



**Looking to the future....  
Never forgetting the past!**

**Presented by  
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Expeditionary Maneuver Warfare and  
Combating Terrorism S&T Department (ONR 30)**

**October 2007**

# Expeditionary Maneuver Warfare & Combating Terrorism S&T Department

## Code 30

DEVELOPING FUTURE NAVAL COMBAT CAPABILITIES

USMC USN

**SMALL UNIT EXCELLENCE**  
LETHALITY, SUSTAINMENT,  
HUMAN PERFORMANCE, AND  
COMBAT LOAD REDUCTION  
TECHNOLOGIES FOR NAVAL  
WARRIORS

**MARITIME IRREGULAR WARFARE**  
NAVAL EXPEDITIONARY  
COMBAT TECHNOLOGIES FOR  
COMBATING TERRORISM AND  
DEFENDING THE HOMELAND

**COMBAT TACTICAL VEHICLES**  
ADVANCED MOBILITY AND  
ARMOR TECHNOLOGIES FOR  
ENHANCED MANEUVER AND  
SURVIVABILITY

**DISTRIBUTED OPERATIONS**  
INTELLIGENCE, SURVEILLANCE,  
AND C2 TECHNOLOGIES FOR  
LITTORAL DOMAIN AWARENESS

**ONR**  
OFFICE OF NAVAL RESEARCH

# Providing a Vision of the Future

**ONR has a concrete vision of the Navy and Marine Corps after Next with the Naval S&T Strategy....**

**It is how we will get from**

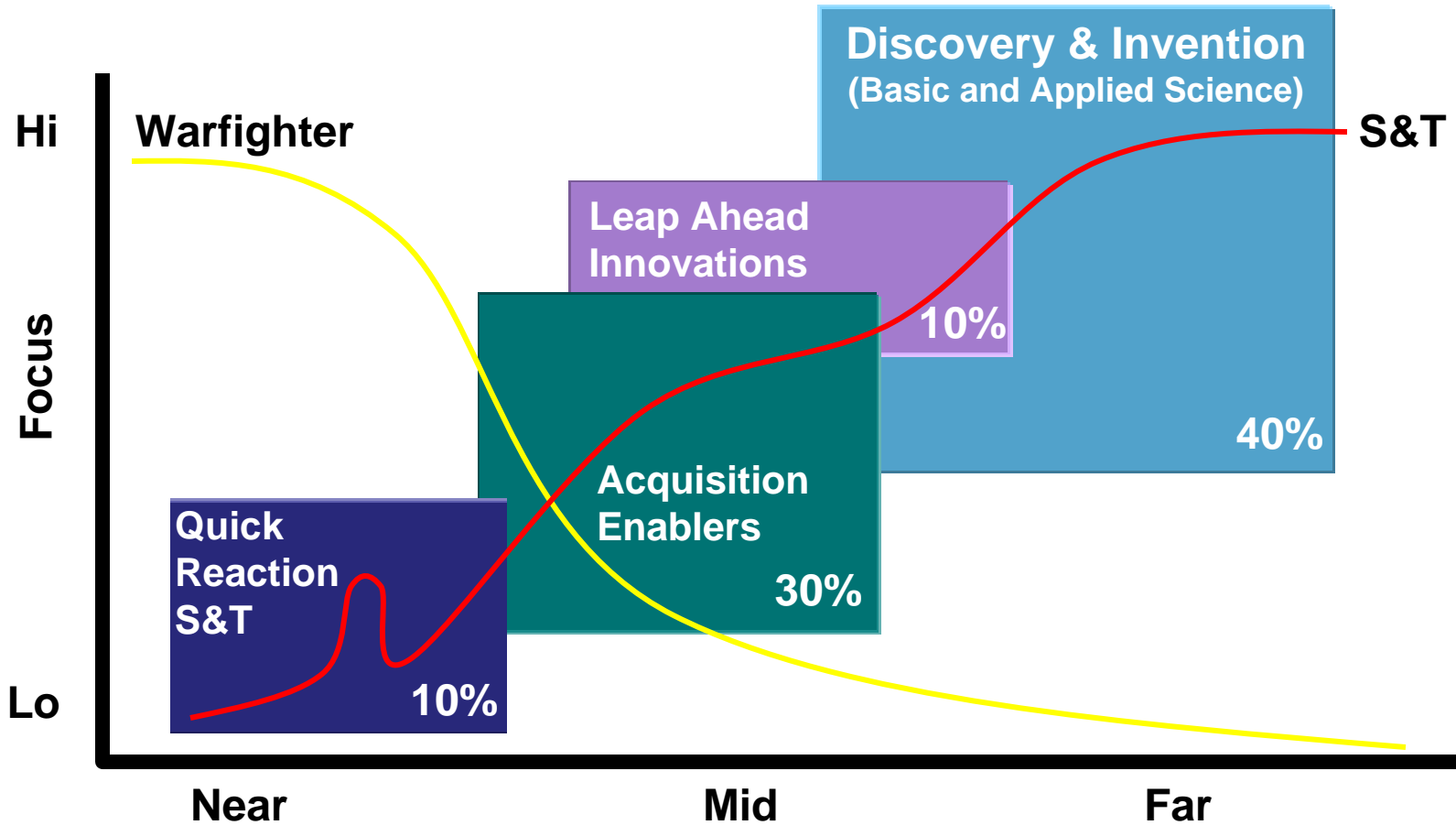
**here...**



**to here**



# ONR S&T Portfolio Balance



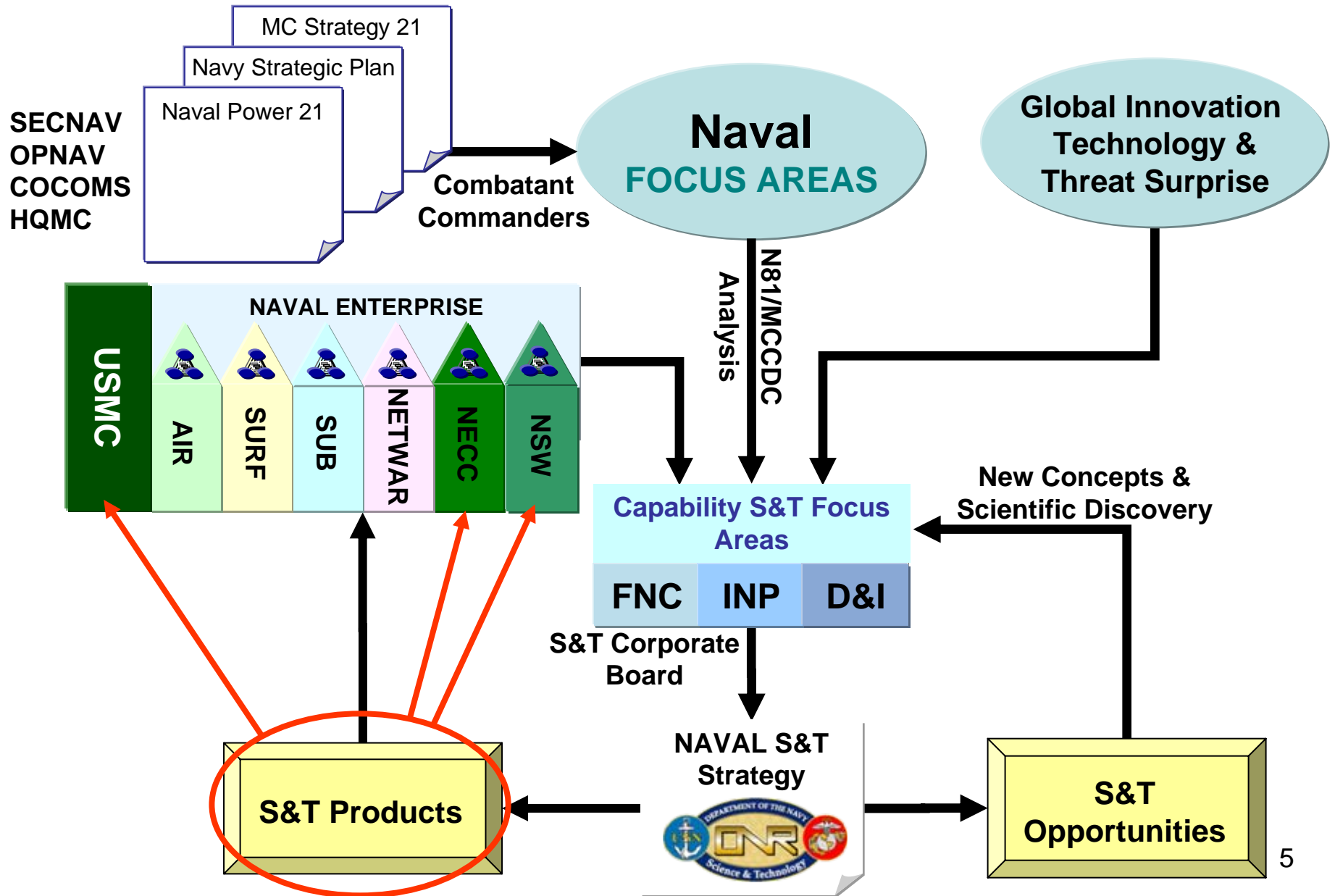
**S&T has a long-term focus but is responsive to near - term Naval needs**

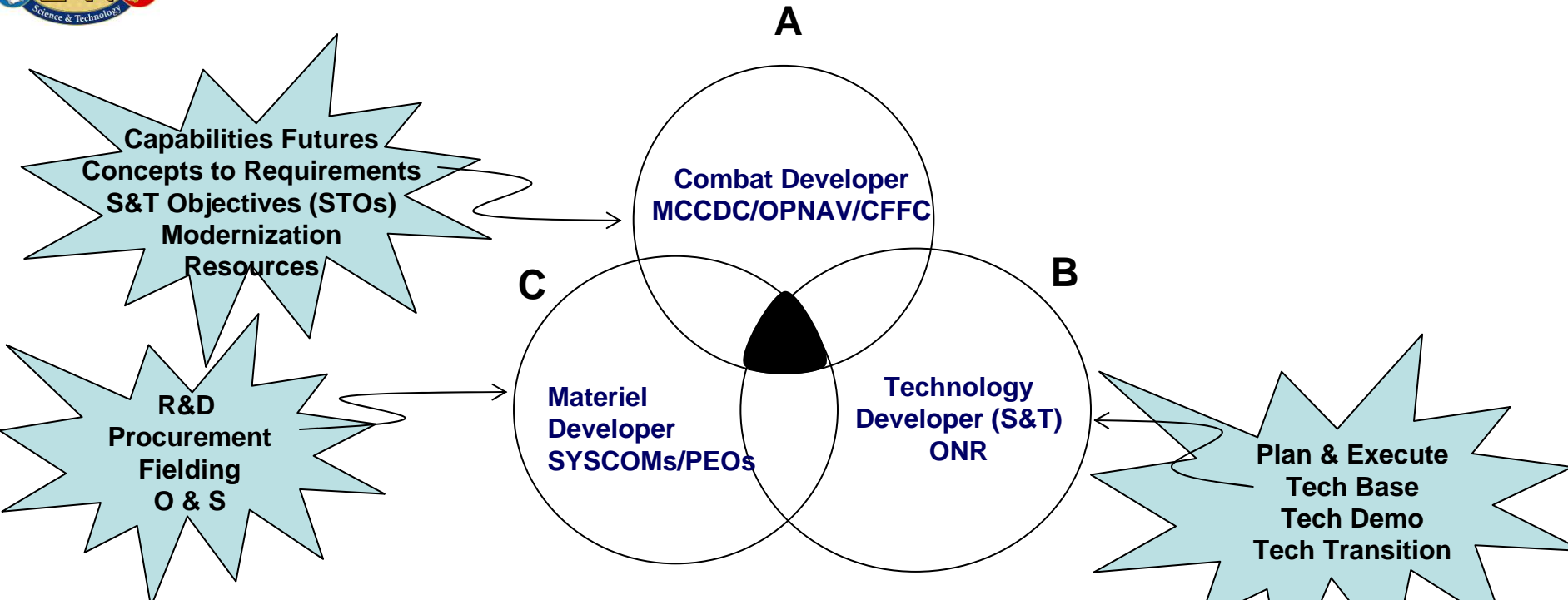
# Blurring Character and Forms of Warfare



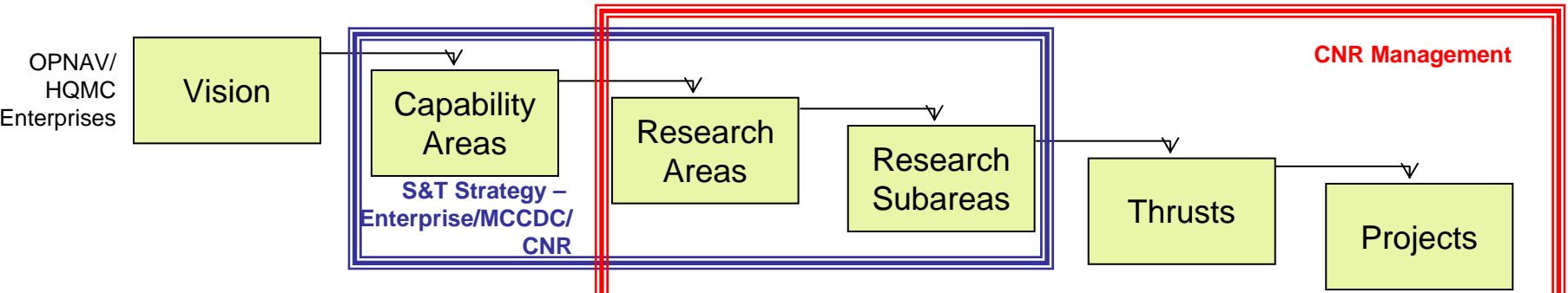
“These categories overlap.....the most capable opponents may seek to combine truly disruptive capacity with traditional, irregular, or catastrophic forms of warfare.” NDS, March 2005, p. 2

