



Improving Developmental & Operational Test Integration via Technology

Brian M. Simmons

**Director
US Army Evaluation Center**

15 April 2008





Agenda

- ATEC Mission
- OSD & Army Acquisition Initiatives
- Benefits of DT/OT Integration
- DT/OT Integration in the Army and Technologies that May Help



ATEC Mission

- Plan, conduct, and report the results of tests, simulations, experiments, and evaluations to Acquisition decision makers in order to ensure our Army's Warfighters have the right capabilities for success across the entire spectrum of operations.
- Conduct rapid testing in direct support of the GWOT warfighter in order to provide capabilities and limitations of weapon systems issued directly to Soldiers conducting combat operations (Iraq/Afghanistan).



OSD T&E Initiatives

- **Focus on measuring improvements to capability and operational support**
- **Experiment to learn strengths & weaknesses - impact on capabilities**
- **Integrate Developmental Testing & Operational Testing**
- **Start early, be operationally realistic, continue throughout the life cycle**
- **Evaluate in mission context at time of fielding**
- **Compare to current mission capabilities**
- **Use all available information**
- **Exploit benefits of Modeling & Simulation**



Army Acquisition Initiative

Reliability Improvements

- Significant number of U.S. Army systems are failing to demonstrate established reliability requirements during operational testing

Effective Immediately:

- A System Development and Demonstration (SDD) reliability test threshold will be established
- Applies to programs in pre-MS B phase
- Applies to Information Technology systems that include hardware development
- Threshold to be established before entrance into MS B
- Must detect and report threshold breaches
- Must implement Reliability Best Practices



Army T&E

Developmental Testing

- to find faults, implement corrective actions, and mature the design
- to confirm technical capabilities/functionality and manufacturability

Operational Testing

- to provide information on integration of the Soldier, the support system, training & doctrine, and materiel in an operational environment
- to confirm/demonstrate operational suitability requirements



Benefits of DT/OT Integration

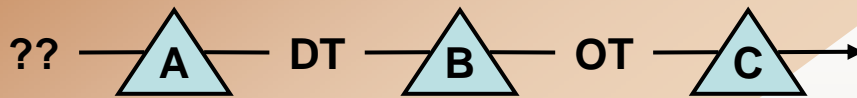
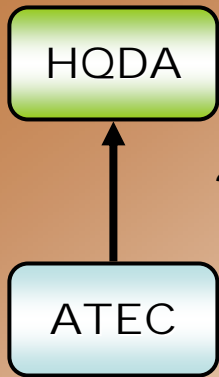
- **Reduced Risk**
 - Ensure capabilities are tied to mission
 - Systems deficiencies identified
 - Test data is shared
- **Reduced Cost**
 - Sharing resources
 - Eliminate duplicative testing
 - Early deficiency identification and correction
- **Reduced Acquisition Timeline**
 - Combined vs. sequential testing
 - Sharing of high-demand testing assets



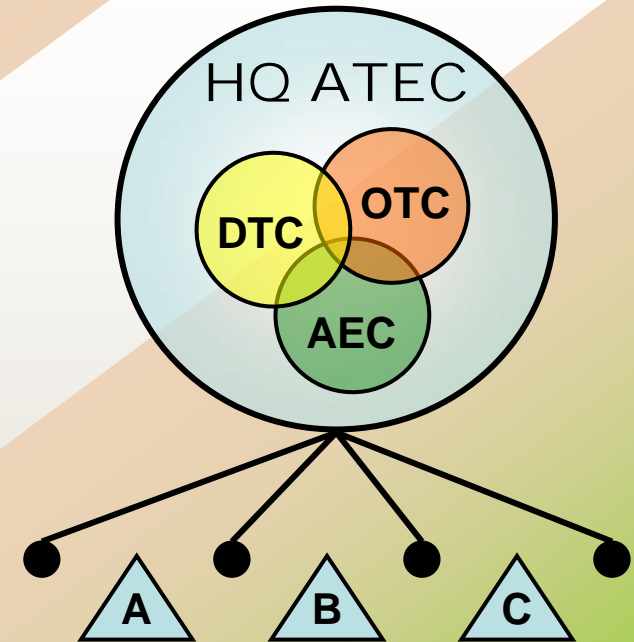
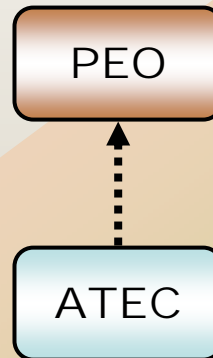
Strategic Organizational Construct

