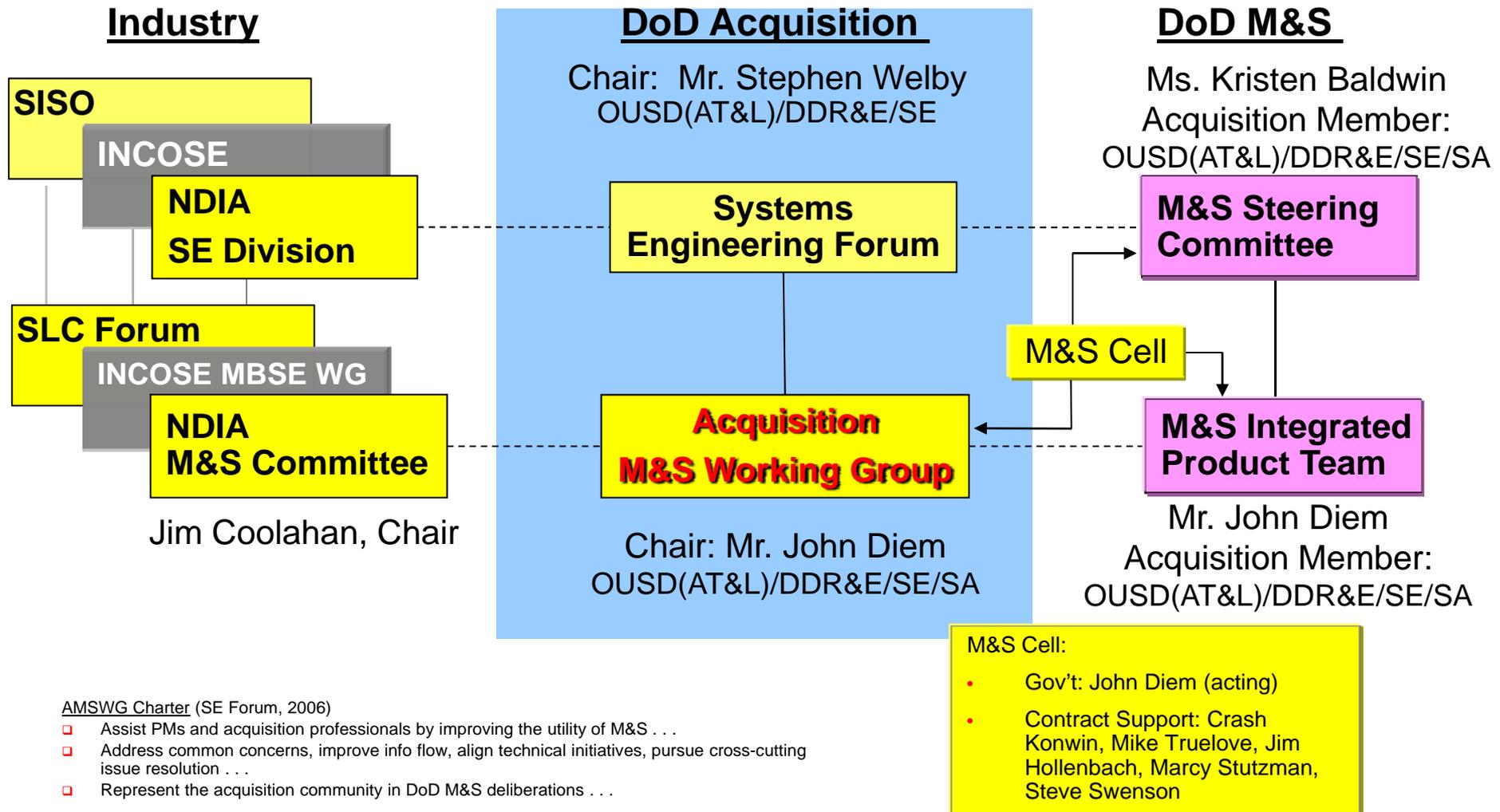




Execution of the DoD Acquisition M&S Master Plan Progress Report

22 September 2009

Acquisition M&S Working Group Relationships



AMSWG Charter (SE Forum, 2006)

- ❑ Assist PMs and acquisition professionals by improving the utility of M&S . . .
- ❑ Address common concerns, improve info flow, align technical initiatives, pursue cross-cutting issue resolution . . .
- ❑ Represent the acquisition community in DoD M&S deliberations . . .

Why Care About M&S?

