OTA Roundtable:
Applying
the
T&E Requirements Process
to
Unmanned / Autonomous Vehicles

Stephen C. Daly
Deputy Director, Operational Test & Evaluation for Land & Expeditionary Warfare
Office of the Secretary of Defense
Pentagon Room 1D548
(703) 697-3891
stephen.daly@osd.mil

Requirements

- Warfighters write requirements or "must have" capabilities – not testers, not evaluators.

- Warfighters define the concept of operations – not testers, not evaluators.

- Program Managers, testers, evaluators need to understand the **RATIONALE** behind the warfighter's requirements and the warfighter's CONOPS.

  - PM: where to trade cost, schedule, and performance.
  - Tester: structure tests to demonstrate system & unit performance.
  - Evaluator:
    - Assess unit mission accomplishment.
    - Assess system performance.
    - Answer the "so-what" question.

Comprehensive Testing

- Works in a well-known process to demonstrate system performance in a "model-test-fix-test" methodology.
  - Developmental Test & Evaluation.
  - Live Fire Test & Evaluation.
  - Operational Test & Evaluation.
  - Evaluation of the significance of system performance & unit mission accomplishment performance.

- Comprehensive T&E characterized by some as:
  - "Too slow."
  - "Too costly."
  - "You don't understand that my UAS/UAV is special."
  - "We're at war for gosh sakes."

DOT&E Point of View

- Many past systems started as Advanced Concept Technology Demonstration (ACTD).
  - Execution of ACTD's often skimps on the <u>demonstration</u>.
  - Often fail to address operational suitability issues.
  - Often has a cumbersome transition to a program-of-record.

- Common theme is to avoid government test in any form.

- In IOT&E:
  - Some UASs have been assessed as operationally effective.
  - To date, none have been assessed as operationally suitable.
  - Services have applied lessons learned and corrections to improve these systems since IOT&E.
  - <u>Lessons apply to other Unmanned Systems in development</u>.

Shadow IOTE in 2002 at Fort Hood

- Operationally effective under fair weather conditions and in the absence of an air threat for cued reconnaissance and surveillance missions … not operationally effective to target acquisition missions.
  - 57% of Recon-Surveillance reports were timely and accurate.
  - Demonstrated target location error in excess of 200 m (80 m req'd).
- Not operationally suitable.
  - Not reliable, not maintainable, 2 AV crashes and 1 significant damage.
  - Operational Availability meets user requirements due to redundancy.
  - Demonstrated ability to meet the Commander's operational tempo.
- Not survivable.
  - Susceptibility to detection is high.
  - Seen and heard within effective ranges of many threats.
  - Significant electromagnetic vulnerability.

Predator IOTE in 2000

- Predator is not operationally effective or suitable.
    - Disparity between the apparently successful fielded system and the systems that did not perform well in IOT is largely attributable to the fact that the system is tasked and operated well within known limitations such as effective time-on-station, weather restrictions, expected threats, expected accuracy, and dissemination abilities.
    - Capable of surveillance, recon, & battle damage assessment missions.
    - Poor Target Location Error (TLE), weather restrictions, and ineffective communication impact strike support, CSAR, area search, and continuous coverage.
    - Cannot meet requirements outlined in the ORD & KPPs.
    - Lack of relief-on-station procedures and poor reliability renders the system unable to meet the 75% Effective Time-on-Station (ETOS) requirement at range of 400 nm.
    - Serious deficiencies in reliability, maintainability, and human factors.

Raven IOTE in 2006 at Fort Bliss

- Raven SUAS is operationally effective.
  - Infantry company commander benefits from enhanced situational awareness and more operational planning options.
  - Used effectively in lieu of manned reconnaissance.
  - Can recognize manned-sized objects, but cannot identify armed from unarmed personnel or find IEDs.
  - AV susceptible to acoustic and visual detection.

- Raven SUAS is not operationally suitable.
  - SUAS-equipped unit cannot sustain itself in prolonged combat.
  - Consumed parts at a rate in excess of the parts allocation.
  - Operators were able to quickly repair the AV if parts were on-hand.
  - AV was not reliable, demonstrated 5.6 hrs MTBSA (12 req'd).

