



# 12<sup>th</sup> ITEA Test Technology Review

***“Back to Basics”***

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**Test Resource Management Center**



# “Back to Basics”

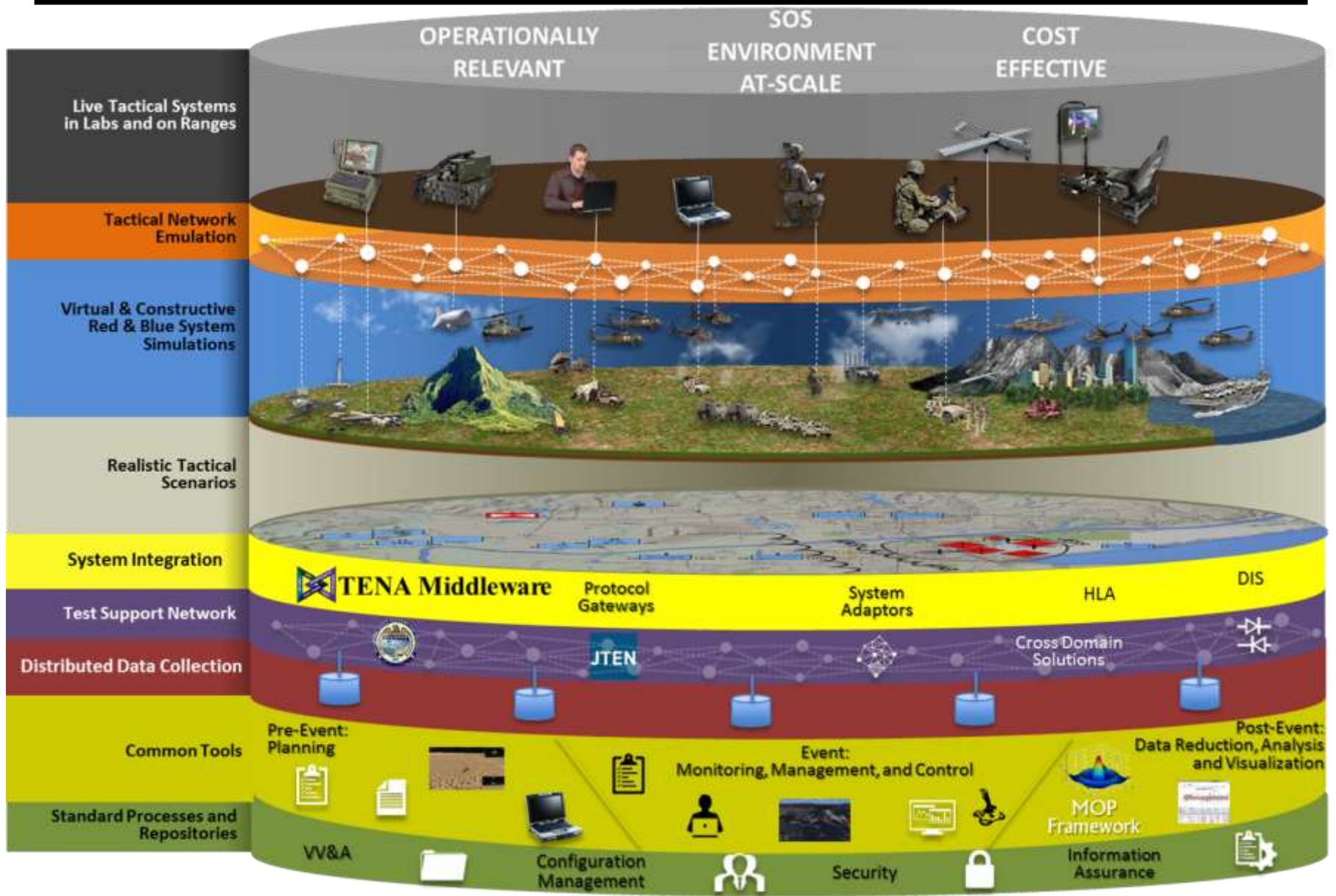
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- **Things That Will Change**
- **Things That Won't Change**
- **Things That Should Change**



