Washington Institute of Technology

TESTING AND EVALUATION OF EMERGING SYSTEMS IN NONTRADITIONAL WARFARE (NTW)

The Pentagon Attacked

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T&E OF EMERGING SYSTEMS IN NTW

AGENDA

- Introduction
- Current T&E Needs and Deficiencies
- T&E Objectives and Issues
- Factors Affecting T&E Initiatives
- Summary

T&E OF EMERGING SYSTEMS IN NTW

BRIEFING PURPOSE	To introduce the implications of emerging threats on test and evaluation initiatives and indicate future parameters needed by M&S to encompass NTW concerns.

CHARACTERISTICS OF NONTRADITIONAL WARFARE (NTW)

NTW consists of activities involving opposing sides—not organized in conventional manner of structured echelons of forces, weapons, and support systems in use during 20th century.

NTW comprises new types of threats from strategic BMs, WMD, electronic warfare, urban and guerrilla operations, mine warfare, and terrorism—perpetrators are often in small groups that are in remote/undisclosed positions.

New threats not effectively countered by conventional means of forces without reshaping tactics, organizations, and technological applications.

Unconventional warfare and asymmetrical warfare terms do not encompass full range of new NTW threats to national security.

NTW drives the need for new types of conflict countermeasures, responses, and systems to meet these nontraditional challenges.

GENESIS OF BOOK

Book on NTW started more than two years ago by small group of scientists, engineers, and defense experts.

Group of talented leaders and thinkers were concerned about focus, characteristics, and aspects of national security programs—reluctant shift from Cold War emphasis.

Decision was made to devote personal time and energy to introduce these concerns and suggest measures and responses for action by US and others through a series of 30 essays.

These independent efforts and views by the individuals were unfunded by government or other interests—Washington Institute of Technology served as arranger and supporter.

Overarching goal of group was to provide a foundation and forum for addressing issues, organizations, processes, and technological developments involved in responding to NTW threats.

NTW BOOK (published in May 2002)

Non-Traditional Warfare is a collection of 30 essays providing a comprehensive overview of various aspects of NTW. Major sections include:

- Threats and Risks in the New Century
- Operations in the Non-Traditional Warfare (NTW) Environment
- Emergency Management in Hostile Environments
- Models and Tools for Addressing Non-Traditional Warfare
- Institutional Responses to Non-Traditional Warfare
- Applying New and Emergent Technologies in Non-Traditional Warfare

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BACKGROUND AND CONCERNS

- Threat to US is shifting from cold war conditions to new array of threats, technologies and warfighting concepts
- This new problem set is designed to create asymetrics in US defenses capabilities through applications of chemical/biological weapons, electronic warfare, urban and guerrilla operations, and terrorist attacks.
- Nontraditional warfare (NTW) situations generate major perturbations to conventional T&E programs organized to address structured combat conditions
- New weapon effects manuals will need to be developed to address methodologies and database requirements outside boundaries of conventional weapons
- These emerging conditions will cause changes in requirements for T&E as well as technology countermeasures, system vulnerabilities and employment strategies for US weapon systems

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CURRENT NEEDS AND DEFICIENCIES

- Ranges to test new technologies or threats from chemical/biological weapons, electronic warfare, and operations in less organized battlefield conditions
- Weapon effects data plus models and simulations (M&S) to support the T&E process
- Relationships and methodologies for estimating/projecting effects of new threats/technologies for future JMEMs
- Development of the T&E Master Plan, funding profile, and critical information requirements
- Preparation of communications and briefing packages to support new T&E program
- Review and modifications of LFT&E legislation and funding to meet emerging threat/technologies

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EMERGING NON-TRADITIONAL WARFIGHTING T&E CONCERNS	T&E OBJECTIVES	T&E ISSUES/REQUIREMENTS
MANAGEMENT INFORMATION AND COMMUNICATIONS SUPPORT SYSTEMS	▪ Determine vulnerability of U.S. systems in electronic warfare (EW) conditions	▪ Determine critical nodes in information transfer process ▪ Define EW threats and engagement concepts ▪ Establish equipment performance threshold criteria ▪ Identify means to intercept information transfer and processing
	▪ Evaluate means to enhance survivability of U.S. C4I systems by adapting design changes and process improvements ▪ Develop test data for V&V of modeling and simulation	▪ Show impact of design changes/hardening on survivability improvements ▪ Create knowledge base on phenomenology associated with coupling of electronic effects to C4I equipment ▪ Determine sensitivity to countermeasures and engagement constraints
DIRECTED ENERGY WEAPONS (DEW) SYSTEMS	▪ Determine susceptibility of U.S. combat systems to damage from DEW systems ▪ Develop data to support methodology for predicting DEW effects using M&S and test data	▪ Investigate compatibility of EMP hardening for other DEW systems including RF and lasers ▪ Expand knowledge base on coupling effects of DEW on combat systems ▪ Determine sensitivity to countermeasures and engagement constraints
	▪ Establish bounds on lethality of DEW against foreign combat systems	▪ Develop insights into utility of focused non-nuclear EMP, RF weapons, and lasers against foreign combat systems ▪ Identify means to enhance performance of DEW against foreign systems

