



Shaping Technology into Tomorrow's T&E Capabilities

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Outline



- **Overview of TRMC**
- **The Investment Mission**
 - Test & Evaluation/Science & Technology (T&E/S&T) Program
- **The Strategic Planning Mission**
 - CY2007 Strategic Plan Highlights
 - CY2005 Targets Gaps Resolution Case Study



FY2003

National Defense Authorization Act



Established TRMC

- DoD Field Activity
 - Direct Report to USD(AT&L)
- ☆☆☆ SES Director

Oversee T&E Budgets

MRTFB
Other T&E Facilities
Within & Outside DoD

Biennial 10-Year Strategic Planning

Administer T&E Investment Programs
CTEIP
T&E/S&T

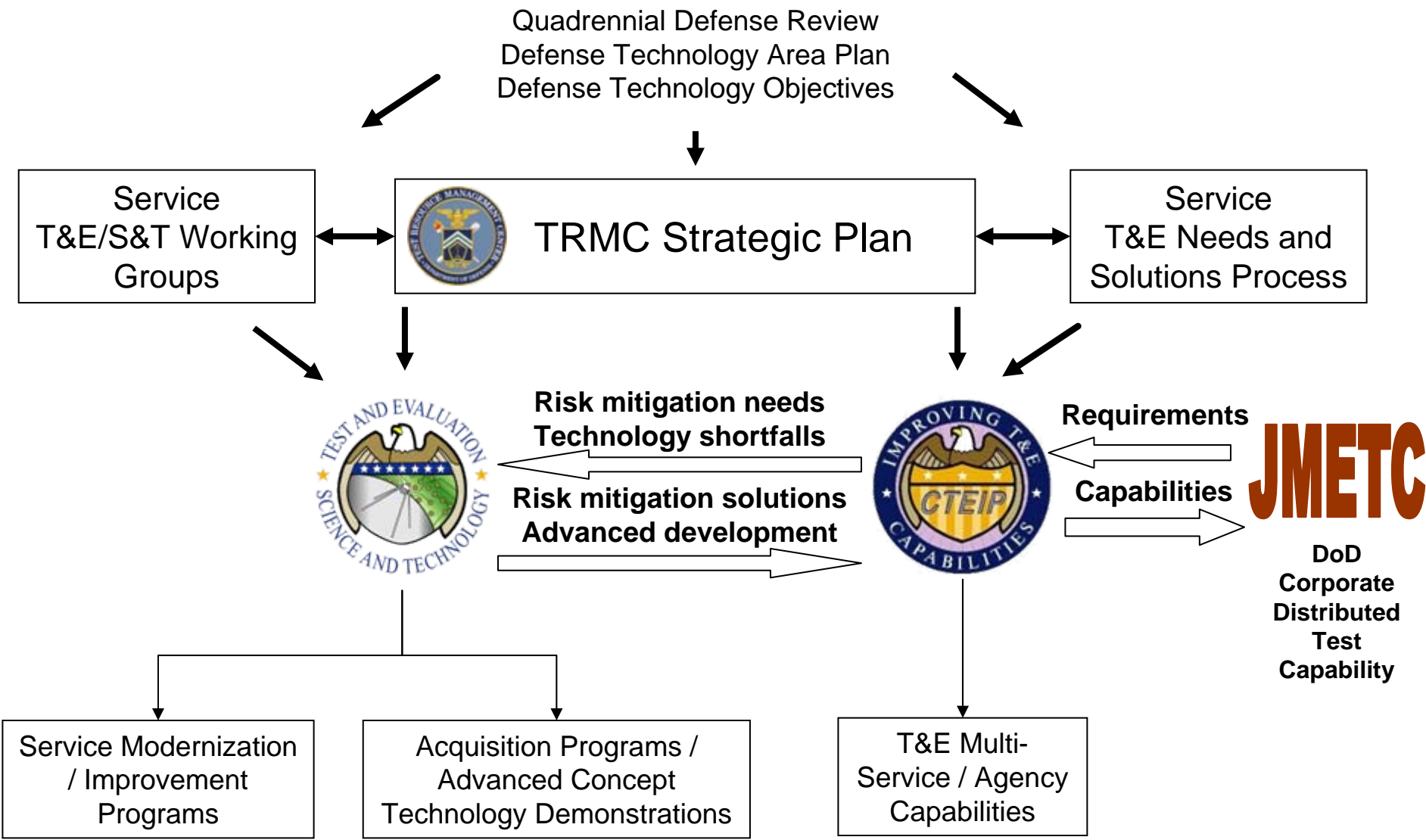
Annual T&E Budget Certification
Military Departments & Defense Agencies