FROM:

TO:



→ Saves Time & Money
→ Does Not Compromise Org Independence

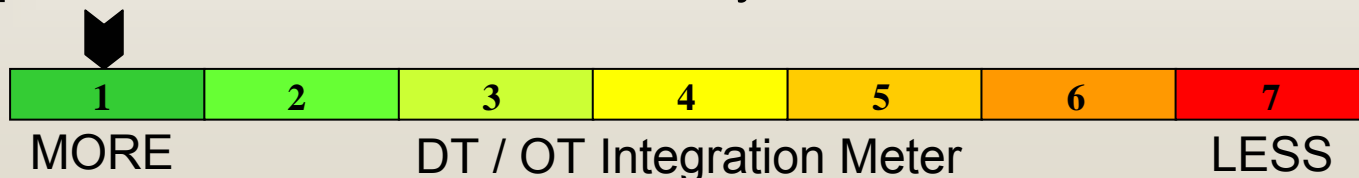




DT/OT Integration in the Army

Ballistic Missile Defense

- DT/OT Integration is widely used, but not in “traditional” definition
- DT is all planned, executed, and reports written by the PM (not ATEC/DTC); has significant system contractor influence/input
- No planned IOT, BMDS OTA arranges for Warfighter participation during DT events, using operationally realistic scenarios and DIA threat representation in HWIL and digital M&S
- Warfighter participation in flight and ground test events
- Proposed end-of-block OT will likely include contractor involvement





Technology That May Improve DT/OT Integration

Ballistic Missile Defense

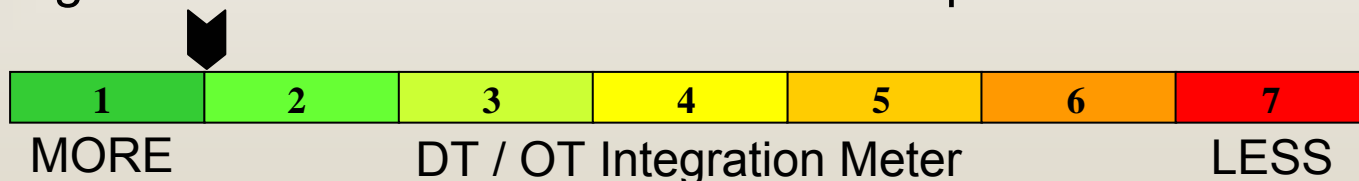
- Screen capture / frame-grabbing devices
- Automated data capture and transfer; data reduction
- Shared analysis tools



DT/OT Integration in the Army

Medical / Business Information Technology (IT) Systems

- A “hybrid DT/OT” usually, depends on product size, system complexity, software maturity
- Developer Integration Testing in laboratory test bed using production-representative hardware
- Not “ad hoc” – firm processes and procedures
- More Commercial Off The Shelf (COTS) - based products in use
- DOT&E process for determining level of OT – ranges from ATEC looking over shoulder of DT tester to a full operational test





Technology That May Improve DT/OT Integration

Medical / Business Information Technology (IT) Systems

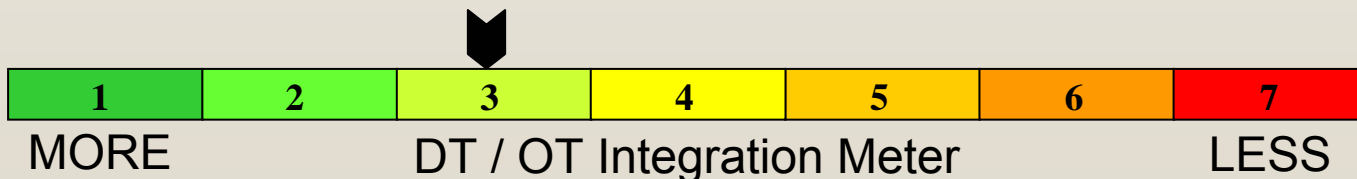
- Improve Modeling of networks (currently using none)
- Better Data Management and sharing



