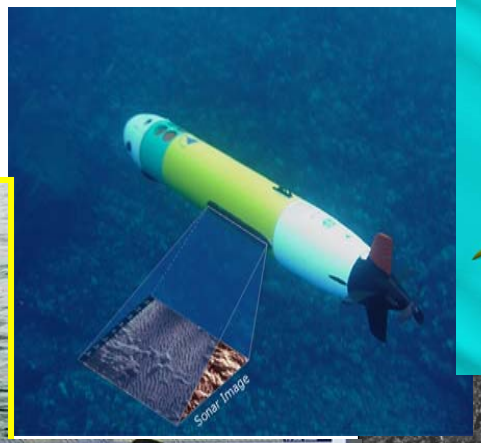
# Naval Oceanography

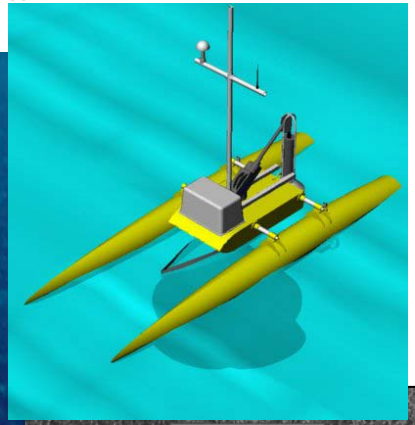
## *Experimenting into the future…*

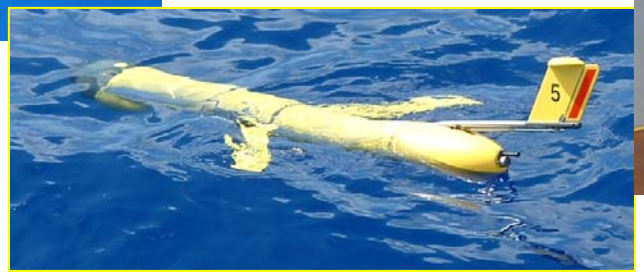

***Mr Ed Gough***

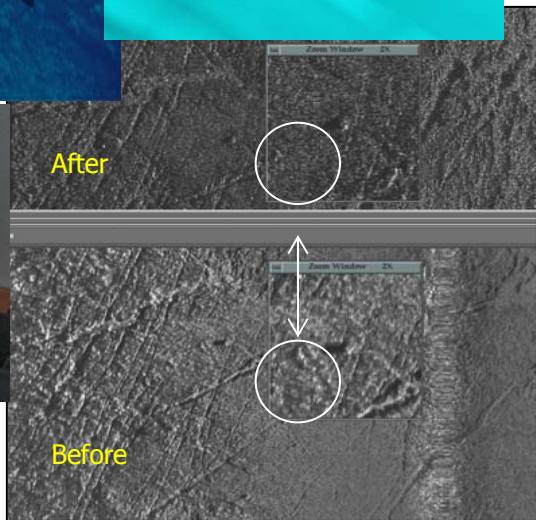
***Deputy Commander***

***Naval Meteorology and Oceanography Command***

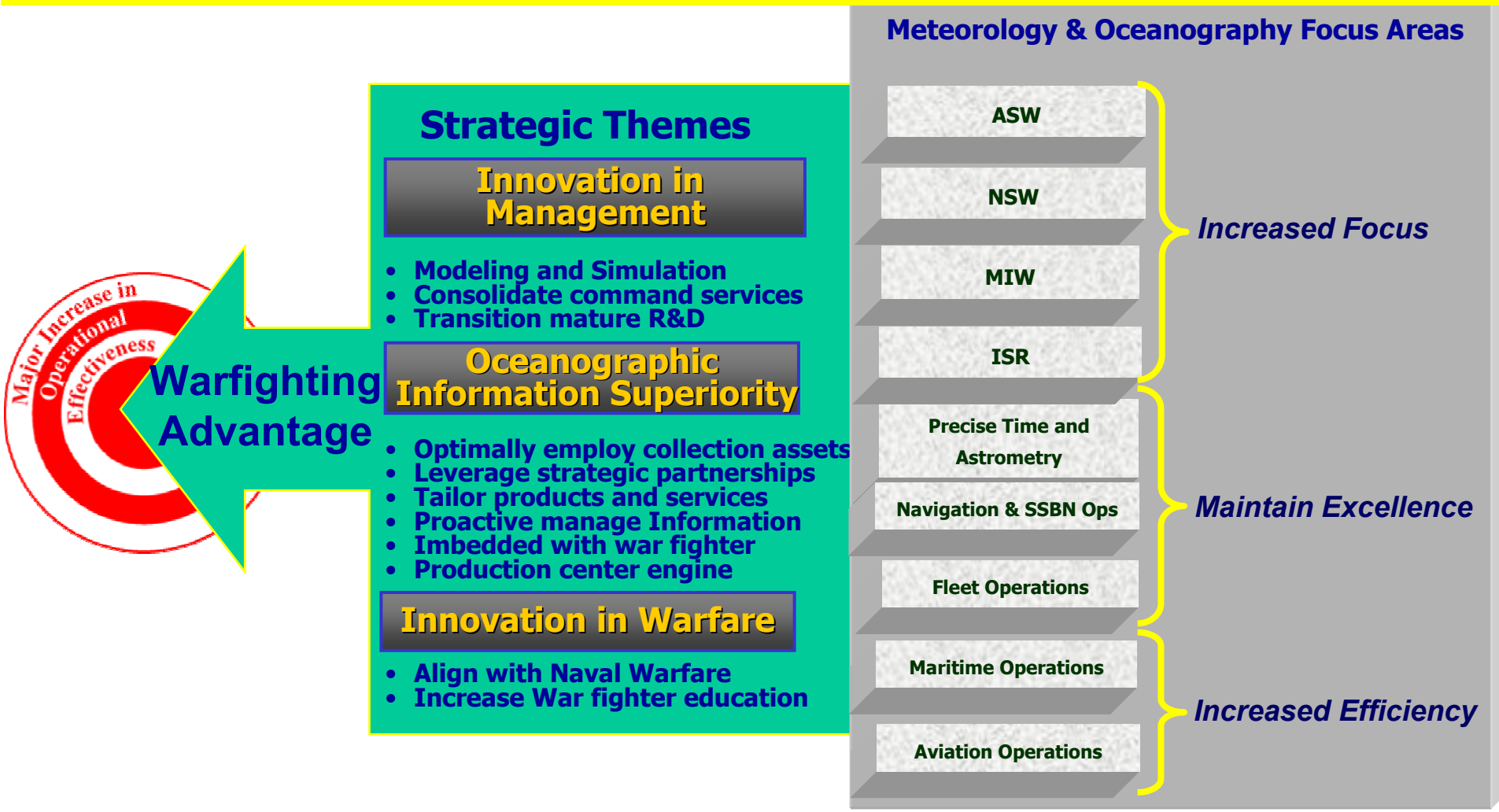







# Meteorology & Oceanography Strategic Plan




*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

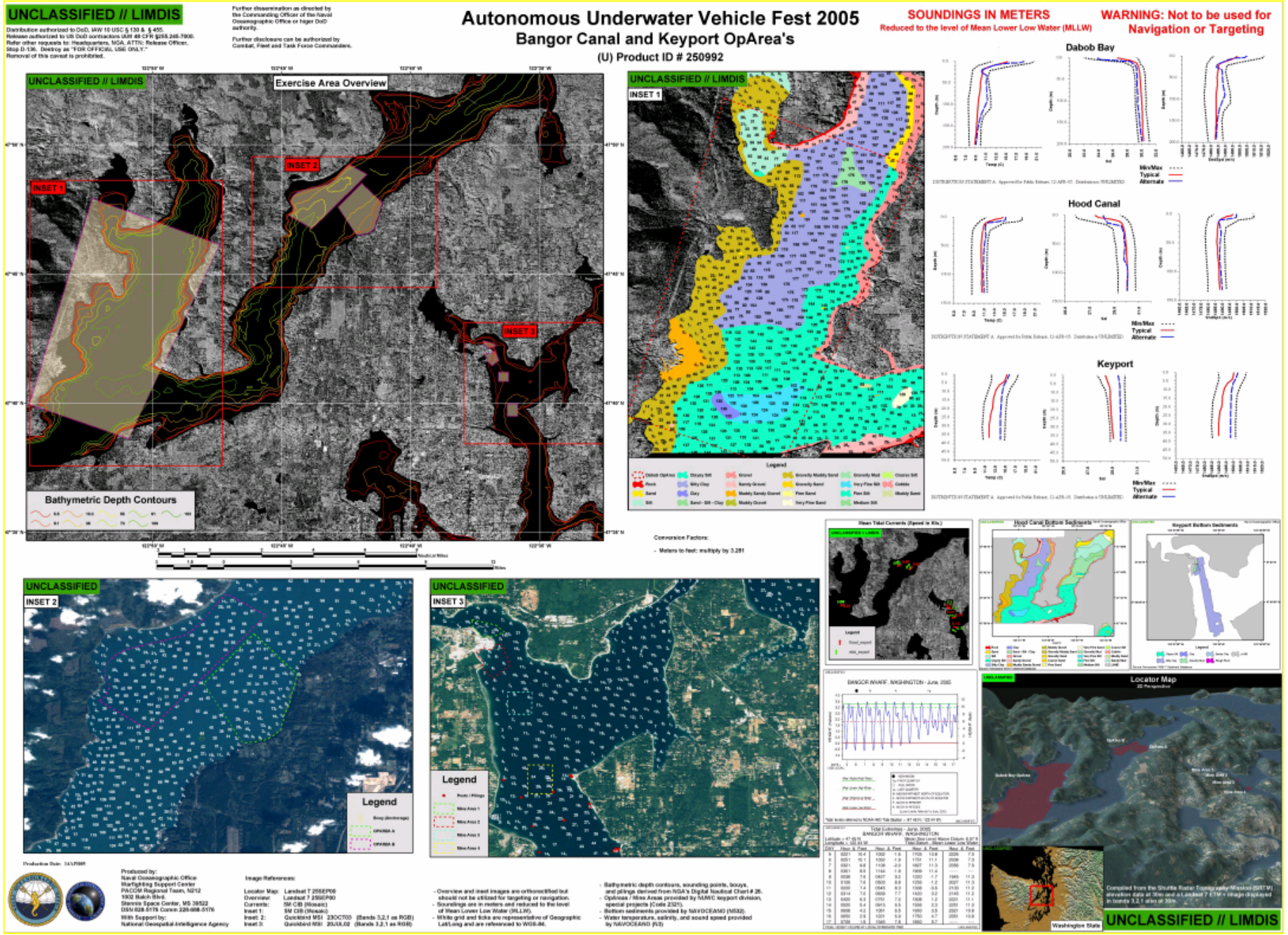