- ❑ To master complexity: M&S tracks the details, presents measures of merit, and identifies issues
 - *Increasingly important with complex systems and SoS*
- ❑ To design faster & better → build models (sys eng, arch., CAD, S/W, . . .)
- ❑ M&S can rapidly assess design merits; speed design-evaluation cycle
 - *Earlier, more accurate insights, reducing risk and cost*
- ❑ Simulation augmentation provides more realistic T&E environments
- ❑ M&S allows assessments when live operations are precluded by security, safety, battlespace constraints, paucity of live assets, or cost
- ❑ Good modeling & simulation must follow a systems engineering process
- ❑ M&S can foster a shared understanding across vast enterprises
- ❑ Credible M&S provides a defensible analytical underpinning for decisions
- ❑ For above reasons, systems engineering is increasingly model-based

Summary: M&S can help cost, risk, performance, and schedule!

But there are many obstacles to maximizing these M&S benefits

Acquisition M&S Master Plan



- Foreword
- Introduction
 - Purpose
 - Vision
 - Scope
- Objectives (5)
- Actions (40)
 - Action
 - Rationale (why it's needed)
 - Discussion (implementation guidance)
 - Lead & supporting organizations
 - Products (what is expected)
 - Completion goal (year)
- Execution Management

http://www.acq.osd.mil/DDRE/SE/dte/initiat_ms.html

AMSMP Strategy

- ❑ Life-cycle-wide view; include manufacturing and sustainment
- ❑ Not try to do the job of program managers; rather, empower them by
 - Removing systemic obstacles in their path
 - Identifying new options for approaching their tasks
 - Fostering widely-needed M&S capabilities that are beyond the reach of individual programs
- ❑ Address M&S issues and actions necessary to enable acquisition of joint capabilities (systems of systems)
- ❑ Lay out tasks as a Work Breakdown Structure (WBS)
 - Discrete tasks with identified leads and explicit deliverables
 - Easier to resource, schedule, and manage
 - Each contributes to better M&S support to acquisition
 - Actions are interrelated; they work together to achieve full effect

Acquisition M&S Master Plan Development Process

(Top-down)

Desired Acqn Environment per
CJCSI 3170 & DoDD 5000.1

Identify Needed System
Engineering Capabilities

Identify M&S Capability Gaps

Identify Needed
M&S Capabilities

Assess Current Issues/Needs
(e.g., SoS efforts)

Assess Recommendations fm
Prior M&S in Acqn Studies

(Bottom-up)

Identify Actions of Others
(e.g., M&S CO, NII, NIST)

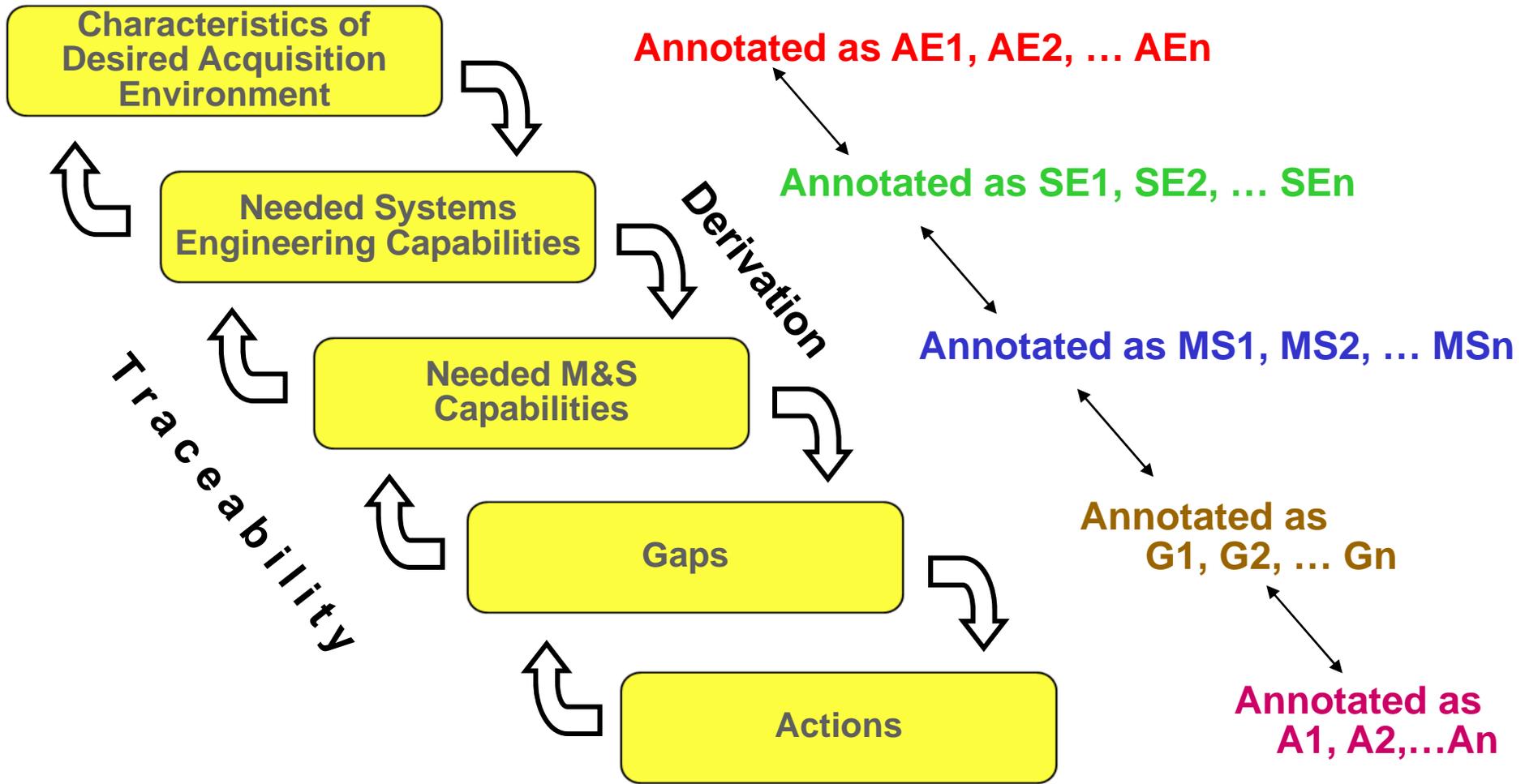
Identify Actions Needed
to Address the Gaps