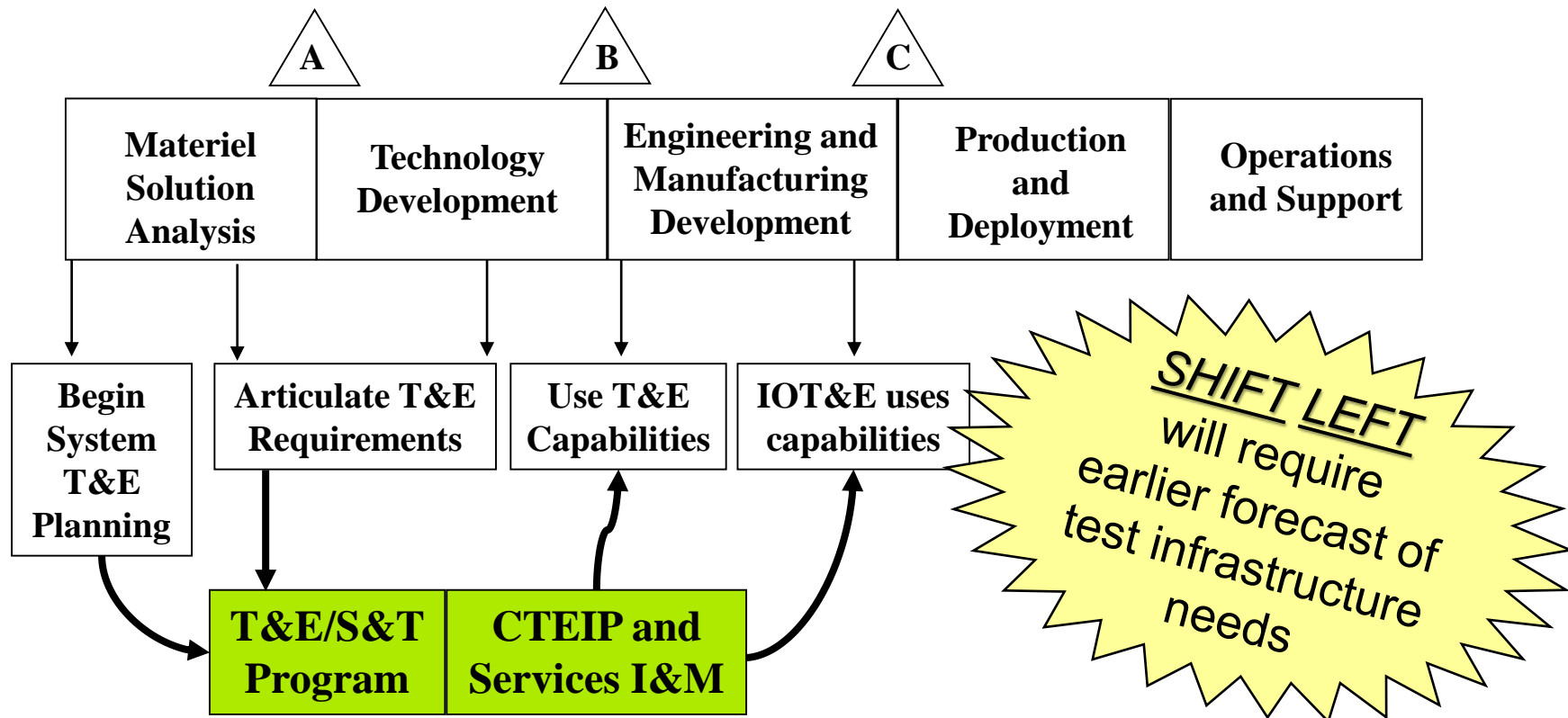
# Live-Virtual-Constructive Distributed T&E Environment





