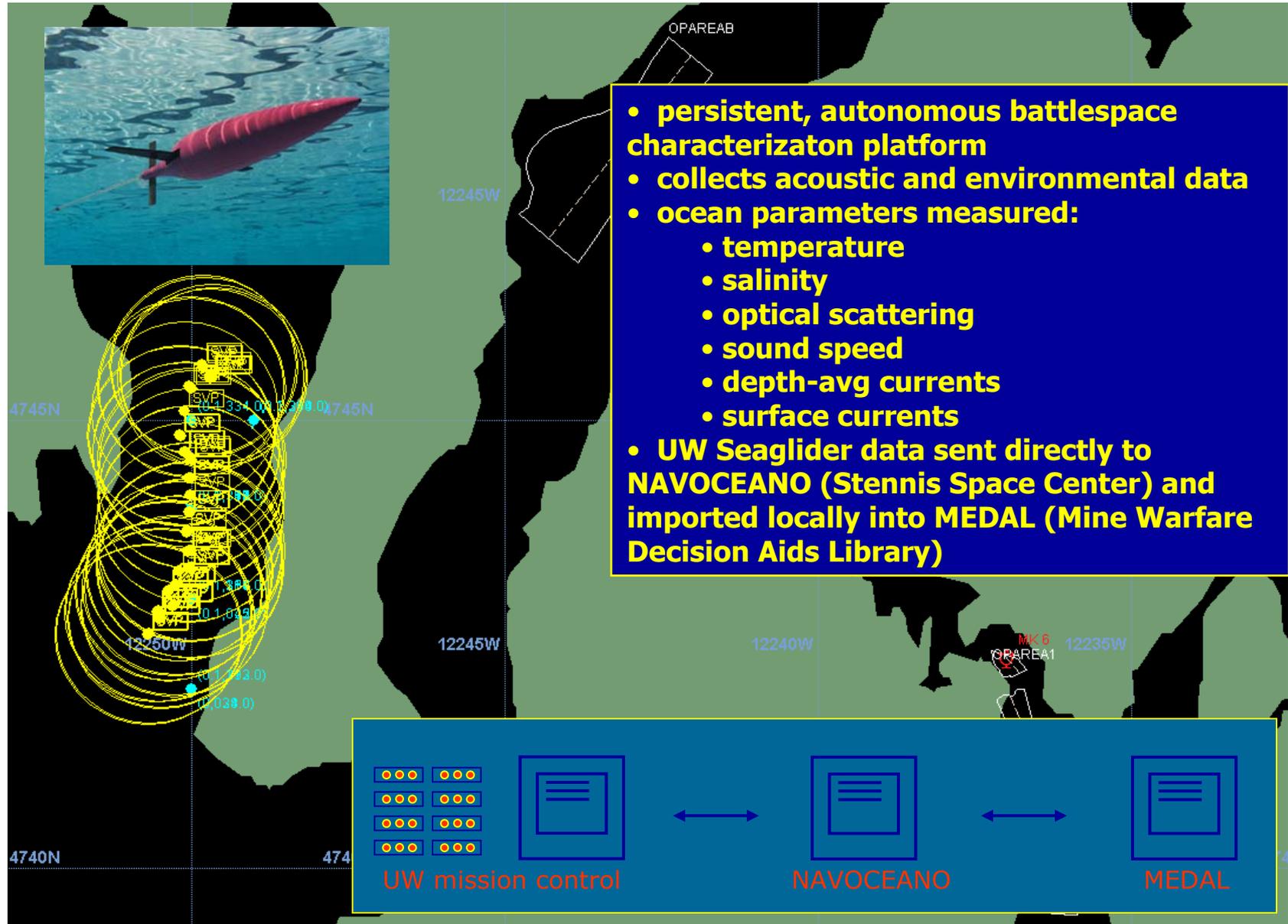


MEDAL



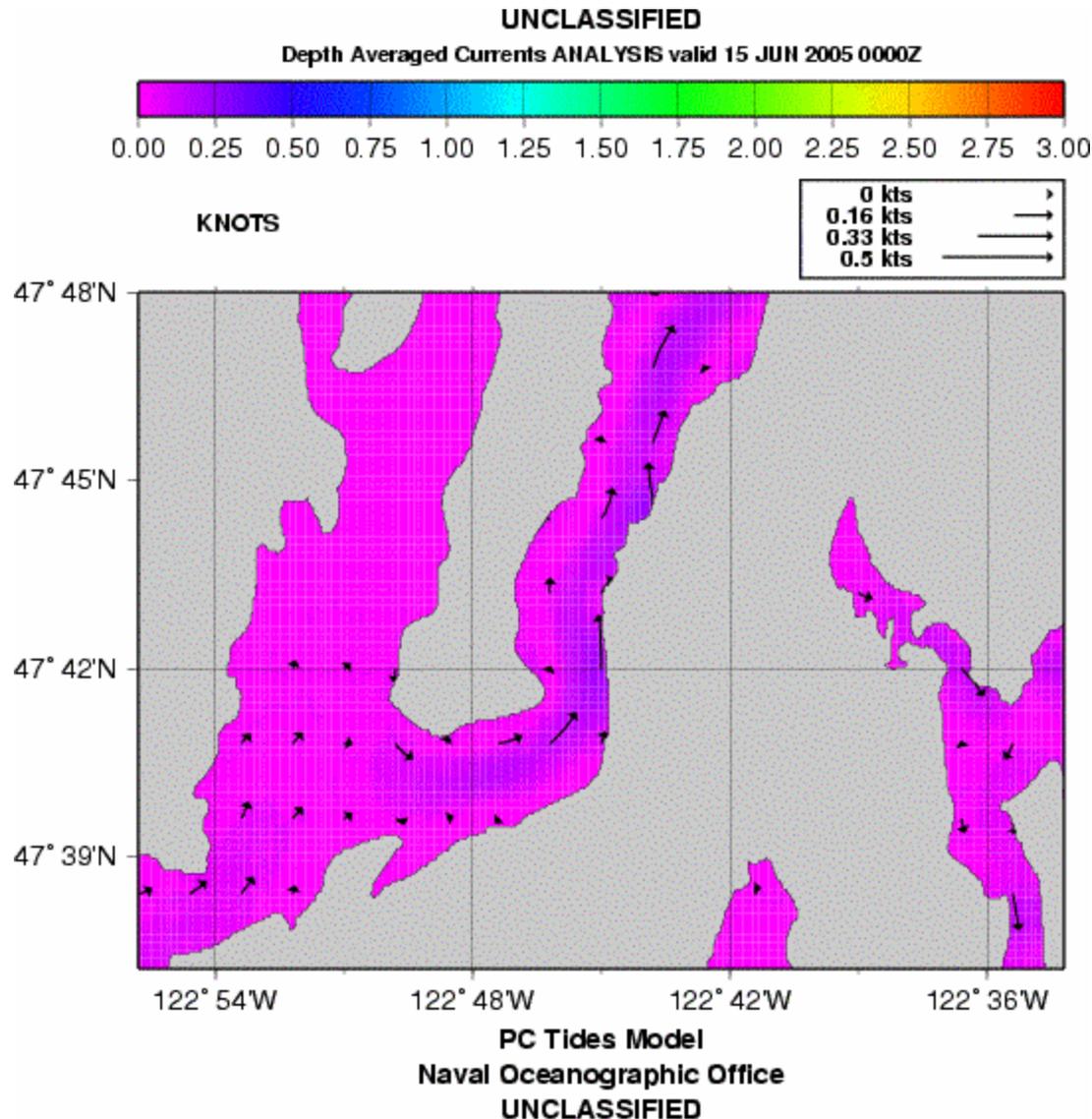
- Impact:**
- Reduction from change detection / battlespace characterization.
 - More *Accurate* Assessment of Risk to Follow-on Forces
 - *Speeds* the Detect to Engage Sequence

Persistent Sampling Using Gliders in Dabob Bay



Operational Ocean Forecasting

- A robust and relocatable forecast system, PCTides, was used for the prediction of tidal currents.
- PCTides tactical forecasts, forced by winds provided by FNMOC, were provided for conditions out to 48 hours.
- Products were used by vehicle operators and dive teams to minimize the impact of strong currents on operations.