Determine & Prioritize What
Acqn. Community Must Do

Acquisition M&S
Master Plan

Top-Down Derivation/Traceability

CJCSI 3170 & DoDD 5000.1



AMSMP: Five Objectives, 40 Actions

Objective 1

Provide necessary policy and guidance

1-1 M&S management

1-2 Model-based systems engineering & collaborative environments

1-3 M&S in testing

1-4 M&S planning documentation

1-5 RFP & contract language

1-6 Security certification

Key

Broader than Acqn

Objective 2

Enhance the technical framework for M&S

2-1 Product development metamodel

2-2 Commercial SE standards

2-3 Distributed simulation standards

2-4 DoDAF utility

a) DoDAF 2.0 Systems Engineering Overlay

b) Standards for depiction & interchange

2-5 Metadata template for reusable resources

Objective 3

Improve model and simulation capabilities

3-1 Acquisition inputs to DoD M&S priorities

3-2 Best practices for model/sim development

3-3 Distributed LVC environments

a) Standards
b) Sim/lab/range compliance
c) Event services

3-4 Central funding of high-priority, broadly-needed models & sims

a) Prioritize needs
b) Pilot projects
c) Expansion as warranted

Objective 4

Improve model and simulation use

4-1 Help defining M&S strategy

4-2 M&S planning & employment best practices

4-3 Foster reuse

a) Business model
b) Responsibilities
c) Resource discovery

4-4 Info availability

a) Scenarios
b) Systems
c) Threats
d) Environment

4-5 VV&A

a) Documentation
b) Risk-based
c) Examination

4-6 COTS SE tools

4-7 M&S utility in Acqn metrics

Objective 5

Shape the workforce

5-1 Definition of required M&S competencies

5-2 Harvesting of commercial M&S lessons

5-3 Assemble Body of Knowledge for Acqn M&S

5-4 M&S education & training

a) DAU, DAG & on-line CLMs
b) Conferences, workshops & assist visits

5-5 MSIAC utility

Funding Approach

Prioritized options to accomplish AMSMP actions

1. Accomplish via sweat equity
 - e.g., DDR&E/SE M&S Cell, cooperative efforts by AMSWG reps
2. Compete for M&S Steering Committee funds (if > acquisition)
3. Compete for OSD study funds, end-of-year “targets of opportunity”
4. Submit as SBIR topics (just beginning)
5. Team with other organizations (shared investment)
6. POM initiatives (none to date)

Example funding successes

- ❖ M&S Resource Reuse Business Model Study (Action 4-3a) \$800k
- ❖ Environmental Scenario Data Generator (Action 4-4d) \$2.3m
- ❖ VV&A Documentation Standardization (Action 4-5a) \$550k
- ❖ LVC (Distributed Simulation) Architecture Roadmap (Action 2-3) \$1.4m
- ❖ Workforce M&S Education (partial Actions 5-1 & 5-3) \$3.2m
- ❖ 3 studies on Best Practices (Actions 1-5, 3-2, & 3-4) \$1.65m total
- ❖ Risk-based VV&A Methods & Guidelines (Action 4-5b) \$750k
- ❖ [FY10 M&S SC HLTs for VV&A, EDCSS, and Educ. Sustainment in work]