# Naval S&T Strategy Process



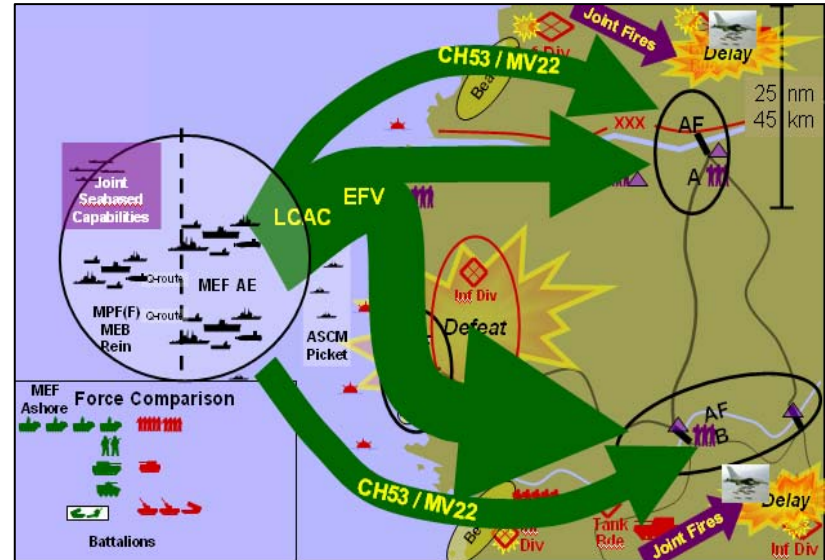


- A** Concept → Capability Futures → Gaps → Requirements
- B** Capability Futures → Gaps → Requirements → Technology
- C** Requirements → Technology → R&D/ Production → Capability

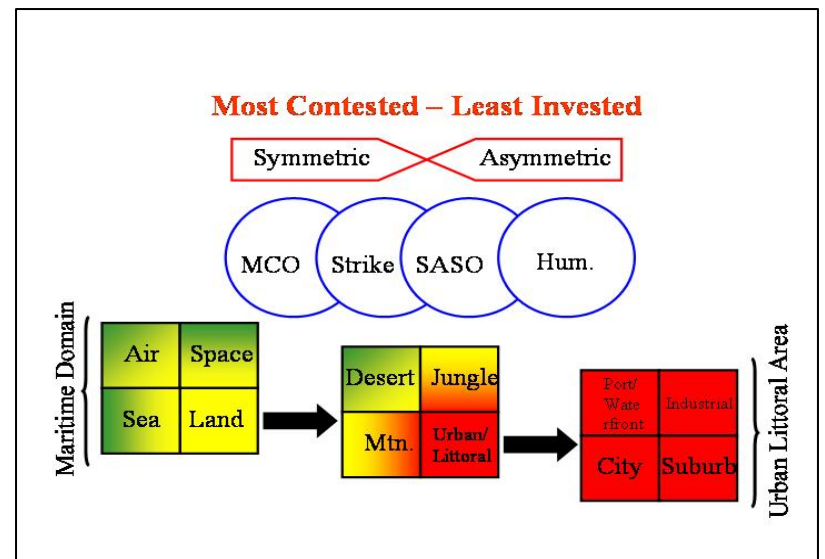


# ONR 30 Focus

— S&T in support of Expeditionary Maneuver Warfare (continued primary importance to both Navy and Marine Corps)



— S&T in support of Combating Terrorism – aka Maritime/Irregular Warfare (MIRWAR), GWOT, Long War, etc. (rapidly growing emphasis in both Navy and Marine Corps)





# ONR 30 Focus (cont'd)

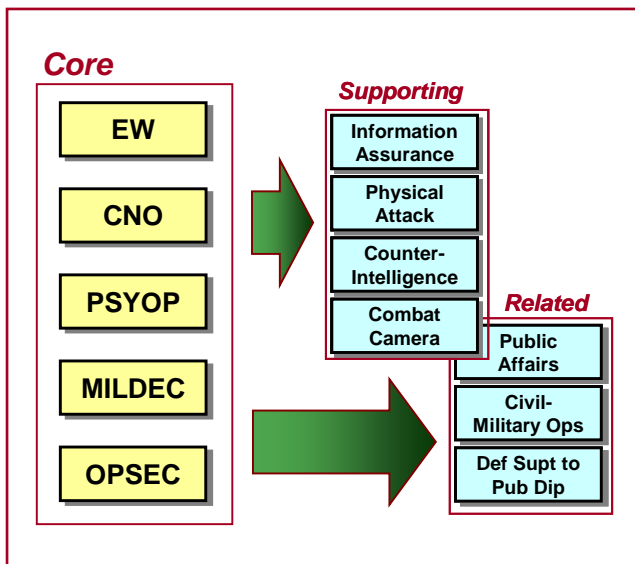
- United States Marine Corps
- Navy Expeditionary Combat Command
- Naval Special Warfare Command



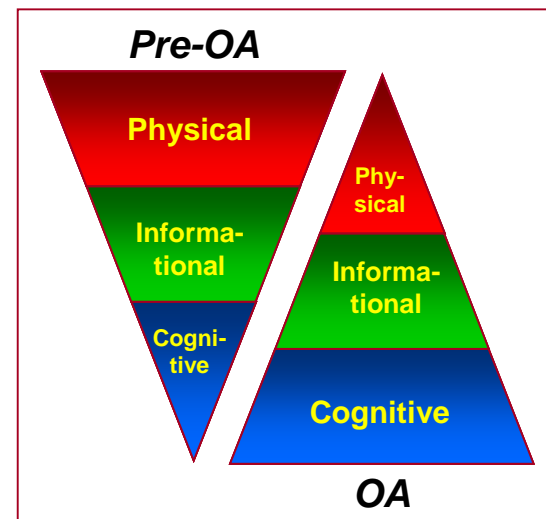
# Operational Adaptation

## Information Operations Evolution

Information Operations are the integrated employment of electronic warfare (EW), computer network operations (CNO), psychological operations (PSYOP), military deception (MILDEC), and operations security (OPSEC), in concert with specified supporting and related capabilities, to influence, disrupt, corrupt or usurp adversarial human and automated decision making while protecting our own.