- Oceanographic Modeling
- Experimentation for driving CONOPS and TTPs
- Readiness Evaluation Measurement (SHAREM/MIREM)

## 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


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

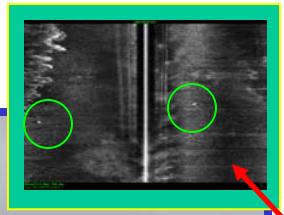
# AUVFest05 Environmental Support

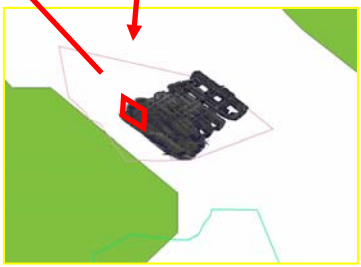


# HydrographicUnmannedSurfaceCrafty

## 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)**





# HydrographicUnmannedSurfaceCrafty

- **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

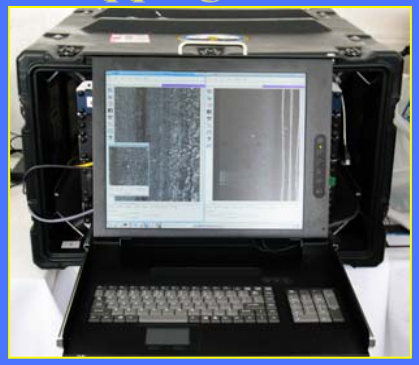
**HUSCy**

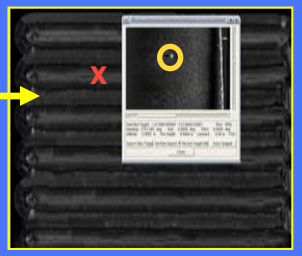
**Sea Lion**

**REMUS**

## NAVOCEANO Bottom Mapping Workstation

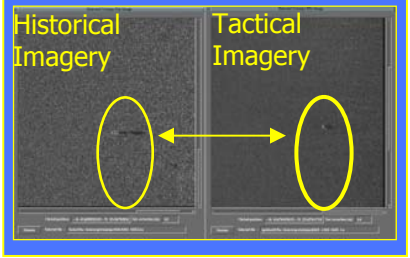
- **Multi-sensor processor**
- **Bottom Mosaics**
- **Automated Algorithms**
  - **Clutter Density**
  - **Bottom Roughness**
  - **Mine-Like Contacts**





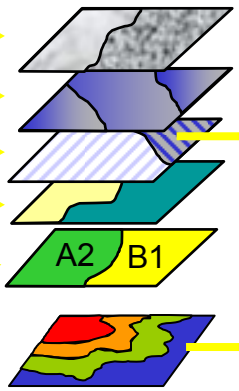

## Change Detection

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.