- Data collected using bottom-mounted ADCPs and vehicle sensors were used to validate predictions.



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Partnership with S&T

How are UUV's utilized in Naval Oceanography?

We exploit the tactical and non-tactical sensors to characterize the battlespace, utilize or derive the environmental knowledge to create a tactical advantage, and make the warfighter's mission more effective and more efficient.

**Fleet
Assets**



DATA

Applied Oceanographic Knowledge
"Navy Corporate Expertise"

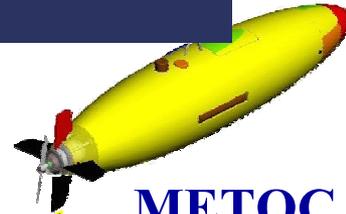
Strategic EIPB

Operational EIPB

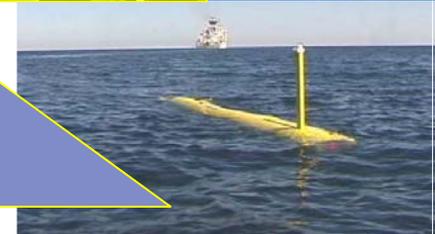
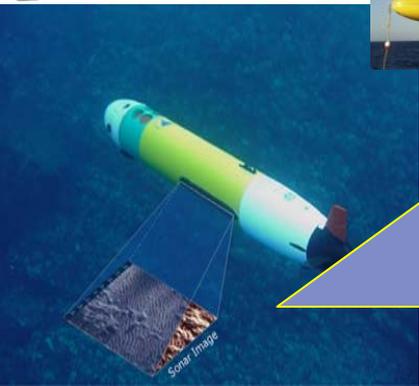
Tactical EIPB