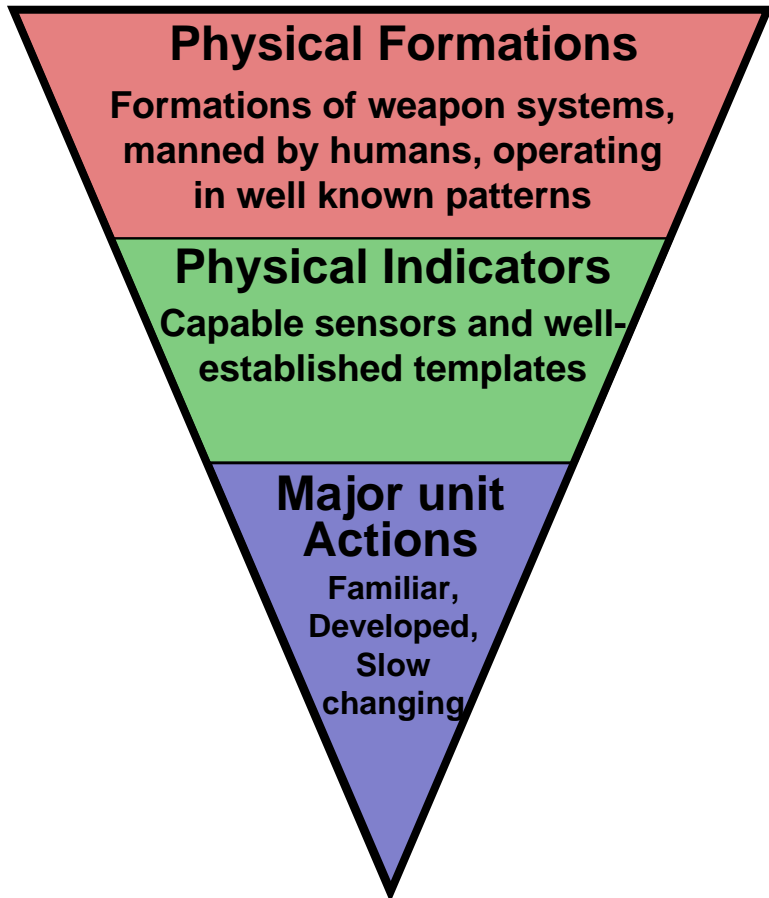
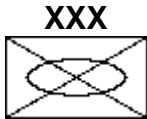
Technology Focus on the Information Environment



Situational Awareness ➡ Prediction ➡ Stimulation ➡ Manipulation/Disruption

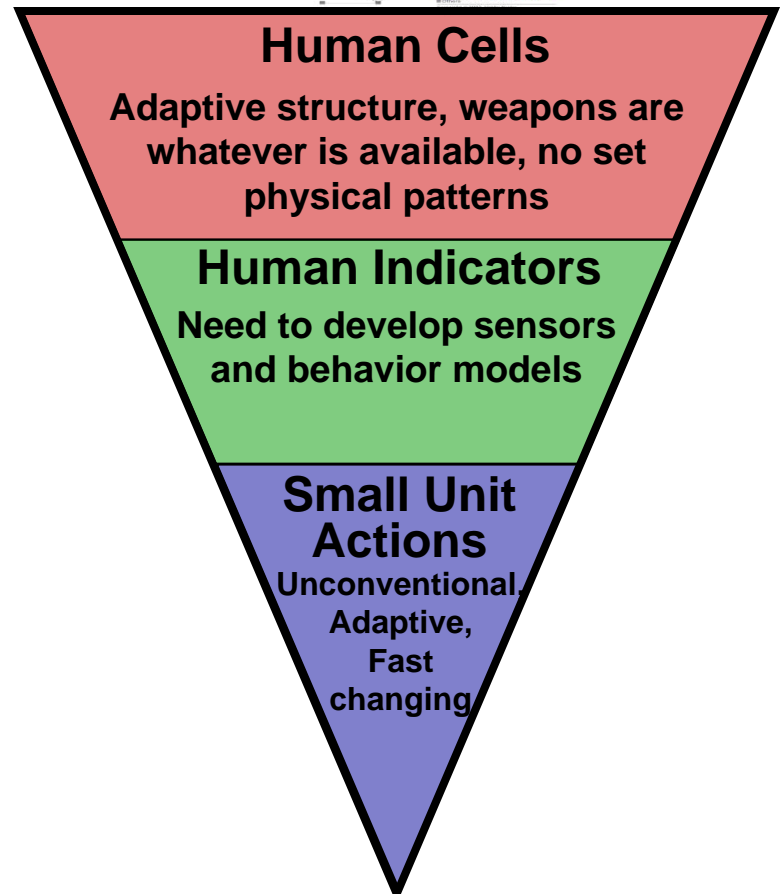
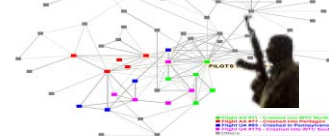
# Conventional vs Irregular/Terrorist Networks