TRMC Investment Programs



Synergy through Aligned Investment





T&E/S&T Program Overview



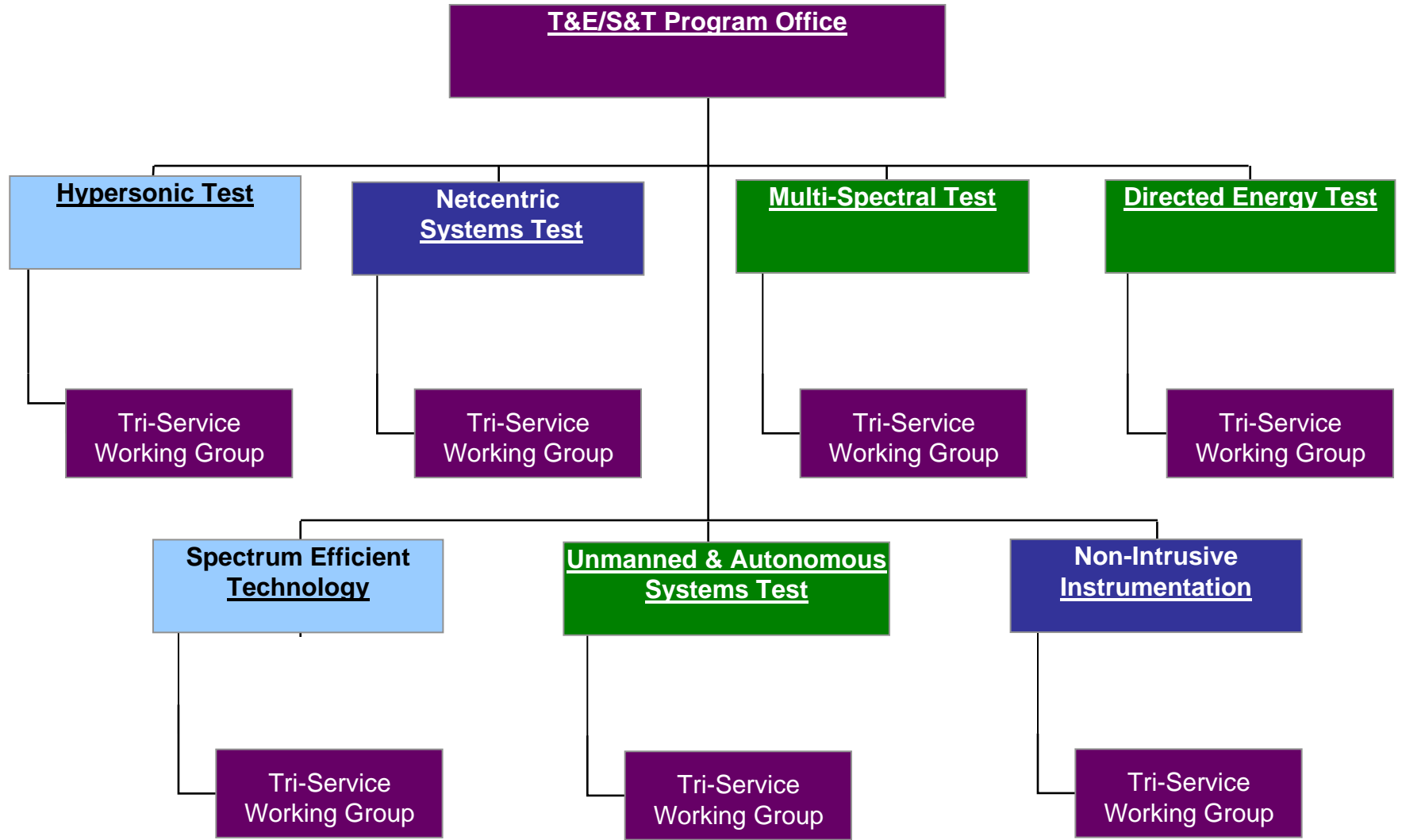
- **Program started in FY 2002**
 - Joint DDR&E / DOT&E initiative
 - Transitioned to TRMC in Feb 2005

