If you would like your presentation included in the 75th MORSS Final Report CD it must:

1. Be unclassified, approved for public release, distribution unlimited, and is exempt from U.S. export licensing and other export approvals including the International Traffic in Arms Regulations (22CFR120 et seq.);
2. Include MORS Form 712CD as the first page of the presentation;
3. Have an approved MORS form 712 A/B and
4. Be turned into the MORS office no later than: **DEADLINE: 14 June 2007** (Late submissions will not be included.)

**Presentation Title:** Methodologies, Models, and Simulations Research for the Analysis of Stability Operations

**Author Request** (To be completed by applicant) - The following author(s) request authority to disclose the following presentation in the MORSS Final Report, for inclusion on the MORSS CD and/or posting on the MORS web site.

Name of Principal Author and all other author(s):
Ms. Kerry Lenninger, LTC Francisco Villanueva, and MAJ David Lindow

Principal Author’s Organization and address:
TRAC-FLVN, 255 Sedgwick Ave, Ft. Leavenworth, KS 66027-2345

| Phone: (913) 684-9243 |
| Fax: (913) 684-9288 |
| Email: Kerry.Lenninger@us.army.mil |

Please use the same title listed on the 75TH MORSS Disclosure Form 712 A/B. If the title of the presentation has changed please list both.)

Original title on 712 A/B: Methodologies, Models, and Simulations Research for the Analysis of Stability Operations

If the title was revised please list the original title above and the revised title here:

**PRESENTED IN:**

| WORKING GROUP: 16 | Special Operations and Irregular Warfare | DEMONSTRATION: |
| COMPOSITE GROUP: | POSTER: |
| SPECIAL SESSION 1: | TUTORIAL: |
| SPECIAL SESSION 2: | OTHER: |
| SPECIAL SESSION 3: |

This presentation is believed to be: **Unclassified, approved for public release, distribution unlimited, and is exempt from U.S. export licensing and other export approvals including the International Traffic in Arms Regulations (22CFR120 et seq.)**
Methodologies, Models, and Simulations Research for the Analysis of Stability Operations

TRAC-FLVN, 255 Sedgwick Ave, Ft. Leavenworth, KS 66027-2345

Approved for public release, distribution unlimited

Methodologies, Models, and Simulations Research for the Analysis of Stability Operations

75th Military Operations Research Society Symposium
13 June 2007
Purpose and Bottom Line

• Purpose.
  – Present results of research efforts.
    - Research methodology.
    - Selection process and tool.
    - Viable methodologies, models, & simulations (MM&S).
  – Discussion/Q&A.

• Bottom Line.
  – Developed and applied a stability operations (SO) MM&S selection process and tool.
  – Developed a database of 30 applications.
  – Assessed and ranked them on functionality and utility.
Agenda

• Background.
• Problem definition.
• Constraints, limitations and assumptions.
• Research methodology.
• Assessment cross-walk (issues, tasks, functionalities).
• Results.
  – Functionality assessment.
  – Utility assessment.
  – Relative ranking.
  – Application process.
Background

• TRADOC Standard Scenarios.
  – Corps/Division Southwest Asia Stability Operations scenario (SWA SO).
  – Bde Mega-City scenario.

• TRAC Stability Operations Functional Area Analysis (FAA).

• HQDA Stability, Security, Transition, and Reconstruction (SSTR) gap analysis.
  – TRAC and CAA partnership with HQDA to conduct Army capability and capacity gap analysis for SO functions.

• TRAC SO MM&S research.
  – What should we model?
  – What can’t we model in our M&S?

• Future Combat Systems (FCS) Stability and Reconstruction Operations (S&RO) analysis for FY08 and beyond.
  – Identify the S&RO analytic issues.
  – Conduct S&RO first order comparative analysis between BCTs.
  – Conduct a model and data review and develop recommendations to enhance representation of phenomenon in the S&RO environment.
Problem Definition

• Purpose of research/specified task: Determine usable MM&S to support the analysis of SO.

• Implied task for the research team: Examine existing MM&S to the degree that an assessment is possible in determining the utility of the MM&S for the intended analysis purpose.

• Accuracy of the answer. Deliverable(s) must have viable applicability in addressing issues of interest, emphasizing the capability of portraying cause and effect relationships.

• Research scope. Focus is on MM&S capability and utility in support of operational level SO analyses.

Bauman’s Law: Assess no model and compare no model to another model outside the context of its intended purpose and applications.
Constraints, Limitations, and Assumptions

• Constraints.
  – Report complete by Apr 07.
  – Stability operations (SO) scenario development drove desired MM&S functionalities.
  – TRAC will not use a MM&S without access to underlying code and supporting data (no black box).