## Conventional Forces



Current capability enables us to be pro-active

## Irregular/Terrorist Forces



Limited capability drives us to be re-active

**Threat**

**Observe**

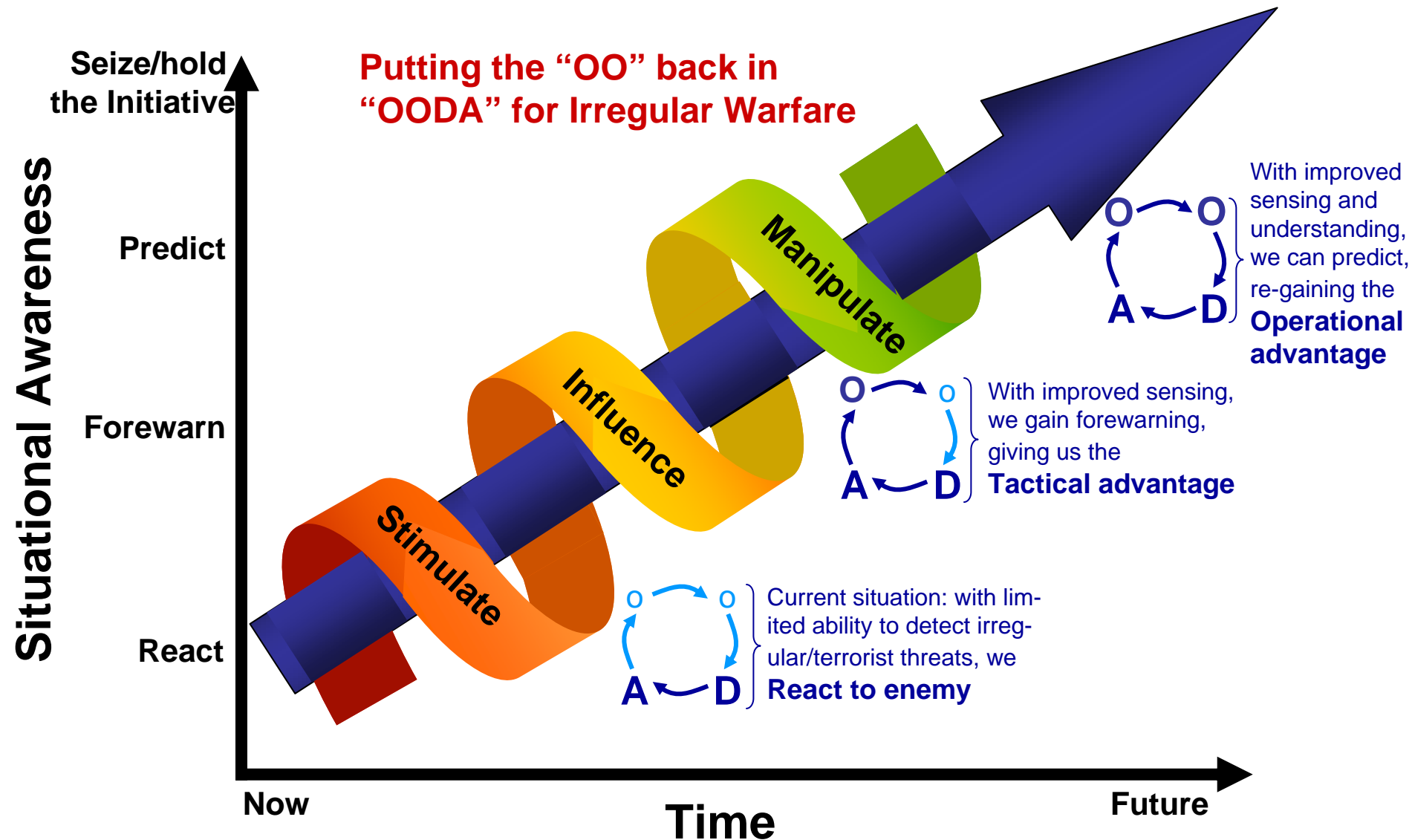
**Orient**

**Decide**

**Act**

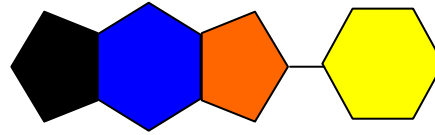
# OA: Defeating Irregular/Terrorist Networks


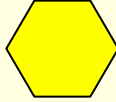
Putting the "OO" back in  
"OODA" for Irregular Warfare



Operational Adaptation → Operational Advantage → Seize and hold the initiative

# NEO S&T (Navy Expeditionary Overwatch)



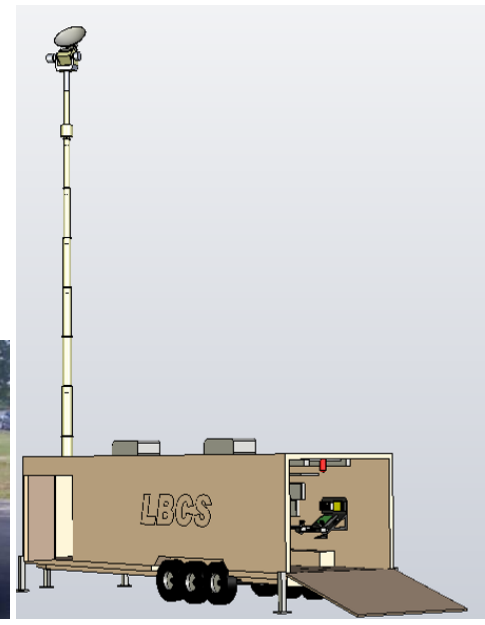
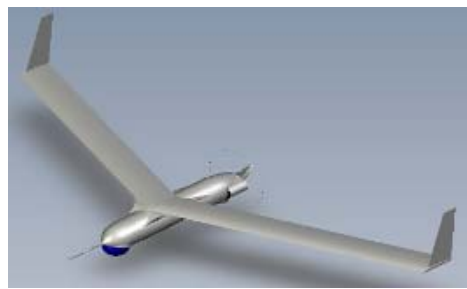
|  |   |  |  |
|--|---|--|--|
| <br><b>Scan Eagle UAS</b> | <br><b>USV</b> | <br><b>Gunslinger</b> | <br><b>Land Based Control Station</b> |
|--|---|--|--|

- Extended ISR (Littoral & Riverine)
- Extended comms
- COMREL payload
- Day-Night EO/IR
- Shared sensor data
- Combat proven UAS

- Extended BLOS USV missions via UAS
- Multi-robot Operator Control Unit software
- Acoustic hailing and listening
- Day-night Multi-spectral ISR (surface & sub-surface)
- Small arms detection/location
- SBIR Technology

- Multi-spectral hostile fire detection/location
- Manned counter-fire
- Shared sensor data
- Up-armored HMMWV
- Modularity
- Vehicle Independent
- Combat Proven Technology
- Networked indirect fire capability

- Common Interface standards
- Data fusion
- C2
- Central data distribution



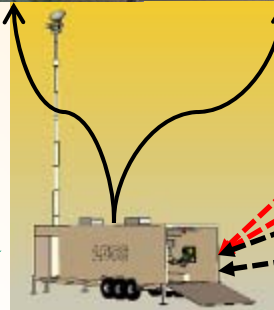
# NEO Spiral I

## Operational View

- System-of-Systems – Detect, Locate, Engage
- System > Than Sum of Parts – Each Platform is Enabled by Others
- System Enables Faster Reaction Time and Coverage of Larger Area
- Communications Infrastructure Enables Collaboration
- Platform Independent

*“Multiple vehicle integration to provide persistent ISR with prosecution capability”*