# T&E Capability Development Cycle

**Challenge: T&E Capabilities must be available in time to provide useful insight to decision-makers and warfighters**



**Cycle for Test Capability Development Must Begin Early**



# T&E/S&T Program Overview



**Mission: Develop Technologies Required to Test Future Warfighting Capabilities**

- Established in FY02
  - Joint DDR&E / DOT&E Initiative
  - Transitioned to TRMC in FY05
- RDT&E Budget Activity 3 funds
- Purpose
  - High Risk / High Payoff R&D for Testing
  - Foster technology transition to major DoD test ranges
  - Risk reduction for test capabilities developments

**82 Active Projects**

- Annual Broad Agency Announcements (BAAs)
  - Academia
  - Industry
  - Government Laboratories
- Tri-Service working groups
  - Validate requirements
  - Evaluate proposals
  - Facilitate technology transition
- Central Oversight – Distributed Execution

Current Test Technology Areas			
High Speed Systems 14 Active Projects	Unmanned & Autonomous Systems 4 Active Projects	Spectrum Efficiency 13 Active Projects	Advanced Instrumentation 11 Active Projects
Directed Energy 14 Active Projects	Cyberspace 3 Active Projects	Electronic Warfare 15 Active Projects	C4I & Software Intensive Systems 8 Active Projects

***Shaping Technology into Tomorrow's T&E Capabilities***





# T&E/S&T Test Technology Area

## Executing Agent Organizations



TRMC HQ

Army

Navy

Air Force

Advanced Instrumentation Systems  
Naval Undersea Warfare Center

Program Office  
TRMC HQ

Spectrum Efficiency  
Edwards AFB

Unmanned &  
Autonomous  
Systems Test  
Naval Air Systems  
Command

C4I & Software  
Intensive Systems Test  
Naval Air Systems  
Command

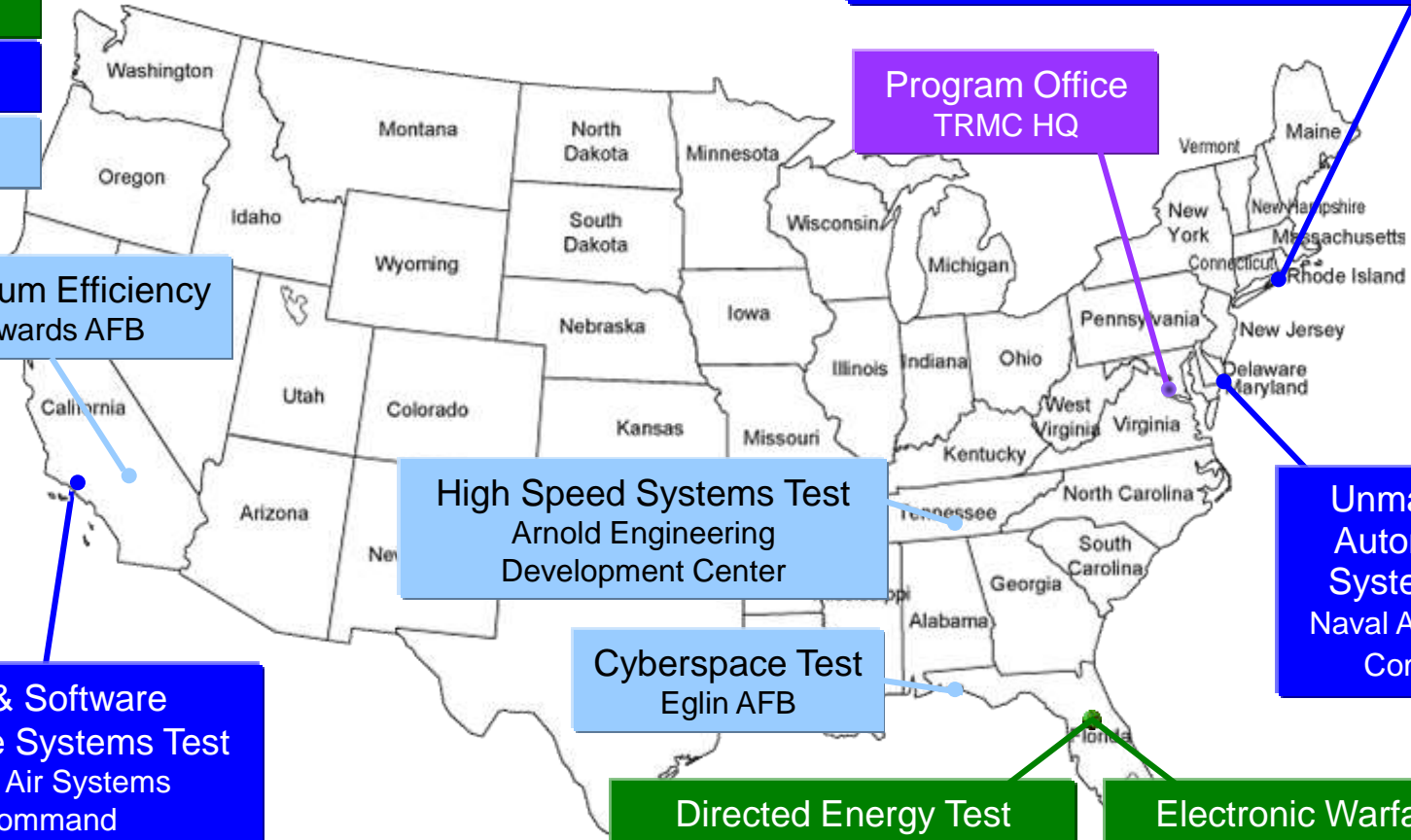
High Speed Systems Test  
Arnold Engineering  
Development Center