• Limitations.
  – Research effort is focused on MM&S that support operational level analyses.
  – Limited TRAC experience and knowledge of available SO MM&S; reliant on MM&S point of contact (POC) feedback on questionnaires and surveys. Must consider POC possible bias.
  – Research effort does not include a formal cost analysis.
  – MM&S capabilities assessed using potential issues (not actual study specific issues).
  – MM&S assessment based only on a subset of the tasks in the Functional Area Analysis for SO (i.e., original task list from SO scenario development).
  – The MM&S assessment did not include federated combinations of candidate MM&S.

• Assumptions.
  – MM&S POC responses/feedback are accurate and form a sufficient basis for the assessment.
  – Formal VV&A of every MM&S against both potential and current issues is too resource-intensive and is infeasible.
  – The SO scenario development issues and attendant tasks are reasonable sets to derive required MM&S functionalities.
Research Methodology

• Identify candidate MM&S; retained 26 of 30 for assessment.

• Assess functionality.
  – Stability operations scenario development.
    - Five Potential Issues.
    - Tasks in eight capability categories.
  – Identify required MM&S functionalities.
    - 66 functionalities in support of 124 tasks.
  – Create and distribute functionality survey.
  – Synthesize input – create and apply selection tool.
  – Determine results (relative ranking) by issue and as a collective issue set.

• Assess utility.
  – Create and distribute utility questionnaire.
    - MM&S attributes (supportive of utility criteria).
    - Narrative assessment (eight capability categories).
    - Team rated POCs’ narrative responses.
  – Apply utility criteria across candidate MM&S.

• Integrate survey results and determine relative rankings.
Potential SO Issues

Issue #1  What Army and civilian personnel are required to conduct SO?

Issue #2*  How does the Army develop a secure environment and transition security activities to host nation authorities?

Issue #3  How can the Army share information with other government agencies, coalition forces, International Organizations, NGOs and host nation authorities supporting SO?

Issue #4  To what degree are Army, Corps, and Division staffs capable of commanding and controlling simultaneous combat and SO?

Issue #5  How does the Army evaluate host nation personnel?

*highlighted to illustrate assessment approach
Assessment Approach: Functionality

**Identify potential issues**

**Select related operational mission/tasks**

**Derive required M&S functionalities**

**Conduct Security Operations**

**Recruit, train, and equip (model resources, time, and force structure changes) indigenous personnel**

**Assess M&S**

**Example (issue 2):** How does the Army develop a secure environment and transition security activities to host nation authorities?
Functionality Assessment Cross-Walk

M&S
A B C … Z

Issue 1  Task 1  Function 1
   Task 2  Function 2
   Task 3  Function 3
   …  …
   Task n  Function n

Issue 2

Issue 3

Issue n

See spreadsheet
## Spreadsheet Example 1 of 2

**Potential Study Issues**: How does the Army develop a secure environment and transition security activities to host nation authorities?