TOC



**LBCS**

(Land Based Control Station)  
Operated by MESF

**Aerial Platform**  
(Detect/Locate/Relay)

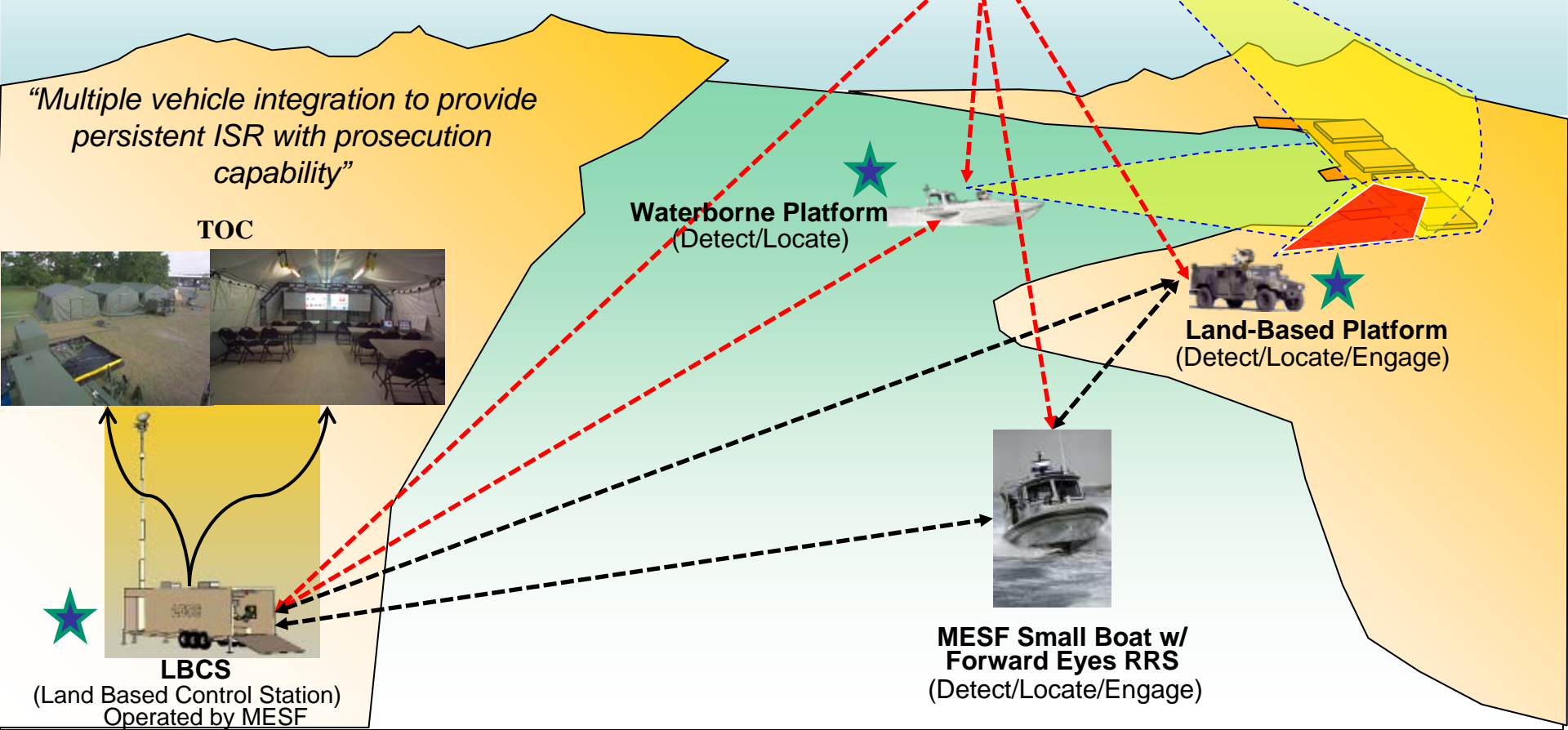
--- Data  
--- Voice

NEO Spiral I Focus

**Waterborne Platform**  
(Detect/Locate)

**Land-Based Platform**  
(Detect/Locate/Engage)

**MESF Small Boat w/  
Forward Eyes RRS**  
(Detect/Locate/Engage)





# **Navy Expeditionary Overwatch (NEO) Execution Team and Responsibilities**

- Naval Surface Warfare Center, Dahlgren
  - Technical Direction Agent/Systems Engineering
- Naval Surface Warfare System, Panama City/  
SPAWAR
  - Multi-Robot Operator Control Unit (MOCU)/Joint Un-Manned Systems Common Control ACTD (JUSC2) Software Updates
- Naval Surface Warfare Center, Carderrock  
(Little Creek)
  - Maintenance, Logistics, Boat Architect, Boat Training
- Naval Surface Warfare Center, PHD (Louisville)
  - MK 45 Gun Mount