Observations & Advice

- Focus on warfighter's mission accomplishment, CONOPS, and total life-cycle cost.
  - Understand the rationale behind the capabilities and KPPs.
  - Clearly define mission success.
- Reliability ….. Reliability ….. Reliability.
- Take advantage of inherent redundancy, balance vs workload.
- Some tactical UAS fielded without operators – additional duty.
- Target location error and resolution.
- Weapons – create whole new set of additional operational issues.
- Work to reduce UAS susceptibility in early design efforts.
- System proliferation creates airspace management issues – will face similar terrestrial battlespace management issues.
- Extreme Environments – hot, cold, wind, weather.
- Countermeasures, GPS jamming, friendly Counter IED Systems – complex spectrum.
- Incorporate Real-Time Casualty Assessment System (RTCA).
- Warfighter's operate in a joint environment today.

Back-up Slides

Deputy Director, Land & Expeditionary Warfare

10 USC Section 139

- "There is a Director of Operational Test and Evaluation in the Department of Defense, appointed from civilian life by the President, by and with the advice and consent of the Senate."

- "**Operational test and evaluation** means --
    - the field test, under realistic combat conditions, of any item of (or key component of) weapons, equipment, or munitions for use in combat by typical military users; and
    - the evaluation of the results of such test."

Deputy Director, Land & Expeditionary Warfare

10 USC Section 139

"The **Director** shall --

- prescribe, by authority of the Secretary of Defense, policies and procedures for the conduct of operational test and evaluation in the Department of Defense;

- provide guidance to and consult with the Secretary of Defense and the Under Secretary of Defense for Acquisition and Technology and the Secretaries of the military departments in general and with respect to specific operational test and evaluation ...;

- coordinate operational testing conducted jointly by more than one military department or defense agency;

- monitor and review all operational test and evaluation in the Department of Defense;

- review and make recommendations to the Secretary of Defense on all budgetary and financial matters...;

- monitor and review the live fire testing activities of the Department...."

Operational Effectiveness

The <u>overall degree of mission accomplishment</u> of a system when used by representative personnel in the environment planned or expected for operational employment of the system considering:

- organization
- doctrine
- tactics
- survivability
- vulnerability
- threat

Operational Suitability

- The degree to which a system can be <u>satisfactorily placed in field use</u>, with consideration given to:
  - availability
  - compatibility
  - transportability
  - interoperability
  - reliability
  - wartime usage rates
  - maintainability
  - safety
  - human factors
  - manpower supportability
  - logistics supportability
  - documentation
  - training requirements

Hon. Charles E. McQueary
Director, Operational Test & Evaluation
703-697-3655

David W. Duma
Principal Deputy Director
703-697-4813
David.Duma@osd.mil
Missile Defense

Dr. Ernest Seglie
Science Advisor
Ernest.Seglie@osd.mil
703-697-3655

COL Bill Bennett
Senior Military Assistant
Henry.Bennett@osd.mil
703-697-3655

Stephen C. Daly **Deputy Director** **Land & Expeditionary** **Warfare** **703-697-3891** **Steve.Daly@osd.mil**	**Michael D. Crisp** **Deputy Director** **Air Warfare** **703-692-9929** **Mike.Crisp@osd.mil**	**Thomas B. Blann** **Deputy Director** **Naval Warfare** **703-681-5417** **Thomas.Blann@osd.mil**	**William J. McCarthy** **Deputy Director** **Net-Centric & Space** **Systems** **703-681-5411** **William.McCarthy@osd.mil**	**Richard G. Sayre** **Deputy Director** **Live Fire** **703-614-3991** **Rick.Sayre@osd.mil**

Land Warfare Systems
Expeditionary Warfare System
Future Combat Systems
Battle Command
Land Munitions
Rotary & Tilt-Rotor Aircraft
Tactical UAV
Chem-Bio Defense Program
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Joint Rapid Acquisition Cell
Integrated Resource Analysis
T&E Threat Resource Activity
Joint Test Board
	Air Combat Systems
	Strategic Air Combat Systems
	Aircraft Carriers
	Air Launched Munitions
	Endurance UAVs
	Air Warfare C4ISR Systems
	IR/UV/RF Def Combat Sys
	Airlift Systems
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	Joint T&E Program
	Center for Counter Measures
		Surface Ships
		Submarines & UUVs
		Navy Combat Systems
		  Radars
		  Sonars
		  EW System
		  CEC
		Naval Munitions
		  Missiles
		  Guided Projectiles
		  Torpedoes
			Space & Strategic Systems
			Net-Centric Systems
			Strategic C4ISR Systems
			Major Automated Info System
			Chemical Weapons Demil
			-------------------------------------- 	
			Network Information
			  Assurance & Interoperability
			  Assessment
				Live Fire – Land, Air, Naval
				Lethality & Survivability
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				Joint IED Defeat
				Joint Live Fire Program
				Joint Aircraft Survivability
				Joint Technical Coordinating
				  Group-Munitions
				  Effectiveness