- **Mission**
 - **Investigate and develop new technologies required to test and evaluate our transforming military capabilities**
 - Mature technologies from TRL 3 to 6
 - Includes any system that makes our warfighters more survivable and effective in combat
 - Lethal and non-lethal weapons
 - Intelligence surveillance and reconnaissance

- **Goal**
 - **Transition emerging technologies into test capabilities in time to verify warfighting performance**



T&E/S&T Program Structure





T&E/S&T Program Project Selection Process



Drivers



Solicitations are issued through <http://www.fedbizopps.gov>

Tri-Service Focus Area Working Group

- Executing Agent
- T&E Community Reps
- S&T Community Reps
- Subject Matter Experts

T&E Needs/Requirements

Roadmaps and Solicitations

Proposals

Source Selection Evaluation Team

- Working Group
- Subject Matter Experts
- Contracting Reps

Executing Agent



Program Manager

Funding Decision

Final Selections

Recommendations

Focus Area Execution



T&E/S&T Program

Active Focus Areas



Test Technologies for

- Emerging Warfighting Capabilities
 - Hypersonic Vehicles
 - 14 active projects
 - Directed Energy Weapons
 - 20 active projects
 - Multi-Spectral / Hyper-Spectral Sensors
 - 9 active projects
 - Netcentric Warfare Systems
 - 13 active projects
 - Unmanned and Autonomous Systems
 - 5 active projects
- Enhanced Test Capabilities
 - Spectrum Efficient Technology
 - 15 active projects
 - Non-Intrusive Instrumentation
 - 13 active projects
- 89 Active Projects



Example: Directed Energy Test



T&E GAPS

- Target sub-systems HEL protection
- Target sub-systems HPM surety
- Target surface temperature measurement
- Target Surrogate Materials
- Surface target incident irradiance/fluence measurement
- Airborne target irradiance and imagery resolution
- Ability to measure HPM fields non-intrusively

S&T Challenges

- Develop laser protected antenna
- Develop Quantum Well Infrared Photodetector (QWIP) focal plane array
- Develop holographic diffusive target board using photo-thermo-refractive (PTR) glass
- Develop scene-based cross correlation adaptive optics
- Develop reflectance and dynamic fusion models
- Develop non-intrusive HPM sensors

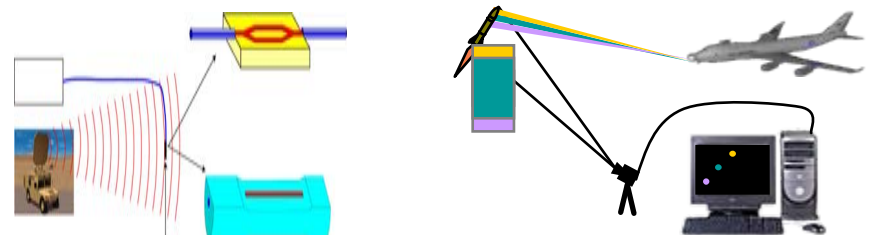
Transitions/Successes

- Microwave Test Diagnostics Recorder integrated within Directed Energy Test and Evaluation Capability (DETEC) HPM Sensor Suite.
- T&E Adaptive Optics System integration with WSMR HEL Advanced Pointer Tracker (APT)



Budget (\$M)

	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
Directed Energy Test	8.83	14.58	23.01	23.07	22.95	23.29	23.42





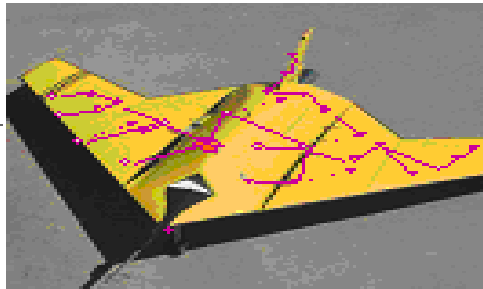
UAST Example

Remote Embedded System Test



T&E GAPS

- Long duration, light weight hybrid power/energy system for reliable UAS operation of onboard sensors and data transmission devices.



S&T Challenges

- Developing “fail safe” methods to power UAS sensors even when operational control systems have been compromised.

