Exercise Modeling & Simulation Briefing

National Exercise Division (NED)
National Exercise Program (NEP)
National Exercise Simulation Center (NESC)

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Objectives of the Presentation

- NED-NEP Overview
- NESC Mission and Objectives
- NESC Business Model
- Introduce the M&S Value Proposition
- Exercise Modeling and Simulation Concepts
- Demonstrate How the NED/NEP/NESC are Instituting Exercise M&S
NEP Components

- NEP program components include:
  - National-Level Exercise (NLEs) (Annual NEP Tier I exercise)
    (national security and/or homeland security exercises centered on
     White House directed, USG-wide strategy and policy)
  - Principal-Level Exercise (PLEs) (Quarterly Presidential Cabinet level
    exercises focused on current USG-wide strategic issues)
  - NEP Five-Year Exercise Schedule of NLE/PLE and significant NEP
    Tiered exercises with a strategic USG-wide focus
  - National Exercise Schedule (NEXS) (schedule of all Federal,
    Regional, State, and local exercises)
  - Corrective Action Program (CAP)
  - Homeland Security Exercise and Evaluation Program (HSEEP)
NESC Foundation & Organization

- References & Authorities:
  - The Federal Response to Hurricane Katrina: Lessons Learned, page 119
  - Sec. 664, DHS Appropriations Act, 2007
  - Sec. 664, Post Katrina Emergency Management Reform Act of 2006

- The NESC falls into the current organizational structure
  - Department of Homeland Security (DHS)
    - Federal Emergency Management Agency (FEMA)
    - National Preparedness Directorate (NPD)
    - National Exercise Division / National Exercise Program (NED – NEP)
    - National Exercise Simulation Center (NESC)

- The NESC was formally established 1/12/09 and is a component of the National Exercise Division. NESC supports NED’s role as the executive agent for the National Exercise Program (NEP)
NESC Mission & Objectives

- Mission: To enhance the Department’s all-hazards preparedness and response mission through the promotion of effective and efficient large-scale exercises and the application of modeling and simulation to these exercises.

- The NESC’s primary objectives include providing a state-of-the-art control & simulation center to support national, federal, state, local, and tribal exercises by:
  - Acting as the central resource hub linking exercise personnel and operational planning personnel to **EXISTING** modeling and simulation capabilities
  - Assist advanced operational planners by modeling what an evolving situation may look like
  - Assisting planners in testing their plans while they are being developed

**#1 Challenge: Change the Culture of Exercises** – introduce M&S as a way of increasing efficiency and creating higher yield metric based exercises (e.g. run/rerun)
NESC Integration into the Preparedness Cycle

- **Exercise**
  - Computer-based Simulation
  - Human-based Simulation (SimCell)

- **Evaluate/Improve**
  - Control Cell
  - Quantitative Metrics Analysis integrated into AARs, IPs, CAPs

- **Plan**
  - Support of Exercise Design and Delivery
NESC Simulation Categorization

Human in the Loop

<table>
<thead>
<tr>
<th>Single Participant</th>
<th>Multi Participant</th>
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<tbody>
<tr>
<td>CPR Mannequin</td>
<td>CDP IC Training</td>
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<tr>
<td>Flight Simulator</td>
<td>NESC</td>
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</tbody>
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NESC = Multi-participant Exercise Simulations

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NESC Business Model

- Modeling and Simulation Repository
- SimCell
- Exercise Control & Evaluation
- Advanced Operational Planning

Customer

Tailored Service Offerings

NESC Core (State-of-the-Art Center)

Computer Modeling & Simulation

Human/SME Simulation

Improve Management & Exercise Eval

Exercise Design & Delivery

SMEs and Capabilities Available Through Contract Vehicles, MOUs, MOAs, & IAAs

- Red Teaming
- What If Analysis (Analysis of Alternatives)
- Quantitative Analysis Support
- Others

VNW, CIA, TEEX, DoE, LLNL, DOT, DOS, FBI, CDC, HHS, DOJ, Saudia, LLIS, TELL, OLIVE, CAP, RAMP, DHS S&T, AAR, NAMSEL, EPA, Etc.
NESC Core Capabilities

- **Facilities**
  - Space in FEMA HQ capable of supporting Control and Simulation Cell activities
  - Space to support up to 100 personnel in the main NESC space
  - Be capable of efficiently surging into other FEMA space in the building

- **Audio/Visual**
  - Conduct, monitor, and manage video teleconferencing (VTC)
  - Display data or video from a variety of sources on networked screens within the NESC
  - Ability to access audio from display screens at each workstation
  - Access to the Virtual News Network (VNN) and champion its further virtual world build-out
  - Ability to project audio selectively throughout the NESC, the Web, and other sources
  - Integrated conference call system
  - Access to information sharing capabilities

- **IT**
  - Access to a shared drive, Internet, and Email for every workstation
  - Ability to push content from any computer to any other computer or large monitor screen
  - Scanning, copying, and printing capabilities

- **Security**
  - Ability to work in all security level environments
  - Work in compliance with IT security protocol
What types of simulation?