Status of Individual Actions

Reported in stoplight colors:

- **Green** – on track or completed
- **Yellow** – significant issues
- **Red** – unsatisfactory situation

Caveat: Did not rate down progress for lateness, unless stalled

Objective 1: Provide Necessary Policy & Guidance

1-1. Provide effective, persistent DoD-wide M&S management to address cross-cutting M&S issues, coordinate actions

Lead: OUSD(AT&L) **Support:** OUSD(AT&L)/DS(DDR&E/SE), OUSD(P&R), OUSD(C)/PA&E (CAPE), etc.

Products: Revised DoDD 5000.59 (M&S Management), revised senior leadership management; and improved policies for M&S management. revised senior leadership management; and improved policies for M&S management.

Completion goal: 2006

- **New DoD M&S management structure in place; effectiveness questioned**
- **Weak DoD Directive finally released Aug 07, with promise of a follow-on DoDI to define key responsibilities and processes**
- **At Jul 09 off-site, M&S SC agreed to pursue a DoDI**
- **Project selection process doesn't ensure most important cross-cutting issues are effectively addressed, misusing M&S PE**
- **Acquisition is largest user of M&S, but doesn't exert proportional influence**

Next Steps:

- **Advocate assessing needs & investments at the enterprise level, not at individual community level, using a systematic analysis**
- **Pursue opportunities to increase Acquisition influence (e.g., O&M funding line)**

Objective 1: Provide Necessary Policy & Guidance

1-2. Promote model-based systems engineering (MBSE) and M&S-enabled collaborative environments, at both the program and joint capability level

Lead: OUSD(AT&L)/DS(DDR&E/SE); **Support:** Components

Products: Revised guidance in DAG

Completion goal: 2007

- **Current DAG mentions collaborative environments 14 times, simulation-based testing once, SBA twice, and MBSE not at all.**
- **Programs/companies often claim collaborative environments, but only partial**
- **MBSE is a prominent part of INCOSE's SE Vision 2020; increasing industry use of MBSE term & tools; series of NDIA M&S Committee presentations**
- **Addressed in "M&S Guidance for the Acquisition Workforce" posted on the SE webpage; now hot-linked from DAG**

Next steps:

- **Investigate possibility of a CLM on MBSE**
- **Investigate AT&L Knowledge Sharing System (AKSS) as a conduit**
- **Revise guidance as appropriate**

Objective 1: Provide Necessary Policy & Guidance

1-3. Establish policy and guidance on appropriate use of M&S to plan tests, to complement system live tests, and to evaluate joint capabilities

Co-leads: OUSD(AT&L)/DS, ODOT&E; **Support:** Components

Products: Revised policy and guidance in DoDI 5000.2 and DAG

Completion goal: 2007

- **Joint Test & Evaluation Methodology (JTEM) has delivered Capability Test Methodology under the Testing in a Joint Environment (TIJE) Roadmap (2004)**
- **Dec 08 DoDI 5000.02 calls for “appropriate use of accredited M&S...,” but is silent regarding how appropriate use is determined**
- **No DoD policy regarding evaluation of joint capabilities enabled by systems of systems (SoS)**

Next steps:

- **Track TIJE policy and guidance development, support/respond appropriately**
- **Draft expanded policy & guidance, vet with the various stakeholders, provide via DAG links to updated “M&S Guidance for the Acquisition Workforce”**
- **Evolve M&S in T&E CLM**

Obj. 1: Provide Necessary Policy & Guidance (cont.)

1-4. Establish policy to require documented M&S planning at the joint capability & program levels as part of the Systems Engineering Plan, T&E Strategy and T&E Master Plan

Co-leads: OUSD(AT&L)/DS(DDR&E/SE), ODOT&E; **Support:** Components

Products: Revised policy and guidance in DoDI 5000.2, DAG, and DOT&E TEMP Planning Guidance

Completion goal: 2007

- SE submitted language to DoD 5000.2, DAG, & SEP Preparation Guide
- SEP Preparation Guide language not accepted
- Dec 08 DoDI 5000.02 cites M&S as critical and requires PM to “plan for M&S throughout the acquisition life cycle,” but omitted documentation requirement
- Addressed in “M&S Guidance for the Acquisition Workforce” posted on the DDR&E/SE webpage and now linked from DAG

Next steps:

- Re-engage with Defense Procurement and Acquisition Policy office
- Investigate AT&L Knowledge Sharing System (AKSS) as another conduit

Obj. 1: Provide Necessary Policy & Guidance (cont.)