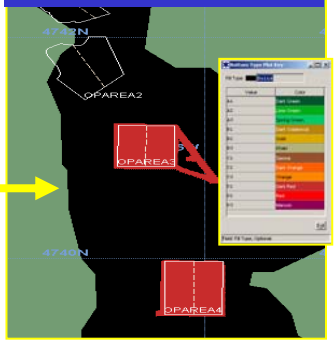



## Environmental Products

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




## MEDAL

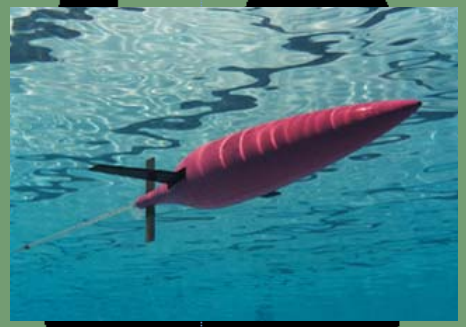



## MEDAL

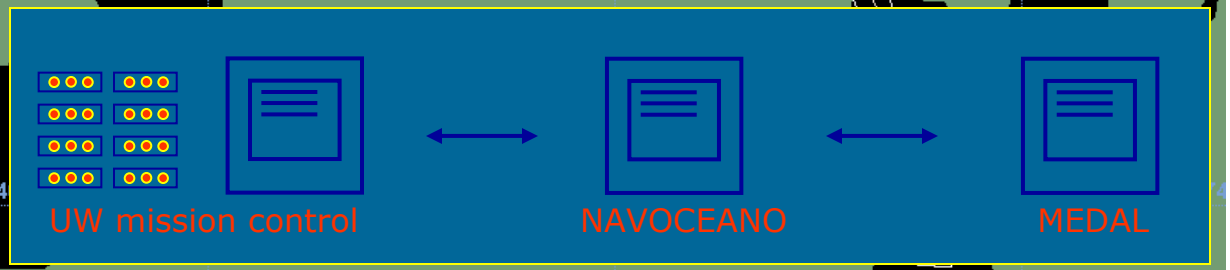
## Impact:

- **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

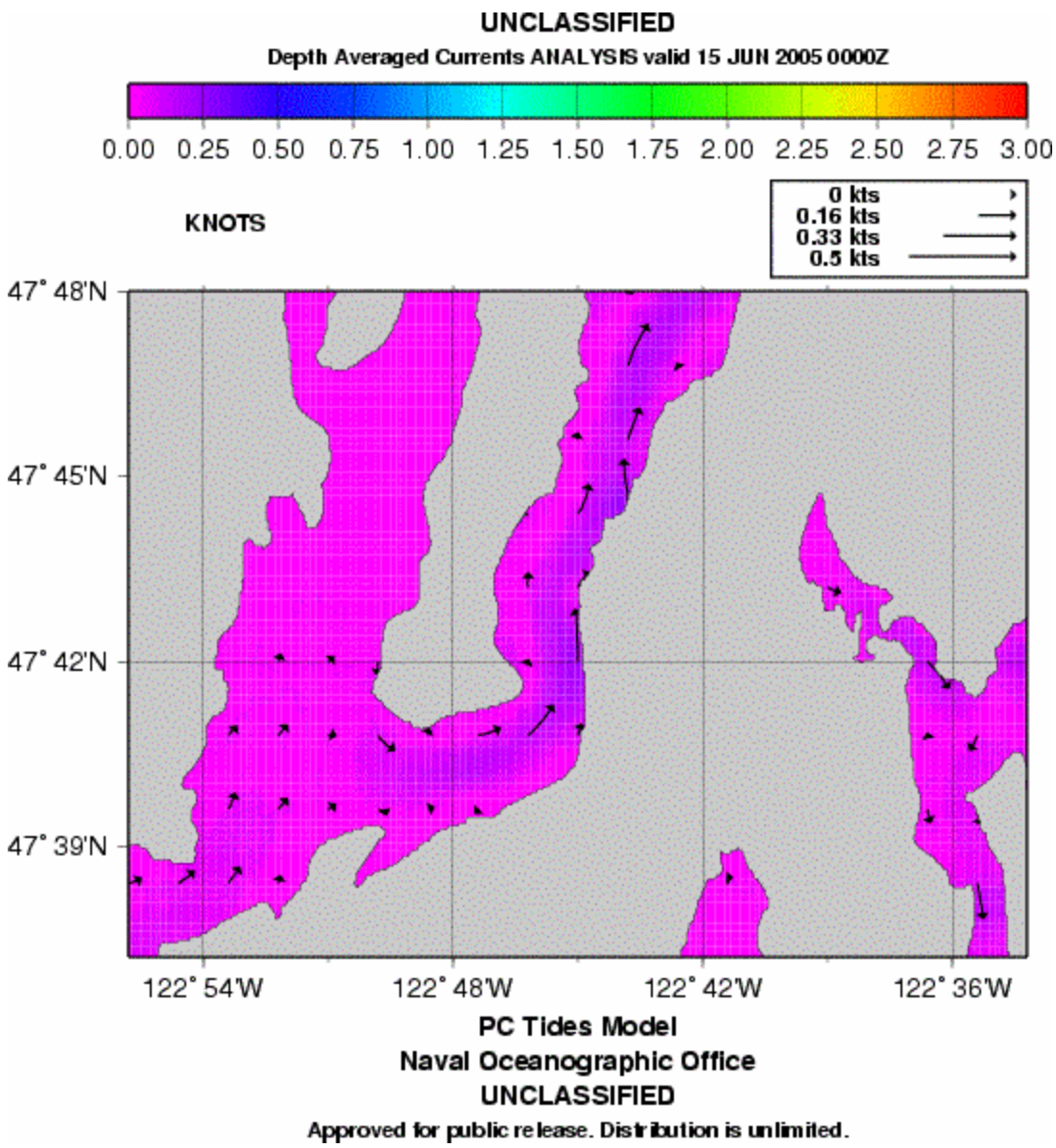


- persistent, autonomous battlespace characterizaton platform
- collects acoustic and environmental data
- ocean parameters measured:
  - temperature
  - salinity
  - optical scattering
  - sound speed
  - depth-avg currents
  - surface currents
- UW Seaglider data sent directly to NAVOCEANO (Stennis Space Center) and imported locally into MEDAL (Mine Warfare Decision Aids Library)



# Operational Ocean Forecasting

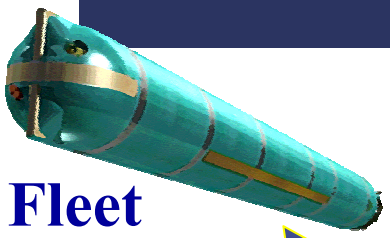
- **A robust and relocatable forecast system, PCTides, was used for the prediction of tidal currents.**
- **PCTides tactical forecasts, forced by winds provided by FNMOC, were provided for conditions out to 48 hours.**
- **Products were used by vehicle operators and dive teams to minimize the impact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



# 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**

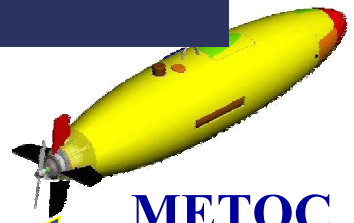
"Navy Corporate Expertise"