- The NESC is focused on utilizing decision support simulation to increase exercise realism and immersion in lifelike scenarios
  - Human Based Simulation (actors)
  - Computer Based Simulation

**Human Based Simulation**
- Virtual News Network (VNN)
- SIMCELL role players
- Actors, Make-up

**Computer Based Simulation**
- Virtual Worlds (Avatars)
- Plume Modeling
- Disease Propagation
- Agent Based Simulation
Example Human Simulation
Virtual News Network (VNN)

- Allow all participants to view events and what is being communicated to the public;
- Enable controllers to insert injects into exercise play;
- Test public information officer’s ability to deliver a coordinated message during a time of a threat;
- Move the exercise forward by offering a way to introduce injects.
Benefits of Utilizing Virtual Worlds such as: **OnLine Interactive Virtual Environment (OLIVE)**

Key Features:

- Bring geographically disparate people together: Geographically disparate community can participate without requiring travel or incurring other costs
- Face-to-face interaction & feeling of presence/connectedness
- Collaboration & communication as part of the decision-making process
- Training & Exercise activities and Role-play scenarios
- Replay decisions: Replay decision-making processes to review or validate the results with others
NESC Simulation Hub and Spokes

- The Simulation Hub portion of the NESC will be developed to provide connectivity to experimentation, modeling, and simulation capabilities distributed throughout the country.

- An inventory of existing and developmental capabilities will be conducted to identify networked means of providing access for use during exercises, planning, and real-world response.

- Support from the working group to identify additional tools, assets, and resources will enhance the available capabilities.
Benefits of Computer Simulation

- Enhanced Realism – Increases the realism participants experience throughout the exercise
- Multiple Outcomes - Potential for efficient multiple dynamically derived outcomes. Roll up performance metrics from multi-jurisdictional exercise into single location
  - $X = f(1,2,3,4)$
  - ROI & Cost-Benefit Analyses
- Run & Re-run – Provides a mechanism to show the responder the downstream impact to his/her decision. Participants can explore alternative courses of action in real-time and react to and go beyond their initial decisions (What ifs?)
- Decision Timing – draws out collaborative opportunities and the appropriate timing for engagement in these opportunities

Challenge of Exercise Culture Change - expanding the use and acceptance of computer simulation as a valuable exercise aid across the community

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Comparison of Outcomes

As is

Decision 1 → Decision 2 → Decision 3

Time

Control Intervention

Predictable Exercise Outcome

To Be

Decision 1 → Impact simulated through Model 1 → Decision 2 → Impact simulated through Model 2 → Decision 3 → Decision 4 → Decision 5 → Decision 6

Time

Bounds

Quantifiable Dynamic Outcomes

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Impact of Time on Decisions (in simulation)

- Within a given situation, the timing of a decision can have as much impact on the outcome as the actual decision itself.
- Simulation allows for a more realistic timing component to be added, which was previously unavailable.

Diagram:

- Decision 1
- Decision 3
- Decision 5

Timeline:

- Time

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Early Successes

- Goal is to operationalize 5-6 models with limited inputs to provide greater degree of immersion to participants
  - Model/Simulation will NOT drive the exercise, but rather provide inputs to and impacts of decisions made during the course of the exercise.
M&S Future Operating Model

1. Create and Maintain a catalogue of available Models and Simulations
2. Utilize a screening process for selection of simulation drivers
3. Categorize M&S through NESC Construct
4. Facilitate linkage to exercise planners through common platform

Screening Process

- Categorize M&S through NESC Construct for the Exercise Requirement through common platform

Common Platform
Objective:

- Allow discovery of models/data/expertise applicable to specified hazard, region, and objective
- Enable simulations that can be rapidly localized to a specified region by facilitating their connections to foundational data
- Enable connection (federation) of diverse modeling components
- Enable integrated display of data and simulation results
- Explore advanced collaboration, delivery and deployment mechanisms
**NESC M&S Technical Goals**

**DHS TELL System**
- Exercise Mgmt Sys
  - NxMSEL
  - E-mail and Chat
  - Lessons Learned
  - File Sharing

**Virtual World OLIVE**

**SUMMIT**

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**Principal Benefits of Current Strategy**
- Increased efficiency
- Captures current investment by DHS S&T
- Enhanced exercise realism
- Highlights impacts of decision timing
- Multiple outcomes option / run & rerun (useful for planners)
- Supports the goal of incorporating M&S into the culture of exercises

**Challenges to Overcome**
- Culture
- Technology integration
- Policy
- Security
- Training

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[Image and Diagram of Models: Model 1 Sandia, Model 2 LLNL, Model 3 DoE, Model 4 DoT]
Example Hurricane User Interface SUMMIT used within OLIVE

Integrated Modeling, Mapping and Simulation (IMMS) Concept

Hurricane Planning with Remote Collaboration
January 2009
General NESC Contact Information

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Questions?