DT/OT Integration in the Army

Chemical / Biological Defense

- All live BWA & actual CWA testing is done in chamber in DT
- For Oversight systems Chem/Bio Policy defines this as DT-OT
- Many OTs are conducted in partnership with DT Community on outdoor ranges (mostly DPG) that operates and manages instrumentation to determine simulant concentration
- Key effectiveness evaluation hinges on integrating results from chamber testing with actual agent and operational testing





Technology That May Improve DT/OT Integration

Chemical / Biological Defense

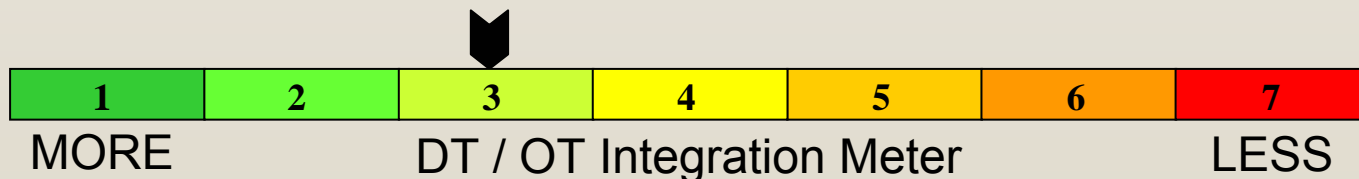
- Increase use of HWIL to stimulate detector sensors
- Real need for more accurate simulants of live agents; ALO (Agent-Like Organism)
- Better Data Management and sharing



DT/OT Integration in the Army

Aviation

- DT/OT widely used for subsystem evaluation (i.e. CMWS)
- Hardware-in-the-Loop Simulations
- Soldiers used in DT, especially moving from component level to subsystem level tests
- Combined test teams - Air Worthiness Release restricts introducing operational pilots early on.
- Operational Testing conducted at DT ranges





Technology That May Improve DT/OT Integration

Aviation

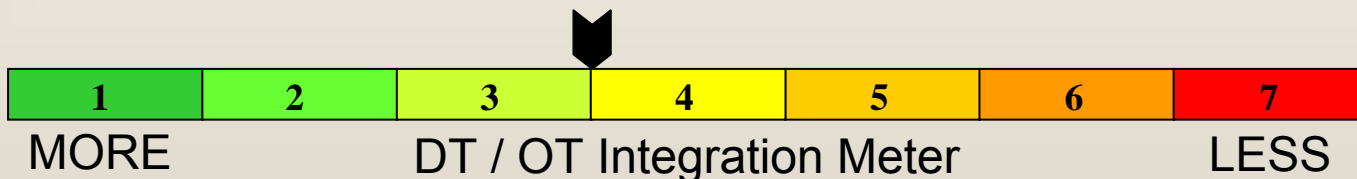
- Improved models and simulations; cockpit simulators
- Automated instrumentation for Real Time Casualty Assessments
- GPS- (or other geometric pairing) based RTCA systems
- Collaborative tools / personal communicators



DT/OT Integration in the Army

Infantry Weapons and Soldier Systems

- Non-oversight ACAT III systems: usually integrated DT/OT in a single location
- DT done first for safety/performance check; OT phase with Soldiers follows
- Rapid Acquisition systems: usually just DT, then theater
- Some OT at technical test sites (hot/cold regions, etc)
- OT = Soldiers in lanes