1-5. Establish M&S-related guidelines for solicitations, source selections, and contracting.

Lead: OUSD(AT&L)/DS(DDR&E/SE); **Support:** OUSD(AT&L)/DPAP, ODOT&E, Components

Products: Sample language in DoD publications (e.g., DAG, SEP Preparation Guide, Contracting for Systems Engineering Guidebook) regarding M&S requirements, data rights, and the responsibilities and liabilities of parties regarding sharing and reuse

Completion goal: 2007

- Solicited inputs from AMSWG and industry (through NDIA M&S Cmte)
- Addressed in “M&S Guidance for the Acquisition Workforce” posted on the SE webpage and now hot-linked from DAG
- CNA study underway with FY09 M&S SC funding; builds on Action 4-3a M&S Resource Reuse Business Model study and will deliver a CLM
- May 09 “Incorporating T&E into DoD Acquisition Contracts” publication includes M&S guidance from above document

Next steps:

- Evaluate study recommendations, further refining them as required
- Submit recommended guidance to DAG (update) and Contracting for Systems Engineering Guidebook
- Investigate AT&L Knowledge Sharing System (AKSS) as a conduit

Obj. 1: Provide Necessary Policy & Guidance (cont.)

1-6. Ensure practical guidelines for information assurance certification and accreditation of M&S federated networks falling under multiple Designated Accreditation Authorities (DAAs)

Lead: OASD(NII); **Support:** OUSD(AT&L)/DS(DDR&E/SE), OUSD(I), NSA

Products: Proven, practical guidelines published in DAG and DoD 8500.2-H, per DoDI 8500.2 "Information Assurance Implementation," Feb 6, 2003

Completion goal: 2007

- NII has published DoDI 8500.2, but AMSWG questions adequacy
- AMSWG-NII discussions held in 2007; NAVAIR procedures identified as a candidate to provide the additional specificity needed
- Now included in FY-09 High Level Task led by NII

Next steps:

- Monitor and support High Level Task execution
- Draft, vet, and submit language for inclusion in DAG or M&S Guidance doc
- Investigate AT&L Knowledge Sharing System (AKSS) as a conduit

Objective 2: Enhance the Technical Framework for M&S

2-1. Develop a product development information metamodel & associated metadata extensions to the DoD Discovery Metadata Specification

Lead: OUSD(AT&L)/DS(DDR&E/SE); **Support:** OASD(NII), Components

Products: Revised DDMS; revised guidance in DAG.

Completion goal: 2008

- JSF has developed a metamodel specification and provided it to M&S CO
- Per SE request, M&S CO provided assistance to work with JSF to evolve/refine its metamodel
- Working group has decided key issues and expects to publish a revised version, **but progress has stalled due to M&S Cell resource constraints**

Next steps:

- JSF complete revised metadata spec with M&S Cell & MSCO assistance
- Coordinate with M&S CO to vet more broadly (likely CAPE interest) and make this a DoD or (preferably) commercial standard
- Submit into DoD Standardization Program process

Objective 2: Enhance the Technical Framework for M&S

2-2. Support development of open commercial and non-proprietary standards for (model-based) systems engineering, such as OMG's Systems Modeling Language (SysML) and ISO Standard 10303 AP-233

Co-leads: OUSD(AT&L)/DS(DDR&E/SE); DoD CIO **Support:** OASD(NII), DLA, OUSD(AT&L), **Products:** Standards suitable for use by DoD

Completion goal: 2007

- **SysML v1.1 published Nov 08; v1.2 in work**
- **Increasing usage & teaching of SysML; major subject at INCOSE**
- **Series of NDIA M&S Committee presentations on SysML as basis for MBSE**
- **SysML included in the DISR as an emerging standard (Mar 09)**
- **AP-233 has been published as a "Draft International Standard" for SE data representation and interchange**
- **SysML to AP233 mapping effort underway with NIST-funded Eurostep project**
- **COTS SE tools are incorporating SysML & AP-233; NIST Plug-Fest underway**

Next steps:

- **Track SysML and AP-233 implementations, publicize results**
- **Determine if SysML and AP-233 should also be submitted to DoD Standardization Program**
- **Identify any needs for additional standards**

Objective 2: Enhance the Technical Framework for M&S

2-3. Establish a forum to clarify the characteristics and application of various distributed simulation standards (ALSP, DIS, HLA, SI3, TENA, etc.) and examine opportunities for convergence

Lead: OUSD(AT&L) **Support:** OUSD(AT&L)/TRMC & DS(DDR&E/SE), ODOT&E, Components

Products: (1) Information on strengths & weaknesses of the various standards; (2) agreement on policy and/or guidance on the use of distributed simulation standards; (3) a way ahead regarding distributed simulation standards

➤ **Completion goal:** 2007

- **M&S Cell participated in LVC Architecture Roadmap study, wrote Business Model and Execution Management sections**
- **LVCAR main report released but not publicized, and annexes still not released**
- **New architecture efforts emerging: Army LVC-IA, USAF LVC-IA, Navy RFI, etc.**

Next steps:

- **Continue to push for release and publication of full LVCAR**
- **Press M&S SC about need for leadership/coordination of LVC arch. policy**

Obj. 2: Enhance the Technical Framework for M&S (cont.)