**Strategic EIPB**

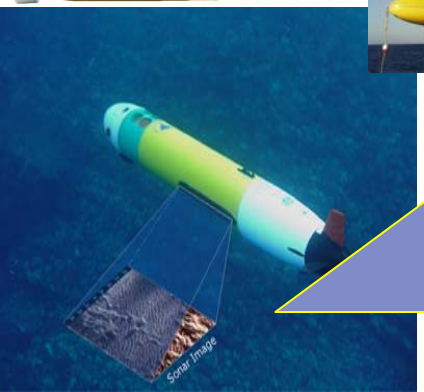
**Operational EIPB**

**Tactical EIPB**

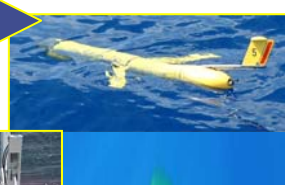
**DATA**

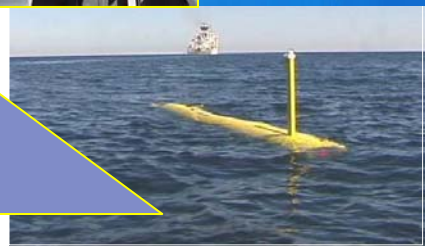


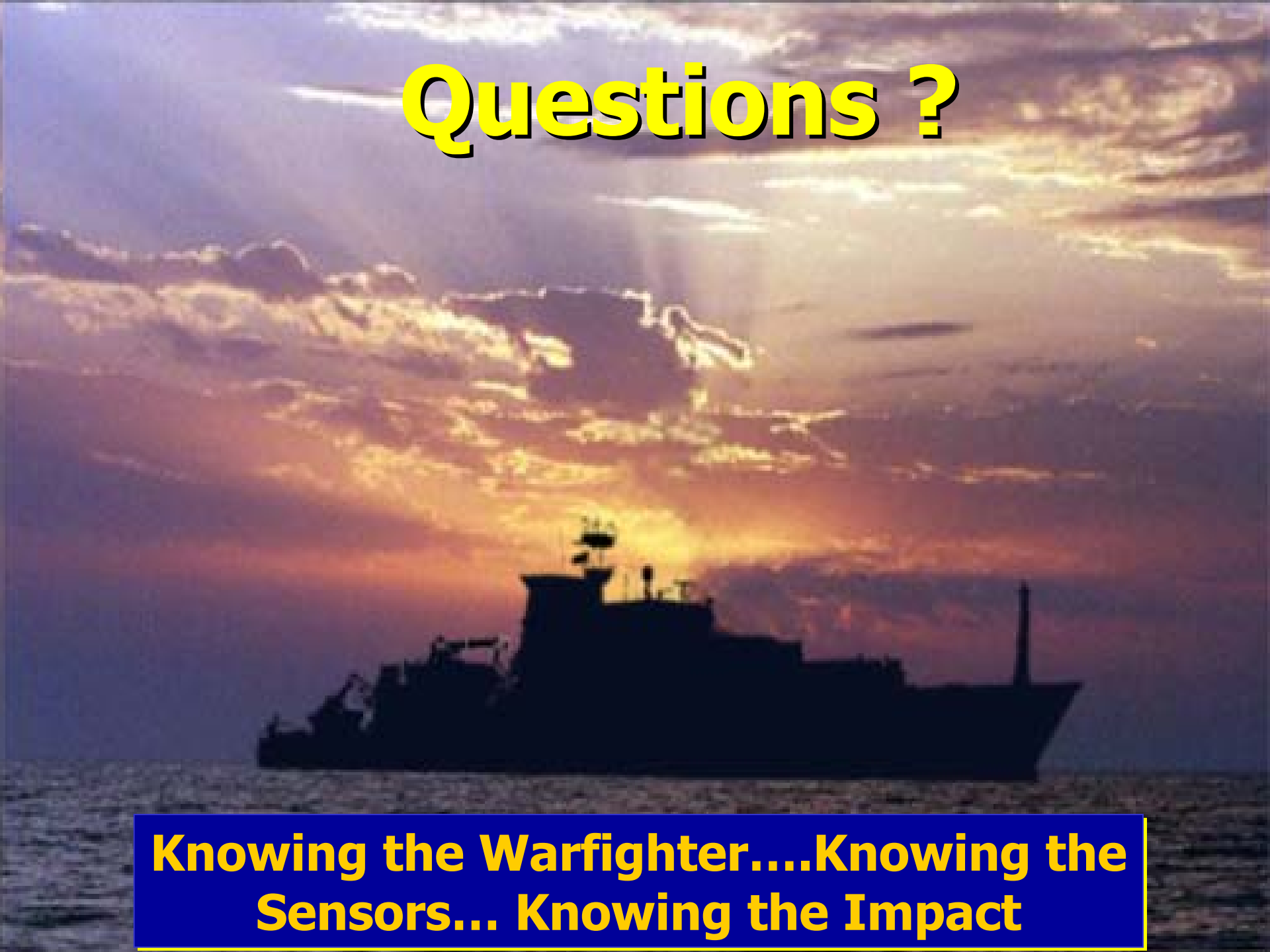
**METOC Assets**




**Warfighting Advantage**






Questions ?
Knowing the Warfighter….Knowing the Sensors… Knowing the Impact