Transition Partners

- CTEIP- Framework for Advanced Modeling Environment, Unmanned and Autonomous System Test, Next Generation TSPI Instrumentation

Description

- Research and develop methodologies to harvest energy from such sources as thermal, piezoelectric, vibration
- Self healing on-board sensor network

Budget (\$M)

FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	Total
.246	.994	.577	0	0	0	1.817

Deliverables

- FY08 Demo w/ wired vibration nodes
- FY09 Demo graceful node degradation
- FY10 Demo robustness and scalability

UAST Technology Topic Addressed

Topic 5: Power/Energy Management to Support UAST



Budget



\$Millions											
FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13
7.9	8.6	12.8	14.7	22.6	38.8	62.9	94.9	97.3	98.9	100.4	101.9

- **\$24M Budget Growth in FY08**
- **Additional \$32M Budget Growth in FY09**



Shaping Technology into Tomorrow's T&E Capabilities

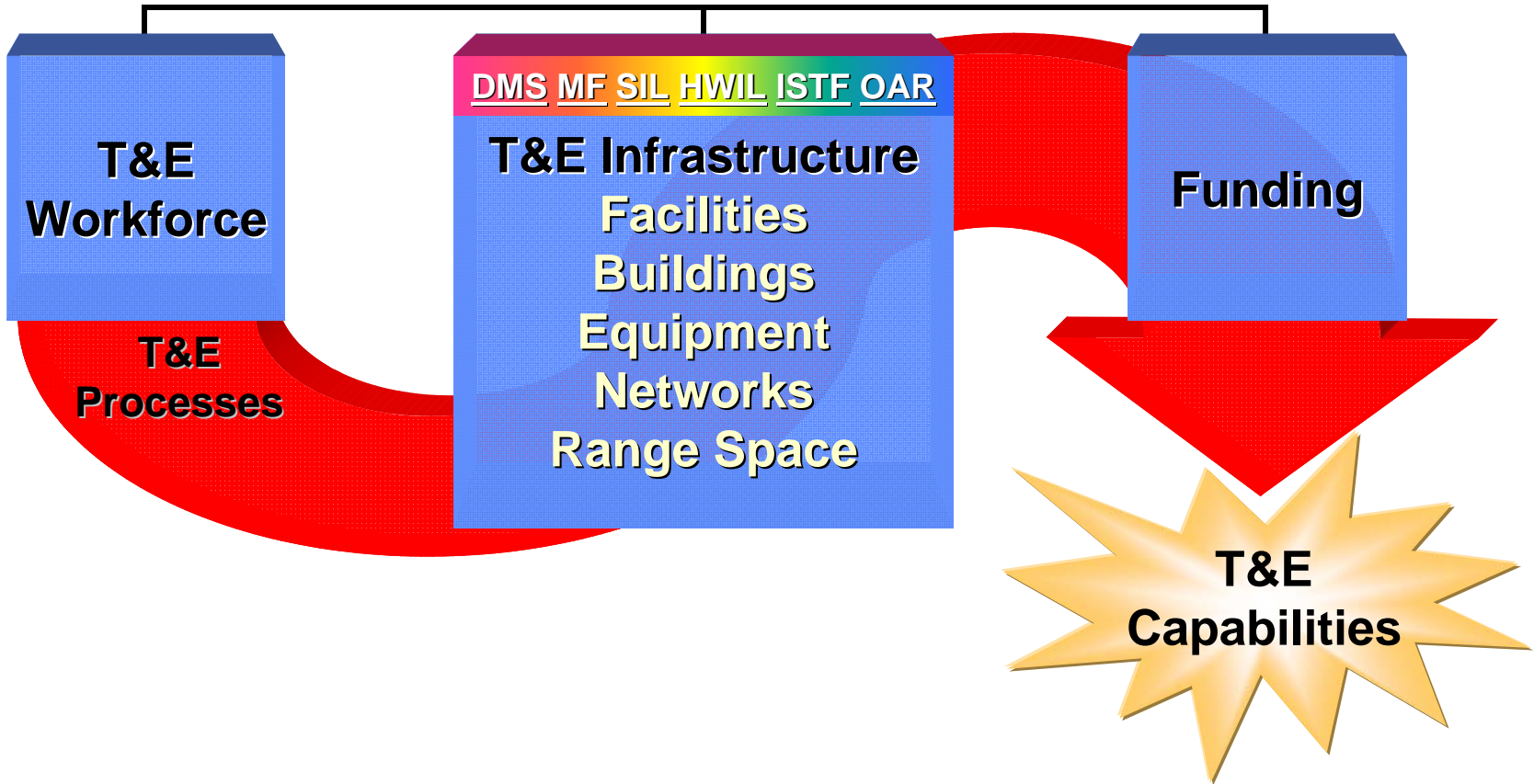


- **T&E/S&T program is maturing technology to meet critical T&E needs**
 - Transition emerging technologies in time to verify warfighting performance
 - Maturing technologies that will facilitate the integration of Test and Training
- **Sustained growth and demonstrated value**
 - 89 projects ongoing across 7 focus areas
 - FY09/10 Budget Ramp expands opportunities
- **Successful Partnership with Services, Laboratories, Industry, and Academia**