2-4. Improve the utility of the DoD Architecture Framework (DoDAF) for acquisition

2-4(a) ~~Develop Systems Engineering Overlay (profile) for DoDAF v2.0~~

~~Lead: OUSD(AT&L)/DS; Support: OASD(NII), Components~~

~~Products: Acquisition Overlay for DoDAF v2.0~~

~~Completion goal: 2006~~

2-4(b) Support development of open commercial standards for the depiction and interchange of DoDAF-compliant architectures

Lead: OASD(NII) Support: OUSD(AT&L)/DS(DDR&E/SE)

Products: Published standards suitable for adoption by DoD; revised guidance in DAG

Completion goal: 2007

- 2-4(a): DoDAF Overlay concept has been dropped, so this action is OBE
- 2-4(b): OMG's UPDM (UML Profile for DoDAF/MODAF) nearly finalized, NII has embraced UPDM as an element of DoDAF 2.0 development
- SE Forum considering the value and impact of DoDAF
- ASD(NII) has stated goal of making DoDAF v2.0 more useful for acquisition
- Systems Engineering participation in DoDAF WG has been gapped

Next steps:

- Increase involvement in DoDAF WG
- Submit UPDM to DoD Standardization Program / DISR Online
- Advocate use of UPDM for architecture data exchange

Obj. 2: Enhance the Technical Framework for M&S (cont.)

2-5. Establish a standard template of key characteristics (metadata) to describe reusable M&S resources

Lead: OUSD(AT&L) **Support:** OUSD(AT&L)/DS(DDR&E/SE) & TRMC, OASD(NII), ODOT&E, Components

Products: Published standard template; usage guidance in DAG

Completion goal: 2007

- **M&S COI Discovery Metadata Spec (MSC-DMS) addresses this; version 1.2 released Jul 09.**
- **Limited beta testing currently underway. Being used in DoD VV&A Documentation Tool (DVDT) and M&S Catalog project being led by CAPE.**
- **It currently isn't practical to search by what's represented; additional standardization (e.g., inclusion of standard keywords in MSC-DMS) is needed**

Next steps:

- **Evaluate the M&S Catalog when it is made available for use**
- **Participate in Configuration Control Board to help overcome search limitation**
- **Draft, vet, and submit DAG language when appropriate**

Objective 3: Improve Model & Simulation Capabilities

3-1. Establish a process to ensure acquisition needs are reflected in DoD M&S priorities

Lead: OUSD(AT&L) **Support:** OUSD(AT&L)/DS(DDR&E/SE), ODOT&E, DOD CIO, Components

Products: A method to capture and prioritize acquisition needs.

Completion goal: 2007

- **AMSWG has successfully obtained M&S SC funding for several projects**
- **AMSWG has started an effort to pursue SBIR opportunities**
- **AMSWG still does not have an effective voice in other venues that affect M&S capability, such as S&T requirement identification**

Next steps:

- **Continue to pursue M&S SC and SBIR funding opportunities**
- **Investigate DoD S&T planning process to identify entry points**
- **Build list of acquisition M&S S&T needs; perhaps cooperatively with SISO and/or SCS**

Objective 3: Improve Model & Simulation Capabilities

3-2. Define and foster best practices for efficient development and evolution of credible M&S tools, incorporating user-defined requirements, a systems engineering approach, and appropriate verification & validation

Lead: OUSD(AT&L); **Support:** OUSD(AT&L)/DS(DDR&E/SE), ODOT&E, DOD CIO, Components

Products: Best practices publication, available via MSIAC, DTIC, etc.; DAG guidance to use

Completion goal: 2008

- **Have obtained OSD study funds for the definition portion of this task**
- **Wrote terms of reference; JHU APL study underway to define best practice**
- **SISO has established a study group to support this activity; possibility it will result in a SISO Best Practice**
- **Survey conducted under NDIA M&S Committee sponsorship**

Next steps:

- **Oversee study, assess JHU APL deliverable**
- **Implement the best practices (via Action 5-4)**

Obj 3: Improve Model & Simulation Capabilities (cont.)