### Task Title: Model Functionality

<table>
<thead>
<tr>
<th>Task Title</th>
<th>Model Number</th>
<th>Max Score</th>
<th>Model Number</th>
<th>Max Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct Security Operations</td>
<td>Two</td>
<td>Twenty eight</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>Coordination with EOD to clear areas of unexploded ordnance</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Determine and assign security for entities (including work teams and sites) at different force protection levels</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Effect of nominating and striking operational targets (e.g. insurgent elements) that are threatening the general population</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Entities consume resources depending on requirements (supplies, security, training and infrastructure)</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Establish Internment Camps/Prisons (manpower, training, and construction)</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Install and maintain a presence within neighborhoods to provide basic security until locals assume responsibility</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Monitor and respond to actions taken by indigenous groups against one another</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Portray capture and internment of key persons (leaders, criminals, etc) and effect on populace</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Portray different levels of Essential Services (SWEAT-MS)</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Portray different levels of SSTR support and effect on communities</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Portray simultaneous combat / stability ops and interactions</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Portray threat attempts to destabilize institutions</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Portray transition to indigenous security forces and effect on security operations</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Recruit, train, and equip (model resources, time, and force structure changes) indigenous personnel</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Seize, secure and dispose of weapons or other sensitive materiel</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td><strong>Conduct Security Operations Total</strong></td>
<td>30</td>
<td>60</td>
<td>15</td>
<td>60</td>
</tr>
<tr>
<td>Provide EOD Support</td>
<td>Two</td>
<td>Twenty eight</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Acquire or generate dynamic Terrain data</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Coordination with EOD to clear areas of unexploded ordnance</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Portray simultaneous combat / stability ops and interactions</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Seize, secure and dispose of weapons or other sensitive materiel</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td><strong>Provide EOD Support Total</strong></td>
<td>21</td>
<td>60</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>Coordinate Host Nation Support</td>
<td>15</td>
<td>44</td>
<td>8</td>
<td>44</td>
</tr>
<tr>
<td>Essential services (SWEAT-MS): Security, Water, Electricity, Academics, Transportation Network, Medical, Sanitation (Trash and Sewage); need Academics, Tr</td>
<td>32</td>
<td>68</td>
<td>21</td>
<td>68</td>
</tr>
<tr>
<td>Resettle Refugees and Displaced Civilians</td>
<td>20</td>
<td>52</td>
<td>21</td>
<td>52</td>
</tr>
<tr>
<td>Assist Host Nation in Population and Resource Control</td>
<td>26</td>
<td>112</td>
<td>25</td>
<td>112</td>
</tr>
<tr>
<td>Conduct Local Security Operations</td>
<td>23</td>
<td>60</td>
<td>24</td>
<td>60</td>
</tr>
<tr>
<td>Provide Protection for Operational Forces, Means and Non Combatants</td>
<td>26</td>
<td>56</td>
<td>21</td>
<td>56</td>
</tr>
<tr>
<td>Provide Protective Services for Selected Individuals</td>
<td>16</td>
<td>32</td>
<td>14</td>
<td>32</td>
</tr>
<tr>
<td>Conduct Internment Activities</td>
<td>13</td>
<td>32</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>Provide Refugee/Displaced Civilian Movement Control</td>
<td>5</td>
<td>32</td>
<td>17</td>
<td>32</td>
</tr>
<tr>
<td>Provide Support to Civil Law Enforcement</td>
<td>31</td>
<td>92</td>
<td>22</td>
<td>92</td>
</tr>
<tr>
<td>Provide Support to DOD and other governmental agencies</td>
<td>16</td>
<td>48</td>
<td>15</td>
<td>48</td>
</tr>
<tr>
<td>Determine National/Agency Capabilities and Limitations</td>
<td>16</td>
<td>32</td>
<td>15</td>
<td>32</td>
</tr>
<tr>
<td>Provide Support to Allies, Regional Governments, International Organizations or Groups</td>
<td>9</td>
<td>56</td>
<td>21</td>
<td>56</td>
</tr>
<tr>
<td>Conduct a Relief in Place</td>
<td>17</td>
<td>28</td>
<td>12</td>
<td>28</td>
</tr>
<tr>
<td>Identify/Transition logistical frameworkd for local security forces</td>
<td>27</td>
<td>56</td>
<td>22</td>
<td>56</td>
</tr>
<tr>
<td>Mark, Report and Record Obstacles</td>
<td>2</td>
<td>4</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>Establish and Conduct Coordination and Liaison</td>
<td>11</td>
<td>44</td>
<td>11</td>
<td>44</td>
</tr>
<tr>
<td>Coordinate plans with Non-DOD organizations</td>
<td>24</td>
<td>60</td>
<td>11</td>
<td>60</td>
</tr>
<tr>
<td>Perform Non Combatant Evacuation Operations</td>
<td>7</td>
<td>48</td>
<td>22</td>
<td>48</td>
</tr>
<tr>
<td>Advise Commander of Obligations to Civilian Population</td>
<td>27</td>
<td>60</td>
<td>16</td>
<td>60</td>
</tr>
<tr>
<td>Task Title</td>
<td>Model functionality</td>
<td>Model Number</td>
<td>Twenty eight</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>--------------</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td>Conduct Civil-Military Operations</td>
<td></td>
<td>27</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Provide interface/liaison between US military forces and local authorities/NGOs</td>
<td></td>
<td>22</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Conduct Foreign Internal Defense Operations</td>
<td></td>
<td>16</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Provide Public Safety Support</td>
<td></td>
<td>16</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Provide Law Enforcement and Prisoner Control</td>
<td></td>
<td>20</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Coordinate Passive CBRNE Defense in the JOA</td>
<td></td>
<td>5</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Conduct Attack on Operational Targets using Non-lethal means</td>
<td></td>
<td>7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Combat Terrorism in an AO</td>
<td></td>
<td>15</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Provide NBC Protection to Friendly Forces</td>
<td></td>
<td>3</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Integrate Host-Nation Security Forces and Means</td>
<td></td>
<td>14</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Provide Operationally Significant Defenses</td>
<td></td>
<td>23</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Combat operations (to address the simultaneity of SO and offense/defense) against organized armed resistance, down to individuals; patrolling; urban ops; non-</td>
<td></td>
<td>18</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>Portrayal of levels of force protection</td>
<td></td>
<td>12</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Conduct Electronic Attack</td>
<td></td>
<td>0</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Provide Combat Assessment</td>
<td></td>
<td>8</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Conduct Joint Force Targeting</td>
<td></td>
<td>6</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Employ Close Air Support</td>
<td></td>
<td>4</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Attack Operational Targets</td>
<td></td>
<td>6</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Employ Fire Support Coordination Measures</td>
<td></td>
<td>11</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Provide Intel Support to Civil-Military Operations</td>
<td></td>
<td>2</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Communication with Non-English-Speaking Force and Agencies</td>
<td></td>
<td>13</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Locate, tag, and track hostile elements; ISR</td>
<td></td>
<td>9</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>Conduct Combat Operations in Support of Foreign Internal Defense</td>
<td></td>
<td>15</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Sharing of intelligence with security forces</td>
<td></td>
<td>2</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Establish foreign disclosure program</td>
<td></td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td>673</td>
<td>2140</td>
<td></td>
</tr>
</tbody>
</table>

