The MUDEM Simulation Model Design and Application

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Jason T. Brown
Operations Research Analyst
Northrop Grumman Corporation
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**Performing Organization Name(S) and Address(es):**
Northrop Grumman Corporation

**Abstract:**

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**Supplementary Notes:**
MUDEM...

- Is Manpower and Unit Deployment Execution Model
- Is a discrete-event system simulation of units serving routine and contingency demands
- Deals with scripted (deterministic) demands
- Makes dynamic unit deployment decisions
- Was developed for USMC, PA&E to support POM-06
- Was developed and is maintained by Northrop Grumman IT, McLean, VA
System modeled

- Pre-deployment training (MAGTF)
- Reserve activation
- Unit training
- Stand down
- Tether

Deployment (MAGTF)
System modeled

- USMC units & personnel rotate through several states
- A number of routine deployments requirements
  - UDP to PACOM
  - MEUs to PACOM and EUCOM
  - Aircraft squadrons
- One-time contingency demands
- Choose units to task organize and deploy based on a number of readiness factors and coordination with other units status
- Reserve units activation and deployment
- Real system uses doctrine and human judgment
Design principles

- **MOE’s**
  - Key MOE was unit deployment tempo (by unit type)
  - PERSTEMPO (by MOS) an increasing priority

- **Typical runs**
  - Add, subtract, or change units
  - Tweak parameters of deployments
  - New contingency

- **Data driven**
  - Keep user in familiar environment: Excel
  - Generalize logic in model

- **Modular**
  - Maintenance and extensibility
Model entities

- **Units**
  - Identified by UIC
  - UTC, “pool”, parent UIC

- **Task Forces**
  - Collection of units
  - Associated with a particular demand

- **Pools – habitual relationships (not doctrine)**

- **Other important items**
  - Demand signal
  - Task force designs
  - Unit orders
Model processes

- At home processes: training, tether, stand down
  - Interruptible delay and data collection
- Deployment: delay and data collection
- Initialization of units and task forces
- Demand signal and unit selection
- Task force batching and unbatching
- Reserve activation
Resolution

- **UTC DEPTEMPO +/- 2 month**
  - Individual unit DEPTEMPO skewed by selection algorithm
  - For USMC, company and det. sized units

- **MOS PERSTEMPO +/- 4 months**
  - MOS’s tracked based on UTC staffing and fixed pool size
  - Personnel do not affect readiness calculations
  - Limit 100 critical MOS’s

- **Time compression: 5 model years in 15 minutes**
  - Longer runs preferred: sampling bias
  - Intense initialization processing – 20 MY in 30 min
fix these numbers
Data requirements and outputs

**Input**
- Unit list
- Initial task forces
- Demands
  - Location
  - Duration
  - Priority
- Task force designs
  - Unit types
  - Required training time
- MOS staffing and pool size
- Reserve activation criteria
- Simulation run time, etc.

**Output**
- Detailed unit status history
- Total unit deployment time
- Task forces assembled
- Demand signals not met
- MOS PERSTEMPO
Future uses and developments

- **Formal V&V ongoing**
- **Analytic tasks**
  - 202,000 end-strength deliberations
  - Dwell time examinations
  - Force sufficiency against demand signal
- **User interface**
  - Ongoing: Data input/manipulation application
  - Ongoing: Rapid reporting application
- **Simulation model refinements**
  - Stochastic demands, deployment time, etc
  - Additional personnel detail (for unit level entities)
  - New model with personnel entities
Questions & back-up slides
Extend Environment

- Discrete event simulation engine
- Libraries of blocks (sub-processes)
- Blocks connected in GUI to define logic
- Ability to develop blocks and modify existing
- Fast internal database
- Compare to Arena
- Demo: www.imaginethatinc.com
PERSTEMPO MOE calculation

- Person-days of required deployment divided by possible person-days of deployment (by MOS)

Unit A: 5 Pers @ 6 months
Unit B: 3 Pers @ 4 months
Unit C: 4 Pers @ 4 months

Suppose there are 15 people in this MOS

58 pers-month/180 pers-month = 0.322
MUDEM data intensity

- 25+ tables
- Relationships require entries to match from a list
- Model requires particular sorting
- Pushed utility of Excel interface to its limits
- Model developer and data developer nearly equally tasked