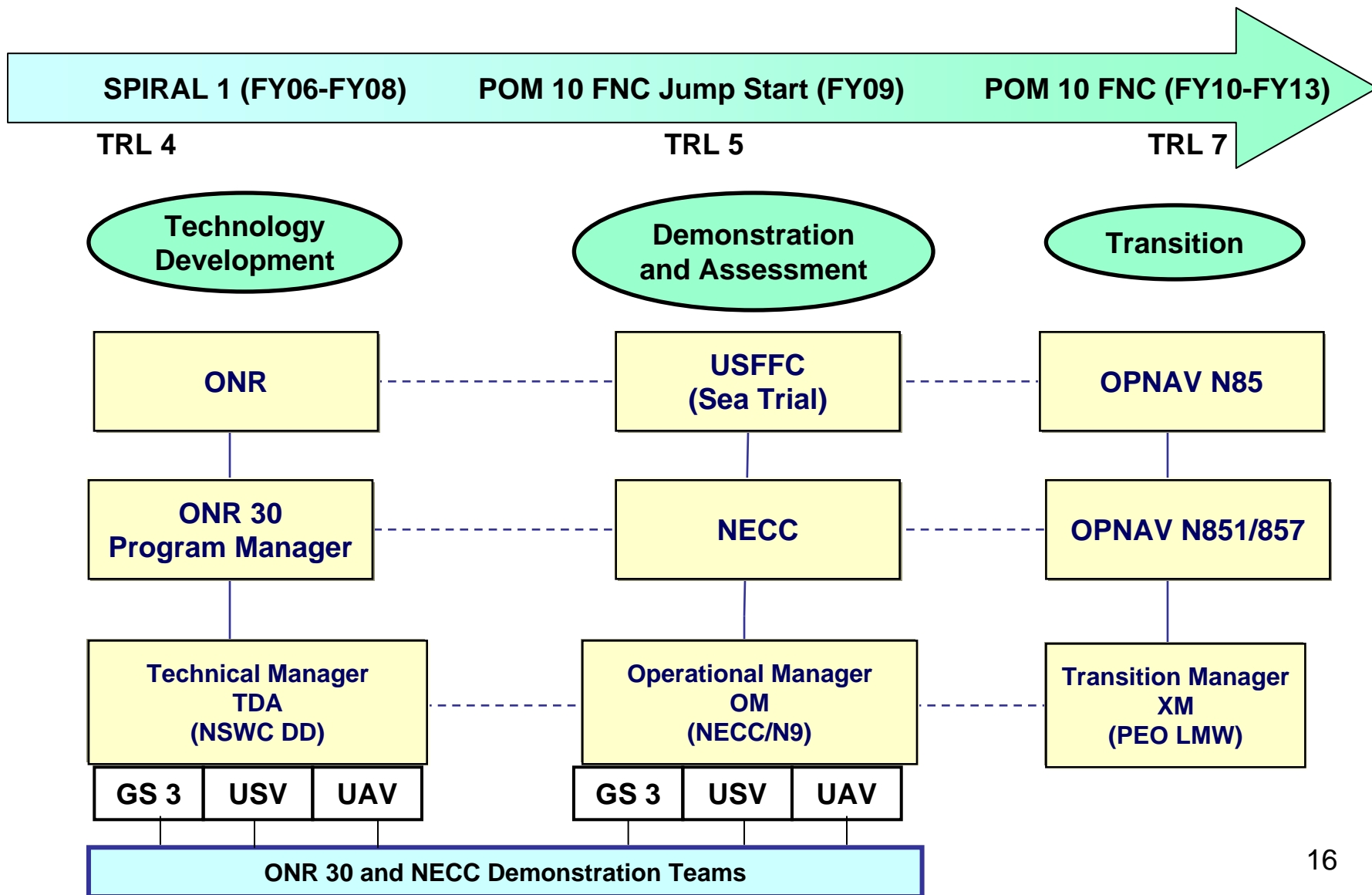


# **Navy Expeditionary Overwatch (NEO) Execution Team and Responsibilities**

- Naval Surface Warfare Center, Dam Neck
  - Systems Integration, C2
- NAVAIR
  - UAV Lessons Learned, Flight Ops. CONOPS, Training
- JUSC2 ACTD Operations Team
  - Ops Testing, Training, Demonstrations/Assessments
- INSITU
  - UAV and UAV Control System, Training
- Northrop Grumman/Accurate Automation
  - USV, USV Control, Integrated Display System, Training

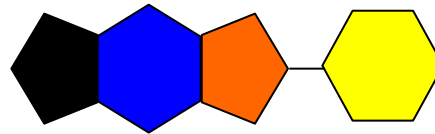



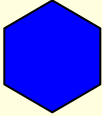
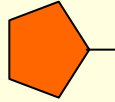
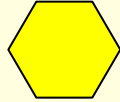
# NEO Management Team/ Transition Path





# S&T Approach to PPE



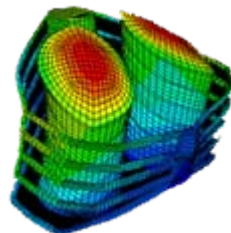
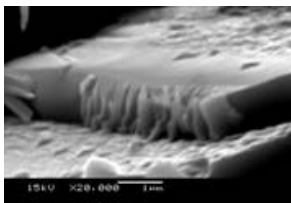
|   |   |   |   |
|---|---|---|---|
|  |  |  |  |
| <b>Advanced Material Development</b>  | <b>Modeling &amp; Simulation</b>  | <b>Modular Designs</b>  | <b>Prototype Fabrication</b>  |

- Fiber Technology
- Composites
- Ceramics
- Transparent Armor

- Materials & Human Modeling & Simulation
- Test Surrogates
- Biological effects

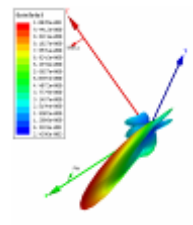
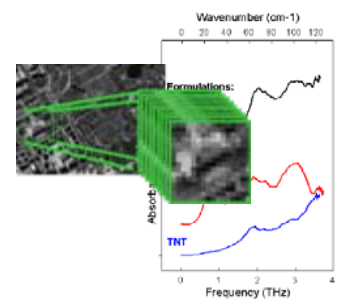
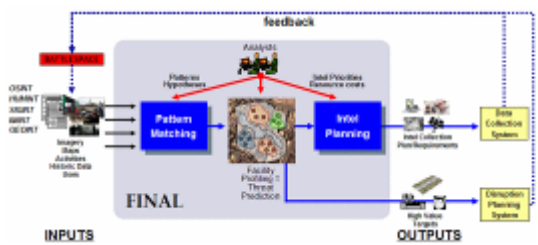
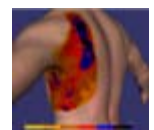
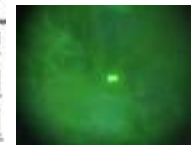
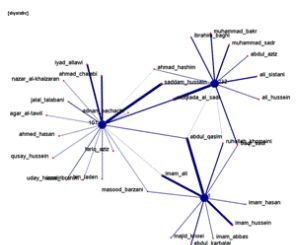
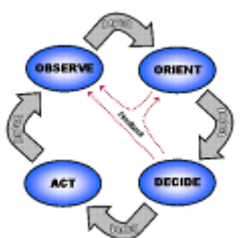
- Tailored Protection
- Wound Mapping
- Modularity
- Anthropometric 3D Body Scanning

- Fabrication
- Human Factors Testing
- Demonstration / User Evaluation



# Systematic Approach to Countering the IED Threat

| PREDICT  | PREVENT | DETECT  | NEUTRALIZE  | MITIGATE   |
|--|---------|---|---|--|
| <b>ATTACK THE SYSTEM</b>   |         |   |   | <b>ATTACK THE DEVICE</b>   |
| <ul style="list-style-type: none"> <li>Operational Adaptation</li> <li>Case Management</li> <li>Event Recognition &amp; Classification</li> <li>Behavior Inference</li> <li>Predictive Modeling</li> <li>Network Targeting</li> <li>Actionable Intelligence</li> </ul> |         | <ul style="list-style-type: none"> <li>IED Process Signatures</li> <li>Device Signatures</li> <li>Sensors and Sensor Processing</li> <li>Airborne</li> <li>Data Fusion</li> <li>Automated Understanding</li> <li>Autonomous Operations</li> </ul> | <ul style="list-style-type: none"> <li>Observer ID</li> <li>Device Phenomenology</li> <li>EM Propagation and Coupling</li> <li>Sensor Spoofing</li> <li>Tx/Rx Interference</li> <li>Back Door Upset</li> <li>EED Initiation</li> <li>Charge Neutralization</li> </ul> | <ul style="list-style-type: none"> <li>Event Context</li> <li>Survivable Vehicles</li> <li>Advanced Armor</li> <li>Shock Mitigation</li> <li>PPE</li> <li>Casualty Prevention</li> <li>Casualty Treatment</li> </ul> |



## Final Thoughts

- Engaging better with inventive & innovative companies – both big and small
- Industry “Skunk Works”
- Finding “non-traditional” performers through partnering
- Better engagement with IRAD
- Better articulation of Naval needs
- Better alignment of public/private sector processes

# Questions?





# Back-up

# NEO Spiral 1 UAS

- Platform Mission Requirements

- Autonomous/Semi-autonomous Detection, Location and Communication/Data Relay Missions
- Controlled from LBCS to Include Pre-programmed Route and Mission Tasking