Max score:

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Twenty eight</th>
</tr>
</thead>
<tbody>
<tr>
<td>68</td>
<td>68</td>
</tr>
<tr>
<td>11</td>
<td>68</td>
</tr>
<tr>
<td>15</td>
<td>44</td>
</tr>
<tr>
<td>15</td>
<td>52</td>
</tr>
<tr>
<td>7</td>
<td>56</td>
</tr>
<tr>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>18</td>
<td>44</td>
</tr>
<tr>
<td>7</td>
<td>68</td>
</tr>
<tr>
<td>15</td>
<td>44</td>
</tr>
<tr>
<td>7</td>
<td>68</td>
</tr>
<tr>
<td>11</td>
<td>68</td>
</tr>
<tr>
<td>15</td>
<td>44</td>
</tr>
<tr>
<td>12</td>
<td>36</td>
</tr>
<tr>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>29</td>
<td>32</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>20</td>
<td>32</td>
</tr>
<tr>
<td>36</td>
<td>60</td>
</tr>
<tr>
<td>44</td>
<td>10</td>
</tr>
<tr>
<td>43</td>
<td>56</td>
</tr>
<tr>
<td>31</td>
<td>48</td>
</tr>
<tr>
<td>27</td>
<td>44</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>2140</td>
<td>2140</td>
</tr>
</tbody>
</table>