3-3. Enable readily-available distributed live-virtual-constructive environments, leveraging related initiatives

3-3(a) Establish DoD-wide standards for distributed environments

Lead: OUSD(AT&L); **Support:** OUSD(AT&L)/TRMC & DS(DDR&E/SE); ODOT&E; DOD CIO, Components

Products: Published standard; DODI (# TBD) policy to use

Completion goal: 2008

3-3(b) Make candidate simulations, labs and ranges compliant with these standards

Lead: Components; **Support:** OUSD(AT&L)/DS(DDR&E/SE) & TRMC, ODOT&E

Products: A larger collection of simulations, labs, and ranges ready to be employed in distributed events

Completion goal: 2010

3-3(c) Ensure availability of services to help plan and conduct events

Lead: Components; **Support:** OUSD(AT&L), OUSD(AT&L)/TRMC, DISA

Products: Fee-based technical services to help users (e.g., PMs, Capability Managers, OTAs) plan and conduct distributed events

Completion goal: 2009

- LVC Architecture Roadmap completed, but not completely released
- Partial LVCAR execution underway by JTIEC under HLT S-C-2; incorporates JFCOM Joint Composable Object Model project underway
- DSB Task Force chartered to consider M&S support to OSD acquisition ops

Next steps:

- Assess LVCAR, JCOM, and DSB deliverables, implement as appropriate
- Identify remaining actions needed, implement

Obj 3: Improve Model & Simulation Capabilities (cont.)

3-4. Centrally fund and manage the development of high-priority, broadly-needed M&S tools

3-4(a) Identify and prioritize broadly-needed M&S tools

Lead: OUSD(AT&L); **Support:** OUSD(AT&L)/(DDR&E/SE); ODOT&E, DOD CIO, Components

Products: Prioritized list of common M&S tool needs

Completion goal: 2007

3-4(b) Conduct one or more pilot projects to develop new M&S tools or update existing ones to meet these needs

Lead: OUSD(AT&L); **Support:** OUSD(AT&L)/DS(DDR&E/SE), Components

Products: Proof of concept for managing the development/evolution of M&S tools to meet broadly-shared needs

Completion goal: 2008

3-4(c) Expand the scope of central M&S tool management as warranted by pilot project results and the list of common M&S needs

Lead: OUSD(AT&L); **Support:** OUSD(AT&L)/DS(DDR&E/SE), ODOT&E, Components

Products: Capability to provide broadly-needed M&S tools in a more responsive and cost-effective way.

- **JHU APL study underway on best practices for managing broadly-needed M&S tools; survey conducted under NDIA M&S Committee sponsorship**

Next steps:

- **Support JHU APL study with NDIA survey; assess JHU APL deliverables**
- **Accomplish above three steps after best practices are defined**

Objective 4: Improve Model & Simulation Use

- 4-1. Provide potential acquisition M&S users the knowledge needed to formulate an effective M&S strategy via ready access to M&S expertise and information about M&S capabilities and gaps, reusable resources, lessons-learned, etc.

Lead: OUSD(AT&L); **Support:** OUSD(AT&L)/DS(DDR&E/SE)

Products: Revised guidance in DAG; improved knowledge base in MSIAC; assist visits (e.g., by OUSD(AT&L)/DS(DDR&E/SE))

Completion goal: 2008

- Addressed in “M&S Guidance for the Acquisition Workforce” posted on the SE webpage; now hot-linked from DAG
- M&S Cell assisting as able, but resource limited, not widely advertised
- Navy coming on line, but no action from other Components
- Educating the Workforce project enumerated many knowledge needs and courses and CLMs help fill those needs, but have limited delivery options

Next steps:

- Advertise and expand assist visits
- Promote similar efforts by other Components
- Improve MSIAC expertise regarding M&S in acquisition (Action 5-5)

Objective 4: Improve Model & Simulation Use

4-2. Define and disseminate best practices for disciplined M&S planning & employment

Lead: OUSD(AT&L)/DS(DDR&E/SE), **Support:** OUSD(AT&L), Components

Product: Revised best practices guidance in DAG and MSIAC

Completion goal: 2007

- High-level discussion included in “M&S for Systems Engineering” CLM
- Addressed in “M&S Guidance for the Acquisition Workforce” posted on the DDR&E/SE webpage; now hot-linked from DAG
- M&S Planning and Employment Best Practices solicitation completed Apr 07
- **Action completion is stalled due to M&S Cell resource constraints**

Next steps:

- Continue working with NAVAIR M&S Enterprise to develop guidance
- Synthesize best practice, conduct AMSWG & NDIA M&S Cmte reviews

Obj. 4: Improve Model & Simulation Use (cont.)