Cyberspace Test  
Eglin AFB

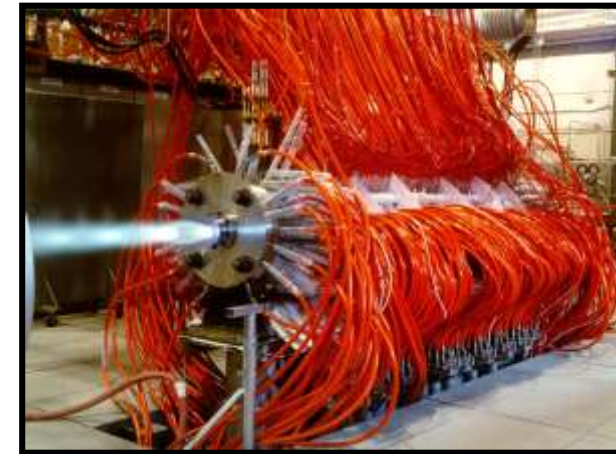
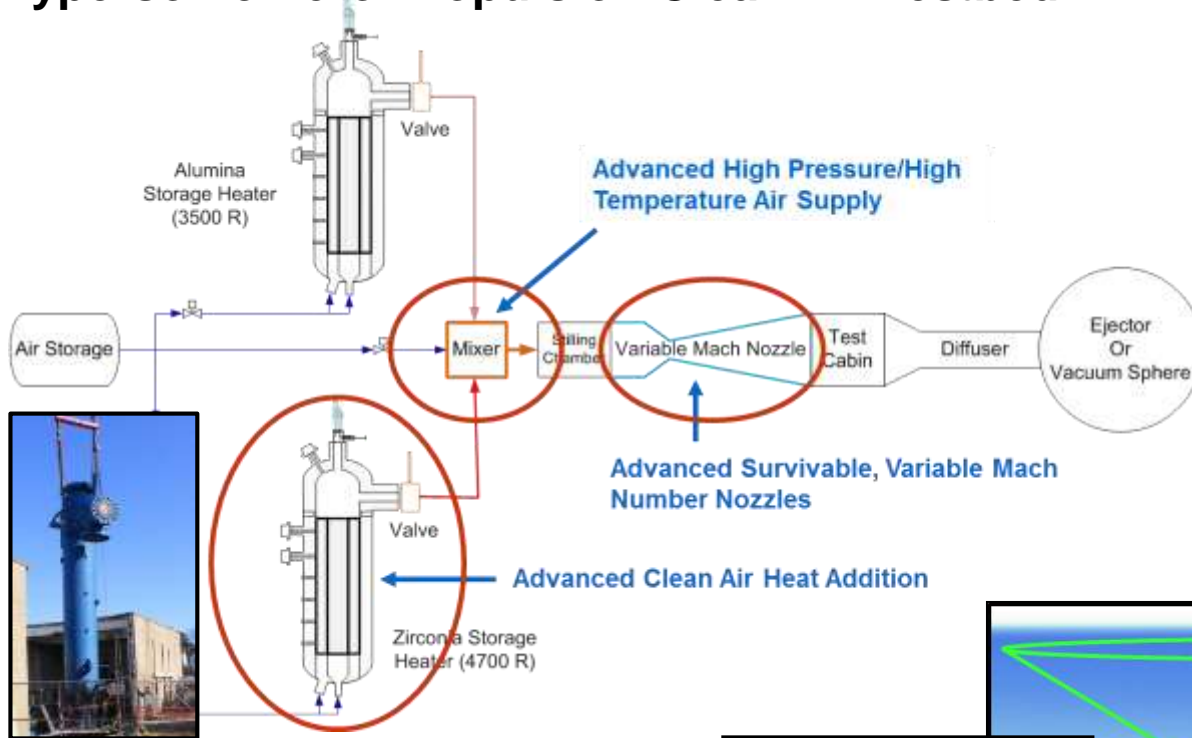
Directed Energy Test  
PEO for Simulation, Training  
and Instrumentation