T&E/S&T Industry Days 19-21 February 2008
(San Diego Marriott La Jolla)



Strategic Planning for DoD's T&E Resources



T&E Resources: A collective term that encompasses the requisite **Workforce**, **Infrastructure** and **Funding** resulting in a **T&E Capability**, by means of the **T&E Processes**



The Strategic Plan Tactical View: *Test Capability Areas*



- *Air Combat*
- *Land Combat*
- *Sea Combat*
- *Space Combat*
- *Electronic Combat*
- *C4ISR*
- *Armaments and Munitions*
- *Targets and Threats*
- *Common Range Instrumentation*
- *Test Environments*

Follows Tri-Service T&E Executive Agent's Reliance Taxonomy



Test Capability Area Risk Assessment



TRCs \ TCAs	Digital Modeling & Simulation (DMS)	Measurement Facilities (MF)	Integration Laboratories (IL)	Hardware in-the-Loop Facilities (HITL)	Installed System Test Facilities (ISTF)	Open Air Ranges (OAR)
Air Combat	GREEN	GREEN	GREEN	GREEN	YELLOW	YELLOW
Land Combat	YELLOW	YELLOW	GREEN	GREEN	YELLOW	YELLOW
Sea Combat	YELLOW	YELLOW	GREEN	GREEN	GREEN	YELLOW
Space Combat	YELLOW	YELLOW	GREEN	GREEN	GREEN	YELLOW
Electronic Combat	YELLOW	YELLOW	GREEN	GREEN	GREEN	YELLOW
C ⁴ ISR	YELLOW	GREEN	GREEN	GREEN	GREEN	YELLOW
Armaments/ Munitions	GREEN	GREEN	GREEN	GREEN	GREEN	GREEN
Targets and Threats	YELLOW	GREEN	GREEN	YELLOW	GREEN	YELLOW
Common Range Instrumentation	YELLOW	GREEN	GREEN	GREEN	GREEN	YELLOW
Test Environments	YELLOW	YELLOW	GREEN	YELLOW	GREEN	GREEN

T&E Requirements 2008-2011

GREEN assessment indicates that sufficient capabilities exist within a Test Resource Category for a corresponding TCA to meet current T&E requirements.

YELLOW assessment indicates that sufficient capabilities do not exist within a Test Resource Category for a corresponding TCA, however, T&E can be conducted in a less-than-efficient manner with resulting higher risks being absorbed by development and acquisition programs.

RED assessment indicates that severe capability limitations exist within a Test Resource Category for a corresponding TCA and high risks are being absorbed by major acquisition programs as a result of these deficiencies.



T&E Gaps Examples



Gap Title	Rationale/Description	Action	Date
Low-speed Aerial Icing	Improved test capability is needed to certify rotary wing, low-speed fixed wing aircraft, and unmanned aerial vehicles to fly in icing conditions. Legacy capability does not support full icing qualification IAW FAR 25C and is incompatible with unmanned aerial systems station keeping requirements.	Army	FOC 2012
Multiple Small Craft Attack Scoring Capability	Programs such as LCS, DDG 1000, CVN-21, CG(X), will require demonstration of survivability in a swarm attack environment. While progress is being made in the target control arena, the ability to score a gunnery test in the small craft swarm environment remains an issue. Ongoing proof of concept initiative has been unable to deliver a capability that can be employed in full scale test scenarios.	Navy	FOC 2012
TSPI in a GPS-denied Environment	Accurate Time Space Positioning Information (TSPI) data (<1m) is critical for resolving RTCA issues and evaluating performance and effectiveness of Land Combat systems, including FCS and Ground Soldier Systems in an UE. Current (Global Positioning System) GPS-based TSPI capabilities will not reliably track forces located inside buildings and underground tunnels. Additionally, open-air players frequently experience satellite signal “dropout” due to building obstructions, threat jamming, and other co-channel interference effects unique to an operating area’s electromagnetic environment.	TRMC	IOC 2014