- Scan Eagle

- Wingspan 10.2 ft, Length 5 ft
- Maximum Weight 40 lbs
- Fuel and Payload Weight 15 lbs
- Cruise Speed 48 knots, Max 75 knots
- Can't See or Hear It at 1200 feet
- Ceiling 19,500 feet
- Endurance 15+ hours
- Autonomous Launch, Flight and Recovery
- Maximum Range from LBCS is 100km

- Sensors

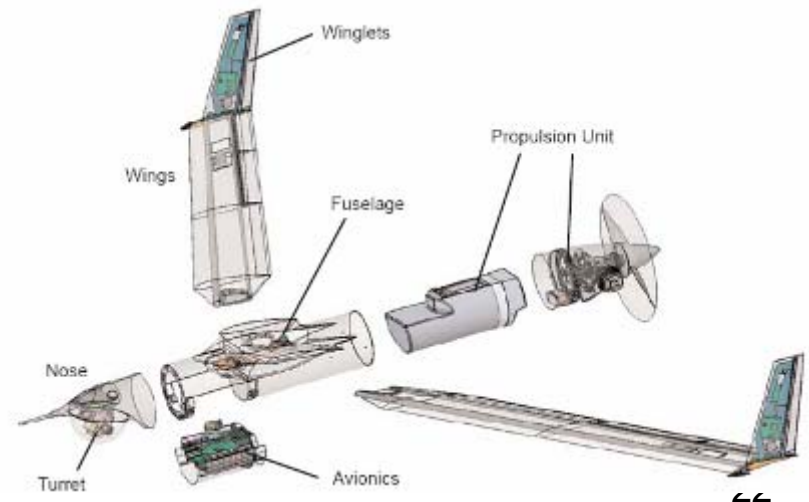
- Day Camera – Stabilized Day Color w/Zoom (45° to 1.8°)
- IR Camera – Stabilized Thermal IR (15°)

- COMREL Payload

- Supports Repeater or Bridge Mode
- Open Source Non-Proprietary
- 54Mbit at 25km Data Rate Expected

- Performers

- Insitu, NSWCCD, NSWCDN, NAVAIR



# NEO Spiral 1 USV

- **Platform Mission Requirements**

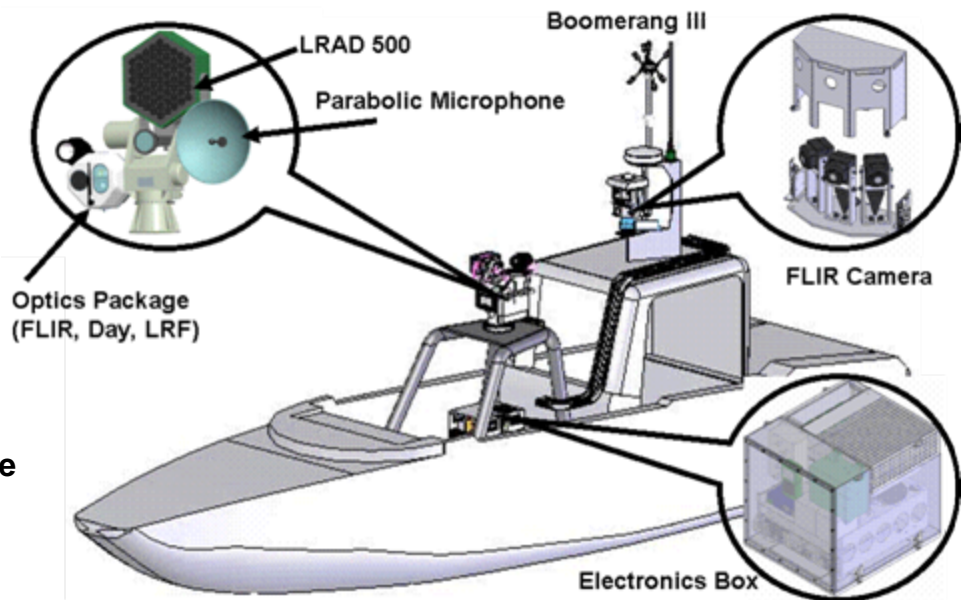
- Unmanned Surface Craft for Inshore, Port, and Brown Water ISR Missions
- Autonomous/Semi-autonomous Detection and Location Missions
- Controlled from LBCS to Include Pre-programmed Route and Mission Tasking
- Capable of BLOS/OTH Operations via UAS Communications Relay Payload

- **Night Hawk FB Design Patrol Boat**

- Length: 38 ft (11.58 m)
- Beam: 9 ft (2.85 m)
- Draft: 18 in (0.46 m)  
36 in (0.91m) (full-load)
- Weight: 8377 lb
- Payload Capacity: 6000 lb
- Speed: 50+ knots (57 mph)
- Range: 300 - 400 nm
- Telemetry Range: > 100 nm
- Fuel Capacity: 158 gal diesel
- Propulsion: 2 Cummins 370 hp

- **Sensors and weapon**

- Multi-spectral Sensor Suite Providing Hostile Fire Detection and Counterfire
- FLIR (10.9° and 2.2° FOV)
- Day Color Camera w/Zoom (43° to 1.8°)
- 1 Hz Eye-Safe Laser Range Finder (LRF)
- 4-Corner PDCue Acoustic Sensor
- NightHunter” Spotlight
- Long Range Acoustic Device (LRAD) 500
- Parabolic Acoustical Listening System (PALS)



**Performers:** Northrup Grumman, AAC, NSWCCR Little23 Creek, NSWCCD



# NEO Spiral 1 GS-3 HMMWV

- **Platform Mission Requirements**
  - Land-based Vehicle Mounted Mission Payload Module
  - Provide Target Location to Support Precision Engagement
  - Provide Real-time, Actionable Targetable Information
  - Perform Man-in-the-Loop Detection, Location and Prosecution Missions
  - Capable of BLOS/OTH Operations via UAS Communications Relay Payload
- **Gunslinger Spiral 3**
  - M1151 Up-Armored HMMWV
- **Sensors and Weapon**
  - Multi-spectral Sensor Suite Providing Hostile Fire Detection and Counterfire
    - FLIR (10.9° and 2.2° FOV)
    - Day Color Camera w/Zoom (43° to 1.8°)
    - 1 Hz Eye-Safe Laser Range Finder (LRF)
    - 4-Corner PDCue Acoustic Sensor
    - NightHunter” Spotlight
  - MK45 “light” with M240G
    - Ammo Capacity 750 Rounds of 7.62 mm
    - 360° Continuous Slew
    - -10° to 45° Elevation
    - 60°/sec Slew Rate
- **Performers**
  - NSWCCD, NSWCLV, AAI, Radiance Technologies