Electronic Warfare Test  
PEO for Simulation, Training  
and Instrumentation

Central Oversight – Distributed Execution



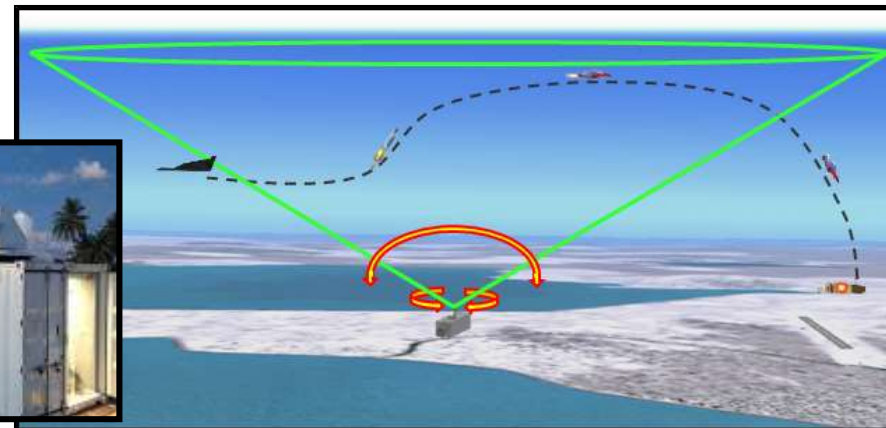
## Hypersonic Aero Propulsion Clean Air Testbed