“Strategic” View: Focus Areas



- **Strategic Issues in the DoD derived from high-level Departmental Guidance**
 - *Directed Energy*
 - *Nuclear Weapons Effects*
 - *Hypersonics*
 - *Distributed Test*
 - *Urban Test Environments*
 - *Unmanned and Autonomous Systems*
 - *IED Defeat*



Examples - Focus Area Issues/Actions



Directed Energy:

Develop a Directed Energy Test and Evaluation Capability Tri-Service Study [Phase 2 capability roadmap](#) to establish a time phased OAR infrastructure modernization plan to meet future DEW test requirements. **(Lead: Army - CTEIP)**

Hypersonics:

Conduct a study of [OAR T&E capabilities](#) (e.g. range space, instrumentation, test control) needed to test hypersonic air vehicles through launch, cruise, and recovery flight regimes. **(Lead: Air Force)**

Urban Test Environment:

Conduct a Joint DoD Agency/Service study to [define requirements for a realistic, reconfigurable, instrumented urban test environment](#) that best makes use of existing DoD infrastructure and distributed LVC capabilities. **(Lead: Army)**

Unmanned and Autonomous Systems:

Complete a requirements analysis of instrumentation, measurement, monitoring, and control capabilities needed for UAS testing and [develop UAS T&E capabilities roadmap](#). **(Lead: Army – T&E/S&T)**



The Gaps Resolution Challenge



“Everything is very simple in War, but the simplest thing is difficult.”

CARL VON CLAUSEWITZ
1832



Threat D

Supersonic Anti-Ship Cruise Missile (ASCM) Target

Required T&E Capabilities

- Advanced supersonic sea skimming target that represents the full range of intelligence validated air vehicle signature and “transition profile” maneuver performance
 - Sprint vehicle separation
 - Acceleration profile
 - Terminal velocity
- Current Capability: None



Supersonic Target

T&E Program Drivers

- Multiple ship self-defense weapons systems to include:
 - Standard Missile (SM-6 TEMP need date FY10/11)
 - Self Defense Test Ship Testing (SDTS TEMP need date FY11/12)
 - LPD-17 & CVN-21
 - DD(X)

Gap Resolution (As of Sep 2005)

Threat “D” RDT&E Funding Profile (\$M)

FY	07	08	09	10
Funded	22.9	10.6	0	0
Required	22.9	52.5	42.3	12.7
Delta		(41.9)	(42.3)	(12.7)

SM-6 & SDTS test dates at High Risk unless Navy provides full RDT&E funding in POM-08



GAP Resolution Chronology



- Sep 2005 CY 2005 Strategic Plan Released
- Dec 2005 TRMC "Critical Gaps" Memorandum to Services
- Mar 2006 OSD Stakeholders Approve Threat D Target Acquisition Strategy
- Aug 2006 SP Addendum Reaffirms Gap/Requirement
- Aug 2006 Navy POM-08 "Zeros" Threat D Funding
- Sep 2006 DOT&E/TRMC Submit Targets POM Issue Paper
- Oct 2006 PA&E Targets Issue Team Reaffirms Requirement - "End-user Pays" Offsets
- Oct 2006 3-Star Programmers ... "Deal or No Deal"
- Nov 2006 PDM-II Directs Additional Threat D Study
- Jan 2007 Navy (JH-APL) Begin "Alternatives" Study



Resolution Chronology Cont.



- Mar 2007 Study Team Recommends Multi-stage Target
- Apr 2007 Congressional Staff Weighs In - RFI
- Apr 2007 3-Star Programmers Accept Recommendations
- Jul 2007 SASC Language – More ASCM Target Studies
- Aug 2007 Navy Cuts Test I&M Budget to Pay Share of MSST Development Bill
- Sep 2007 TRMC Submits PBD to Restore I&M Budget
- Oct 2007 TRMC-Navy “FY09 T&E Budget Certification” Drill

Current Status:

- MSST Development Program On-Track, PMA-208 Adequately Funded
- Restoration of the Navy’s Major Test Range I&M Funds TBD (OSD Comptroller Action Pending)
- Congressional Requirement for Additional ASCM Target Studies TBD (Authorization Bill Conference Report Language Pending)



TRMC's Overarching Goal



*“Robust and Flexible T&E Capabilities
to Support the Warfighter”*