0.314 0.409
# Functionality Assessment Results

- MM&S developers self-scored their abilities to address each functionality (0 - 4).
- Data reflects relative score ranking in addressing an issue.
- Total is a sum of issue scores (possible 5.0).
- Unweighted tasks, issues, and functionalities.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Personnel</th>
<th>Security</th>
<th>Information</th>
<th>C2</th>
<th>Host Nation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fourteen</td>
<td>0.74</td>
<td>0.75</td>
<td>0.76</td>
<td>0.75</td>
<td>0.72</td>
<td>3.71</td>
</tr>
<tr>
<td>One</td>
<td>0.69</td>
<td>0.66</td>
<td>0.69</td>
<td>0.69</td>
<td>0.70</td>
<td>3.43</td>
</tr>
<tr>
<td>Twenty three</td>
<td>0.68</td>
<td>0.66</td>
<td>0.66</td>
<td>0.65</td>
<td>0.70</td>
<td>3.35</td>
</tr>
<tr>
<td>Twenty seven</td>
<td>0.65</td>
<td>0.70</td>
<td>0.64</td>
<td>0.69</td>
<td>0.65</td>
<td>3.33</td>
</tr>
<tr>
<td>Twenty one</td>
<td>0.63</td>
<td>0.63</td>
<td>0.58</td>
<td>0.64</td>
<td>0.64</td>
<td>3.13</td>
</tr>
<tr>
<td>Seventeen</td>
<td>0.57</td>
<td>0.56</td>
<td>0.56</td>
<td>0.54</td>
<td>0.57</td>
<td>2.79</td>
</tr>
<tr>
<td>Five</td>
<td>0.46</td>
<td>0.53</td>
<td>0.44</td>
<td>0.49</td>
<td>0.49</td>
<td>2.41</td>
</tr>
<tr>
<td>Twenty nine</td>
<td>0.42</td>
<td>0.53</td>
<td>0.48</td>
<td>0.45</td>
<td>0.48</td>
<td>2.37</td>
</tr>
<tr>
<td>Seven</td>
<td>0.46</td>
<td>0.46</td>
<td>0.41</td>
<td>0.44</td>
<td>0.42</td>
<td>2.19</td>
</tr>
<tr>
<td>Four</td>
<td>0.42</td>
<td>0.40</td>
<td>0.46</td>
<td>0.41</td>
<td>0.45</td>
<td>2.12</td>
</tr>
<tr>
<td>Thirteen</td>
<td>0.42</td>
<td>0.40</td>
<td>0.46</td>
<td>0.41</td>
<td>0.45</td>
<td>2.12</td>
</tr>
<tr>
<td>Twenty five</td>
<td>0.43</td>
<td>0.40</td>
<td>0.36</td>
<td>0.36</td>
<td>0.37</td>
<td>1.91</td>
</tr>
<tr>
<td>Twenty eight</td>
<td>0.40</td>
<td>0.41</td>
<td>0.28</td>
<td>0.43</td>
<td>0.33</td>
<td>1.85</td>
</tr>
<tr>
<td>Nineteen</td>
<td>0.32</td>
<td>0.32</td>
<td>0.32</td>
<td>0.32</td>
<td>0.33</td>
<td>1.61</td>
</tr>
<tr>
<td>Twelve</td>
<td>0.35</td>
<td>0.32</td>
<td>0.31</td>
<td>0.29</td>
<td>0.34</td>
<td>1.60</td>
</tr>
<tr>
<td>Two</td>
<td>0.30</td>
<td>0.31</td>
<td>0.27</td>
<td>0.28</td>
<td>0.34</td>
<td>1.50</td>
</tr>
<tr>
<td>Twenty six</td>
<td>0.26</td>
<td>0.33</td>
<td>0.26</td>
<td>0.27</td>
<td>0.29</td>
<td>1.41</td>
</tr>
<tr>
<td>Six</td>
<td>0.23</td>
<td>0.30</td>
<td>0.29</td>
<td>0.27</td>
<td>0.22</td>
<td>1.32</td>
</tr>
<tr>
<td>Twenty</td>
<td>0.25</td>
<td>0.16</td>
<td>0.24</td>
<td>0.19</td>
<td>0.19</td>
<td>1.02</td>
</tr>
</tbody>
</table>
Utility Criteria

A. Capability to aggregate.
   – None to user defined.

B. Maturity.
   – Established track record.

C. Run time (real and/or faster than real time).

D. Data input requirements.
   – Number of variables and sources.

E. Required resources.
   – Personnel, training, HW/SW.

F. Output flexibility.
   – Standard/pre-built reports; user definable.

G. Availability.
   – Access, proprietary, acquisition (product or services).

H. Portrays public opinion and its relationship with other areas of the model.

I. Impact of political, military, economic, social, infrastructure, information (PMESII) interactions (on popular support).

*Higher is better*
Utility Assessment Results

Shaded – top 5 M&S from functionality

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Agg</th>
<th>Mature</th>
<th>Run Time</th>
<th>Data</th>
<th>Res Reqd</th>
<th>Flex</th>
<th>Avail</th>
<th>Public Opin</th>
<th>PMESII</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Twenty one</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Five</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>Seventeen</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>23</td>
</tr>
<tr>
<td>Twenty eight</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>Seven</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Twelve</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Twenty seven</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Twenty three</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Two</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Thirteen</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>Twenty five</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Twenty nine</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>Nineteen</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>Twenty</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Four</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>Fourteen</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Six</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>Twenty six</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>13</td>
</tr>
</tbody>
</table>

Rank order of potential MM&S based on the total (unweighted).
Application Process and Selection Tool

Start → Identify specific study issues → ID SO tasks → New* tasks?

- Yes: Develop mapping and required M&S functionality
- No: Functionality assessment against issues using database

- No time: Study timeline
- Time available: Update SO M&S database

Utility assessment → Determine/apply recommended MM&S** solution(s) to include changes to MM&S → Conduct study

Remaining issues?

- No: Stop
- Yes: New* tasks?

* new = significant/not trivial
** tradeoff judgment (func/util)

SO~stability operations  MM&S~methodologies, models & simulations
Summary / Way Ahead

• Summary.
  – Developed and applied a stability operations methodology, model, and simulation (SO MM&S) selection process and tool.
  – Developed a database of 30 applications.
  – Assessed and ranked them on functionality and utility.

• Way Ahead.
  – Adopt/apply application process and selection tool in upcoming FY08 FCS stability operations (SO) analysis.
  – Maintain and regularly update database of SO MM&S.
  – Develop better understanding of highly ranked applications.
  – Investigate implementation options.
Questions?