Technology That May Improve DT/OT Integration

Infantry Weapons and Soldier Systems

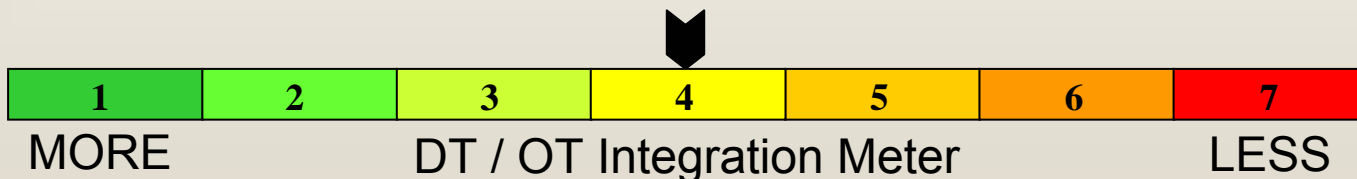
- Improved commonality of instrumentation
- Common data reduction protocols at all test sites



DT/OT Integration in the Army

Unmanned Aerial Vehicles (UAV)

- DT always for component-level building and assessment and Air Worthiness Release
- Soldiers used in DT, especially moving to subsystem level tests to obtain early user feedback
- DOTE requires greater operational realism in OT – tactical personnel using approved doctrine





Technology That May Improve DT/OT Integration

Unmanned Aerial Vehicles (UAV)

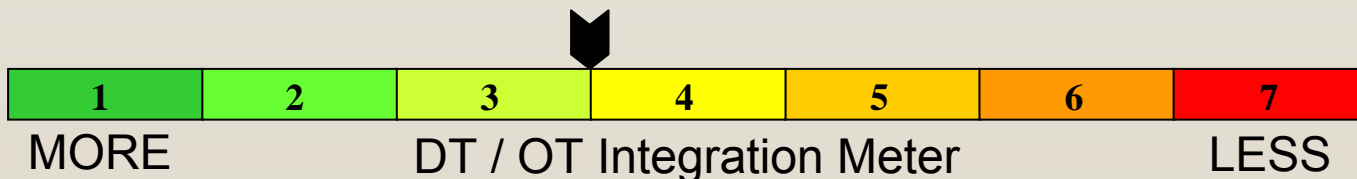
- Improved availability of models
- Improved Operator simulators
- Improved communication equipment to keep Combined Test Team in the loop
- Develop common instrumentation and data reduction protocols at all sites



DT/OT Integration in the Army

Missiles (Direct / Indirect Fire)

- Extensive firings early without operators
- Extensive Developmental Testing
- Extensive HWIL
- Extensive M & S
- Formal OT's





Technology That May Improve DT/OT Integration

Missiles (Direct / Indirect Fire)

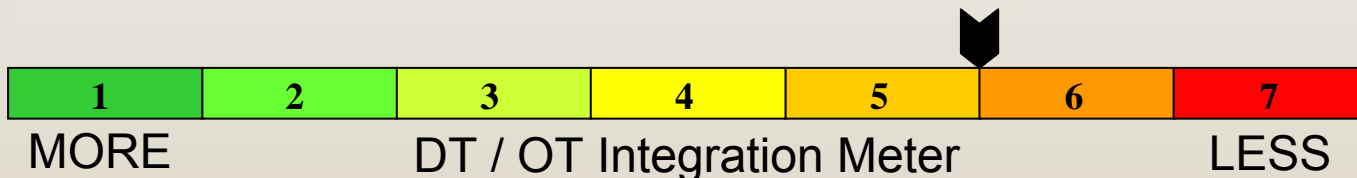
- Continued heavy emphasis on M&S and HWIL
- Improved data collection, data reduction to speed up test reports to the evaluator
- Better threat replication (consistency between DT & OT) and usage in virtual environment



DT/OT Integration in the Army

C4 Systems

- Limited Gov't DT – shock, vibration testing, interoperability; message completion rates
- Communications systems – performance centers on stress testing and operational environment
- Field testing is most useful integrated event – soldiers and developers working together to establish system configuration and achieve optimization
- Field tests are cost prohibitive – need for architecture for system to create the environment





