M&S Support to Joint Experimentation

From Today’s Concepts to Tomorrow’s Capabilities

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Simulating Tomorrow
J95 Mission Statement

Joint Experimentation

- J95 will support the Joint Experimentation Program with model and simulation tools that:
  - Are analytically accurate, flexible, responsive, and user-friendly.
  - Are capable of reflecting future doctrine, organizations and materiel.
  - Represent the synergies of Joint and coalition warfighting concepts.
Rapid Decisive Ops

Joint Experimentation

- RDO is the integrating concept that our efforts will focus around.

  - Spiral 1 FY00 - Shaping the Battlespace.
  - Spiral 2 FY01 - “Strike” Operations.
  - Spiral 3 FY02 - Sustainment and Transition.
  - Spiral 4 FY03 - Simulation of the Live event in FY04.
  - Spiral 5 FY04 - Live Event with simulation support.

- Under the RDO concept the following concepts will be explored:
  - Attack Ops Against Critical Mobile Targets (AOACMT)
  - Adaptive, Joint C2
Current Programs

Joint Experimentation

- RDO Phase 1 - FY00 - Setting Conditions
  - LOE 001 Non-Kinetic Weapons - JCATS
  - Urban AOACMT - TRANSIMS
  - Information Superiority & AOACMT - EADTB
  - RDO Options & Information Superiority - EBW
  - RAPID Deployment - JFAST
  - Air, Sea Superiority, AO expanded tgt set - PEGASUS
  - Test JWARS
  - Aerospace M&S.
  - Preparation of JSAF(STOW) for 1st Qtr FY01.
  - Sensor Federate.
  - Millennium Challenge 00
Future Programs

Joint Experimentation

• RDO Phase 2 - FY01 - Strike Operations
  ▲ JSAF/STOW Federation
  ▲ JWARS Availability?? (back-up is Pegasus)

• Phase 3 - FY02 - Sustainment and Transition
  ▲ M&S candidates are few.

• Phase 4 - FY03 - Virtual Field Test of the Concepts (CAWE?)
  ▲ JSIMS Availability?? (Back-up is JTC)
  ▲ JWARS Applicability??

• Phase 5 - FY04 - Live Integrating Event - Field test of the Concepts.
  ▲ Supported by JSIMS ??.
“According to the DMSO, the Ability to Model or Simulate Important Warfighting Elements, Such As Command and Control, Operations Other Than War, Information Operations, Human/group Behavior Representation, Is Not Well Understood Or Within Dod’s Current Technological Capabilities. These Capabilities May Not Be Fully Achieved for a Decade And Will Require Significant Basic Research Effort to Establish An Acceptable Degree of Confidence in Their Utility.”
Joint Experimentation is an *iterative process* of collecting, developing and exploring *concepts* to identify and recommend the *better value-added solutions* for changes to DOTMLP required to achieve *significant advances* in future joint operational capabilities.
M&S Tools to Support Joint Experimentation

OPERATIONAL REQUIREMENTS

- Doctrine - “Jointness”.
- Training - Identifying Training deficiencies.
- Materiel - Non-linear Battlespace.
- Leadership - Simulation of Human Decision Making.
- Personnel - Simulation of Human Behaviors.
**Tools to Support JE Process**

**Joint Experimentation**

**Concepts** - **Experiment Design** - **Experiment Operations** - **Assessment** - **Integration**

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**Increasing Scope & increasing Analytic Rigor**

- **Constructive**
  - **Virtual**
  - **LIVE Field testing of the Concept.**

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<thead>
<tr>
<th>Stage</th>
<th>Description</th>
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<tr>
<td>Concept development supported with “spreadsheet” type simulations</td>
<td>Experiment Design supported with M&amp;S tools that are closed-form, faster-than-real-time M&amp;S to assist Scenario development, &amp; technical planning (network structures, etc.)</td>
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<tr>
<td>Constructive M&amp;S for concept refinement. Virtual M&amp;S for HITL issues.</td>
<td>M&amp;S used to examine nuances discovered in branches and sequels. Fast running PC based M&amp;S.</td>
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<td>Visualization from M&amp;S playback facility may be used to present prelim concept to Seniors.</td>
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**Time**

- **DISCOVERY**
- **ANALYSIS**
- **REFINEMENT**
- **DOTMLP Transformation**
• A Single Simulation Environment That Could Be Configured to Be:
  ▶ Fast Running Constructive.
  ▶ Real-time HITL, Virtual.
  ▶ Multi-resolution!!!.

• A Simulation Environment That Allows For:
  ▶ Easy and Flexible Scenario Generation
  ▶ Rapid, Numerous Changes to Parameters, Doctrine, Forces, Organizations…
  ▶ Scenario Sharing Across the Resolutions.

• Analytic Rigor:
  ▶ Data and Algorithm “Pedigrees.”
  ▶ Service “Buy-in”.

• A Simulation Environment That Can Be Configured As
  ▶ PC-based or an “Immersive” Environment.
  ▶ Single Processor And/or Distributed.

• User Friendly and Meets DOD Standards.