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EMERGING NON-TRADITIONAL WARFIGHTING T&E CONCERNS	T&E OBJECTIVES	T&E ISSUES/REQUIREMENTS
PRECISION STRIKE SYSTEMS	▪ Investigate lethality of precision gun-launched projectiles against high value military targets	▪ Show trades between employing velocity and guidance-combinations versus mass to achieve targets kills ▪ Clarify promise of electro-mechanical-chemical technology to reduce cost and weight factors
	▪ Develop data to support methodology for projectile lethality based on velocity rather than mass for target kills	▪ Develop concepts for testing precision guided sensor weapon combinations ▪ Evaluate consequences of hitting “sweet spot” or tight hit patterns rather than general vulnerability areas to predict damage ▪ Assess the validity of current models for JLF/LFT shot planning in precision strike tests
NON-LETHAL WEAPONS	▪ Determine vulnerability of U.S. and foreign systems to non-destructive weapons concepts to include non-nuclear EMP, electrical energy dispensing personnel debilitation, and mechanical energy material debilitation	▪ Develop performance objectives/criteria for non-lethal weapon requirements against personnel and material ▪ Determine Battle Damage Assessment (BDA) methods and processes
	▪ Support methodologies for predicting non-lethal target damage	▪ Evaluate personnel and material damage levels necessary to accomplish mission degradation

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EMERGING NON-TRADITIONAL WARFIGHTING T&E CONCERNS	T&E OBJECTIVES	T&E ISSUES/REQUIREMENTS
ROBOTIC COMBAT SYSTEMS	▪ Determine vulnerability of emerging combat systems to anti-armor robotic systems	▪ Evaluate implications of target size, mobility, and stealth capability to achieve target kills
	▪ Assess lethality of U.S. weapons against threat robotic systems	▪ Investigate options and techniques for defeating robotic threat systems with lethal and DEW systems
COUNTER-TERRORIST WEAPONS	▪ Determine capability of U.S. armored systems to withstand chemical/biological attacks from mortars and artillery rounds	▪ Translate threat scenarios into framework for test planning including simulations, burst locations from targets, and instrumentation ▪ Determine vulnerability of combat vehicle occupants as a function of test conditions and engagement parameters
	▪ Determine capability of U.S. personnel in combat vehicles to withstand chemical/ biological weapons by onboard rapid detection and protective measures	▪ Assess utility of current and planned measures to protect combat vehicle occupants with detection devices and inoculation, protective clothing, overpressure, etc.

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FACTORS AFFECTING T&E REQUIREMENTS FOR NONTRADITIONAL WARFIGHTING EQUIPMENT AND SYSTEMS

EMERGING NTW SYSTEMS	KEY CONSIDERATIONS AND FACTORS				
	TESTING STANDARDS/ CRITERIA	TESTING RESOURCES	M&S AVAILABILITY	ACDTs	COLLATERAL DAMAGE
Management Information and Communications Support Systems	●	●	●	●	○
DEW Systems	●	●	●	◎	●
Precision Strike Systems	◎	○	◎	●	◎
Non-Lethal Weapons	●	●	●	◎	●
Robotic Combat Systems	●	○	●	◎	○
Counterterrorist Weapons	●	●	●	○	●

○ Somewhat important

◎ Moderately important

● Extremely important

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MODEL PURPOSE	MODEL OPERATION	LIMITATIONS
To test and evaluate capability of systems to operate in NTW environments. To use models for predicting performance and vulnerability issues.	T&E models consist of processes, automation, and algorithms to reflect system performance or technology capabilities. Models can be physics-based, empirical based, or analytical formulations	▪ M&S predictions rarely coincide with actual test results. ▪ Surrogates, simulations, and new test ranges are necessary to treat many NTW scenarios ▪ Existing databases do not cover emerging NTW threats

SUMMARY

- Most of the current T&E efforts are related to previous threats and situations and cannot encompass the emerging NTW threats
- New problems and concerns are quickly surfacing on NTW problems
- The program dimensions and understanding necessary to address NTW problems is lacking
- Future T&E efforts for NTW should include:

  --Ranges to test new technologies and threats

  --Environmental constraints on test facilities

  --Instrumentation to measure performance

  --Standard new weapon effects data to support M&S
- New M&S are necessary to support the emerging threat evaluation process