**Warfighting
Advantage**

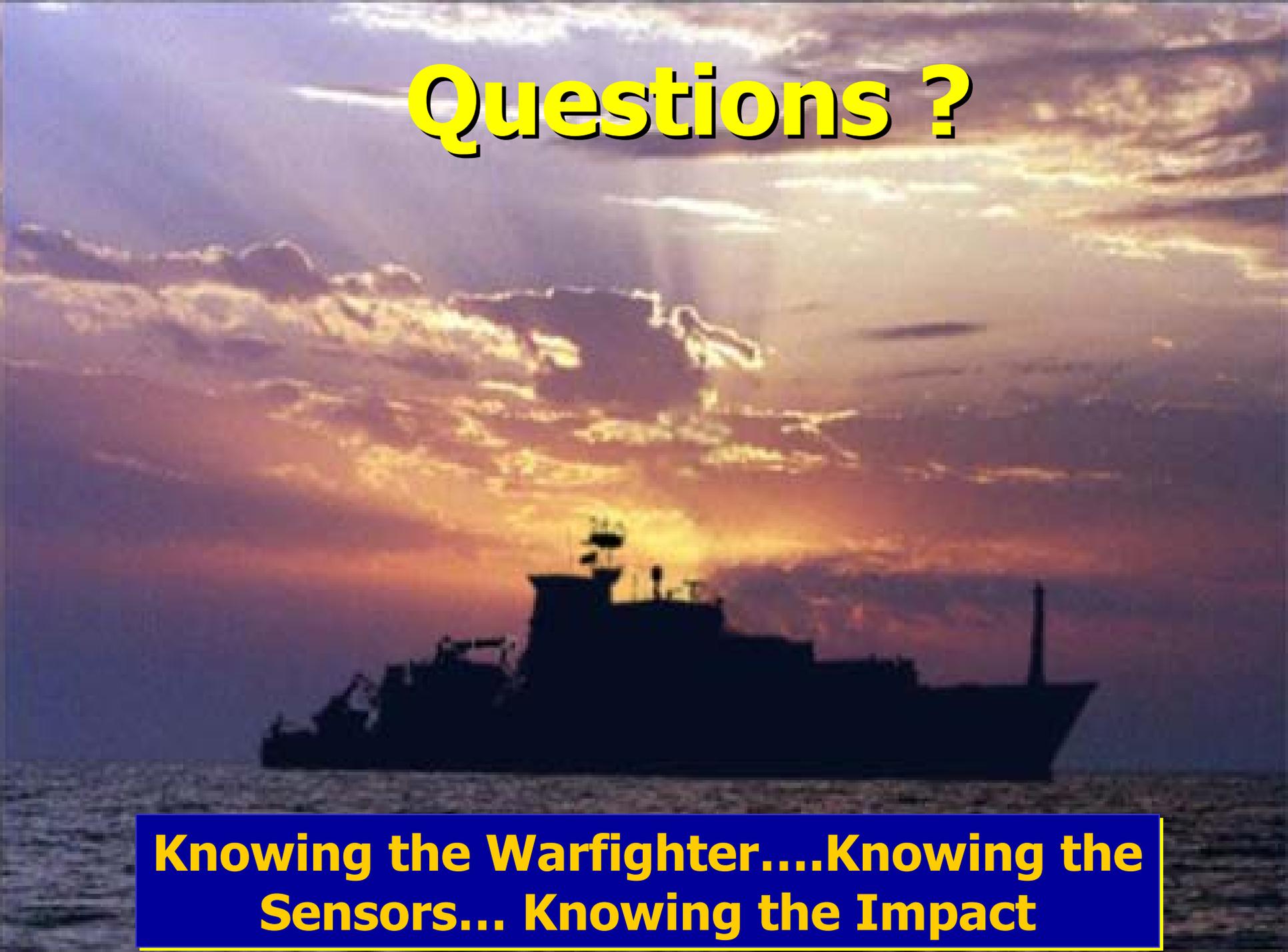
**METOC
Assets**



DATA



Questions ?

A silhouette of a warship is shown on the sea at sunset. The sky is filled with dramatic, colorful clouds in shades of orange, red, and purple, with the sun low on the horizon behind the ship. The ship's silhouette is dark against the bright, glowing sky.

Knowing the Warfighter....Knowing the Sensors... Knowing the Impact