FLEXIBLE, FLEXIBLE, FLEXIBLE, FLEXIBLE
# Contact List

## Joint Experimentation

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<thead>
<tr>
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BACKUP SLIDES
**JFAST** (Joint Flow and Analysis System for Transportation)

**Joint Experimentation**

- USTRANSCOM-Owned, Proven, Operational Planning Tool for Multi-modal Transportation Analysis (Part of the Global Transportation Network (GTN)).

**STRENGTHS:**
- Runs on One NT Workstation; Can Also Be Distributed.
- Highly Graphic, User-friendly GUI With Extensive Reporting Module.
- Accepts and Outputs Standard JOPES TPFDD in B8 Format.
- FREE!

**LIMITATIONS:**
- Requires User to Pre-specify Transportation Mode for Each Deploying Element.

**APPLICATION:**
- Front-end Analysis Tool to Assist in Defining the “Rapid”
EBW (Entropy Based Warfare)

Joint Experimentation

• A BAH product used to support wargaming efforts in the Army, Navy and the Office of net Assessment. EBW is different from legacy, attrition-based models.

• **STRENGTHS:** Represents the impact and/or value of information.
  ▲ Information impacts the battle outcomes through Entropy, which measures levels of disorganization, dysfunction, and demoralization
  ▲ Lack of information, or delivery of misinformation, increases entropy
  ▲ Delivery of timely, accurate, high quality information decreases entropy
  ▲ The model also accounts for the full range of conventional (air, ground, and naval combat) and unconventional (information operations and space warfare) military actions.

• **LIMITATIONS:** It was built from a board war-game and requires the “smart-guy” behind the curtain to make it function. Not verified and validated for analytical or experimentation uses. Limited availability of data.
• **USACOM owned, multi-service, multi-sided, interactive, entity-level simulation.**

• **STRENGTHS:**
  √ Plays a range of battlespace missions in a wide variety of terrain settings.
  √ Real strengths lie in its portrayal of urban terrain operations and in its portrayal of non-lethal weapons.

• **LIMITATIONS:** Scalability upwards. Not Verified and Validated for Analytical or Experimentation uses.

• **APPLICATION:** JCATS is the perfect tool for the Non-Kinetic LOE. It plays all forms of non-kinetic weapons and there is already available Kosovo terrain and scenario data bases.
JSAF (Joint Semi-Automated Forces) STOW

Joint Experimentation

• JSAF is the simulation piece of the STOW ACTD and its control center is resident within the JTASC.

• STRENGTHS:
  ▶ Excellent HITL capability.
  ▶ High resolution facilitates examination of specific systems/parameters.
  ▶ Already performed VVA leading up to J9901 event.

• LIMITATIONS:
  ▶ High operating overhead - personnel/equipment.
  ▶ Limited scalability upwards
• A DOE-LANL simulation that represents the next generation of M&S technologies and is designed to take advantage of the supercomputing power of the lab.

• **STRENGTHS**: Can model upwards of 2.5M entities. Used to analyze the traffic problems in Dallas and Los Angeles. Use of this simulation allows JFCOM to “buy into” M&S future technology and assess it for use in other areas of combat simulation.

• **LIMITATIONS**: Will need to adapt this for military context.
JWARS (Joint WARfare System)

Joint Experimentation

• JWARS is a Joint Staff J8-sponsored program currently under development as an analytical tool to support joint analysis and the QDR.

• STRENGTHS:
  ▶ A joint, fast-running simulation.
  ▶ Robust, balanced representation of warfare functionality.
  ▶ Designed from the ground up as an analytical tool with concurrent V&V.

• LIMITATIONS: A limited version will be released next spring. Unknown.

• APPLICATION: J9 will use this tool to shadow the Pegasus work and to learn evaluate its’ impact and effectiveness.
EADTB (Extended Air Defense Test Bed)

Joint Experimentation

- Space and Missile Defense Battle Lab-owned, high-resolution simulation of the full spectrum of Joint battlefield sensors and resultant weapon performance against fixed, mobile, and airborne targets.

- **STRENGTHS:**
  - Good options for varying levels of detail across all battlefield elements.
  - Flexibility in specific system representation allows balancing of scope, fidelity, and execution speed.
  - Multi-resolution terrain and features, and weather.
  - High resolution.

- **LIMITATIONS:**
  - More air-oriented than others.
  - Limited Battlespace.

- **APPLICATION:** Use to support AOACMT special issues
• DMSO-sponsored HLA federation demonstration project linking nominated Service models - Eagle, NSS, and EADSIM.

• **STRENGTHS:**
  ▶ Runs faster than real time.
  ▶ Federation development process facilitates linking the best models for a specific event quickly.
  ▶ Strong suite of data collection and analysis tools.
  ▶ Sims were nominated by the service components to specifically address JSEAD issues.

• **LIMITATIONS:**
  ▶ Limited capability to explore HITL issues.

• **APPLICATION:** Use to conduct RDO/AOACMT event J0019.
Joint Experimentation

**JFAST** (prep-pegasus WS)

**JCATS** (LOE0001)

**EADTB** (AO WS)

**JSAF** (LOE0002)

**EBW** (IS/RDO Wargame)

**J0019 PEGASUS** (RDO/AO)

**JWARS** (M&S)

**TRANSIM** (LOE0002)

**MC00**

**JCATS** (LOE0001)

**JWARS** (M&S)

**TRANSIM** (LOE0002)

**MC00**