**Mid-Pressure Arc Heater Prototype**



**Shock Tunnel Enhancements**



**High Altitude LIDAR Atmospheric Sensing**

# Improving Testing Warfighters in GPS-Denied Environments

## Warfighter Inertial Tracking

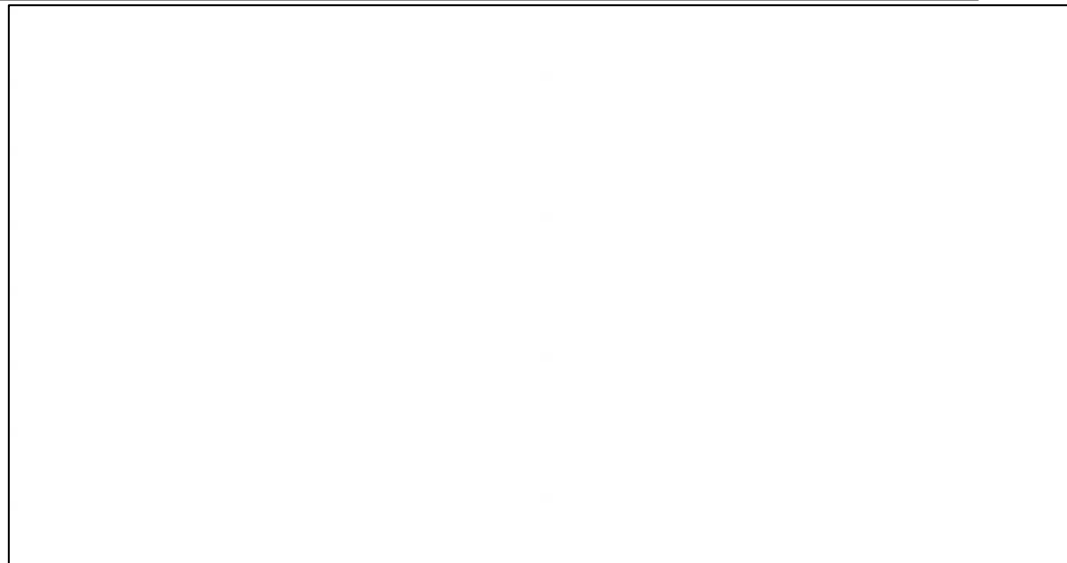


Battery enclosure

Sensor package



## Orientation and Posture Tracking







# T&E/S&T Program

## Significant Test Technology Needs (1 of 2)



### High Speed Systems Test

- Propulsion Scaling Test Techniques
- Combined Cycle Propulsion Test Methods
- Hypersonic Flight Erosion Test Methods
- Thermal Protection System Ablation Testing
- Improved Computational Tools

### Electronic Warfare Test

- High-Speed EO/IR Scene Generation
- Missile Body & Plume Attitude Measurement
- Real-time, High-Fidelity, High-Density RF Signal Generation
- Multi-Beam Characterization
- Radar Clutter Simulation

### Directed Energy Test

- Neutron Environment Simulator to replicate required nuclear effects test environments
- In Chamber HPM Source
- HPM Electronic Failure Analysis
- Characterizing beam propagation through atmosphere & maximizing laser test windows

### C4I & Software Intensive Systems Test

- Flexible Test Harness Generator
- Automated, Rapid, Agile Test Planning
- Removing biases in Distributed Testing
- Rapid Analysis of Voluminous Unstructured Data (“Test Data to Decision”)
- Determining Required M&S Fidelity in Tests



# T&E/S&T Program

## Significant Test Technology Needs (2 of 2)



### Unmanned & Autonomous Systems Test

- Predicting autonomous behavior for testing scenarios
- Enhancing safety of autonomous testing
- Testing of autonomy components
- Measure autonomous system reliability and performance
- Testing swarming scenarios

### Cyberspace Test

- Cyberspace test visualization
- Defining cyberspace test measurements
- Improved, scalable cyberspace threat representations
- Improved cyberspace range turn-around
- Advanced cyberspace instrumentation
- Improved cyberspace analysis

### Spectrum Efficiency Technology

- Multiple Access Schemes for Serial Streaming Telemetry
- Modulation Agile Radio for Test Applications
- Channel Estimation and Equalization
- Steerable Multiband Antenna (L-band, S-band, & C-band) for Airborne Test Articles

### Adv. Instrumentation Sys. Technology

- TSPI without GPS (or with limited GPS)
- Measuring body armor / helmet effectiveness
- Measuring cognitive workload
- Improved weapon characterization and scoring
- Mitigating test range impacts from alternative energy solutions



# The Proposal — Key Criteria

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- **Meets a T&E need**
- **Requires S&T work**
- **High payoff**
- **Broad application**  
(more than one DoD test activity)



# **“Back to Basics”**

## **Wrap-up**



- **Discern what will change, what won't change, and what should change**
- **Well-formed use cases are key to decisions**
- **T&E/S&T Program advances technology for the T&E community**
  - **Seeking innovative approaches to core problems**
- **STEM initiatives are required to revitalize and transform the T&E workforce**

***Looking Ahead, Responsive, and Agile***





# Questions?



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