Technology That May Improve DT/OT Integration

C4 Systems

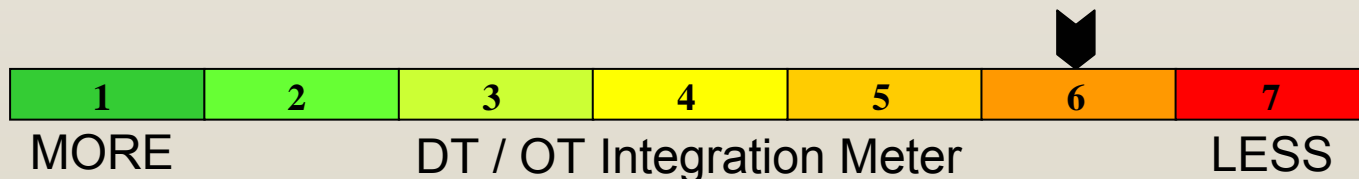
- Improve available models and simulations
- Invest in jammers / Electro-Magnetic Environment generators
- Improved data management (storage, retrieval, sharing)



DT/OT Integration in the Army

Counter IED

- non-typical development process
- from Laboratory to DT Ranges to Theater – fielding decisions based on DT results and production timelines
- for Jammers – DTs are technical tests on instrumented ranges; PM data considered when available
- DOT&E has not been involved in this commodity area





Technology That May Improve DT/OT Integration

Counter IED

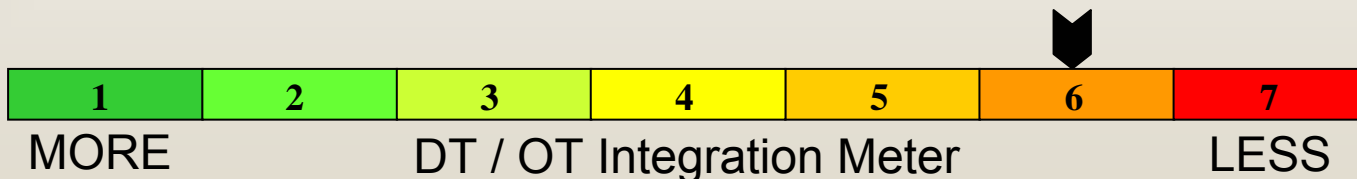
- Increase investment in S&T / R&D before T&E
- Invest in in-line jammers / Electro-Magnetic Environment generators
- Better threat replication (consistency between DT & OT)
- Commonality of instrumentation
- Instrumentation sharing between DT & OT organizations



DT/OT Integration in the Army

Tracked & Wheeled Vehicles

- Usually Separate DTs and OTs; higher risk – more oversight
- OMS/MP miles driven by contract, over known, precise courses
- Extensive data collection in DT
- DOT&E wants “free play” in OT; freedom of maneuver, much of which can be done at Soldiers’ home station





Technology That May Improve DT/OT Integration

Tracked & Wheeled Vehicles

- Increase number of instrumented test articles
- Embedded instrumentation
- Common instrumentation and data reduction protocols at all sites
- Technology for tracking in GPS-denied environments



Integration Roll-Up

Ballistic Missile Defense

Medical/Business IT Systems

Chemical/Biological Defense

Aviation

Infantry Weapons/Soldier Systems

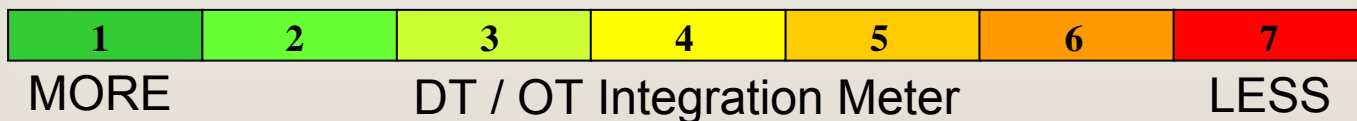
Missiles (Dir/Indirect Fire)

Unmanned Aerial Vehicles

C4 Systems

Counter IED

Tracked/Wheeled Vehicles





Summary

To further improve DT & OT integration,

T&E technology needs include:

- Data management (repository, reference models)
- M&S advances (physical system models, simulations, networks)
- Network Models
- Distributed operations & systems
- Embedded / common instrumentation



Brian M. Simmons
(410) 278-0370
brian.simmons@us.army.mil