4-3. Facilitate the sharing of reusable resources

4-3(a) Establish a DoD-wide business model for compensating providers of reusable M&S resources (e.g., information, software, services)

Lead: OUSD(AT&L); **Support:** OUSD(AT&L)/DS(DDR&E/SE), OUSD(P&R), OUSD(C)/PA&E (CAPE), Components

Product: Documented business model; revised policy and/or guidance in DoD 5000 series & DAG

Completion goal: 2007

- CNA's Business Model study identified key issues and recommended actions in 7 areas: IP, contracting, open standards, open source, open business models, license rights, and management of broadly-used tools
- LVC Architecture Roadmap (LVCAR) is addressing business model issues
- JHU APL study on management of broadly-needed tools underway
- **An effective business model is not yet established**

Next steps:

- **Consider findings from LVCAR and JHU APL study on Best Practices for Managing Broadly-needed M&S tools**
- **Synthesize an integrated execution plan and execute it**

Obj. 4: Improve Model & Simulation Use (cont.)

4-3. Facilitate the sharing of reusable resources

4-3(b) Establish DoD policy and/or guidance regarding responsibilities to share, protect and properly use M&S information, tools, and data

Co-Leads: OASD(NII), OUSD(AT&L), USD(I); **Support:** OUSD(AT&L)/DS(DDR&E/SE) & DPAP, OUSD(P&R), OUSD(C)/PA&E (CAPE), Components

Product: Revised policy and/or guidance in various issuances (e.g., DoD 5000 series, DAG, contracting guidance)

Completion goal: 2008

- Partially addressed in “M&S Guidance for the Acquisition Workforce” posted on the DDR&E/SE webpage; now hot-linked from DAG
- CNA Business Model study made recommendations; new study will too
- MIL-STD 3022 and DoD VV&A Documentation Tool foster sharing VV&A info
- “Data Management and Technical Data Rights” policy in new DoDI 5000.02, but doesn’t address key issues identified in business model study

Next steps:

- Coordinate with Defense Procurement and Acquisition Policy office to evolve DoDI 5000.02 guidance on data, and expand to cover other resources and intra-gov’t sharing of gov’t-owned resources

Obj. 4: Improve Model & Simulation Use (cont.)

4-3. Facilitate the sharing of reusable resources

4-3(c) Enhance the means (e.g., directory service, registries, bulletin boards) to discover the existence of reusable resources required for M&S and contact information

Lead: OUSD(AT&L) **Support:** OUSD(AT&L)/DS(DDR&E/SE), OUSD(P&R), OUSD(C)/PA&E (CAPE), Components

Product: A better way to discover reusable resources. Re-orientation and integration of various DoD M&S resources repositories.

Completion goal: 2007

- A M&S CO-funded project to develop an “M&S Catalog,” led by CAPE, is in beta testing, but search capability is limited (Action 2-5)
- SE provided responses to CAPE questionnaire
- We see a viable business model as a prerequisite to resource disclosure

Next steps:

- Track Catalog project, support as able
- Advocate fixing metadata template (Action 2-5) shortfalls
- Execute integrated business model plan per Action 4-3(a)

Obj. 4: Improve Model & Simulation Use (cont.)

4-4. Define the types of information DoD organizations shall make available to others with a clearance and valid need to know and the processes to obtain them (per reuse business model). The process to obtain information should include an efficient mechanism for industry to request government data with specific "need to know" outside a specific contract environment.

4-4(a) Scenario data

Lead: OUSD(AT&L) **Support:** OCJCS(J8), OUSD(C)/PA&E (CAPE), DIA, Components
Product: Approved scenarios and process to obtain
Completion goal: 2007

4-4(b) System-related data

Lead: OUSD(AT&L)/DS(DDR&E/SE); **Support:** ODOT&E, Components
Product: Process to obtain authoritative system data (characteristics and performance, interactions, interfaces, logistic support, etc.) documented in the DAG and appropriate OASD (NII) policy documents.
Completion goal: 2008

4-4(c) Threat data

Lead: DIA; **Support:** OUSD(AT&L); OUSD(AT&L)/DS(DDR&E/SE), ODOT&E, and Components
Product: Authoritative threat data and process to obtain
Completion goal: 2007

4-4(d) Natural environment data

Lead: DoD Natural Environment MSEAs (MSCAs); **Support:** OUSD(AT&L), OUSD(AT&L)/DS(DDR&E/SE), Components
Product: Authoritative natural environment data and process to obtain
Completion goal: 2007

Action 4-4 Assessment

- Acquisition Support Division of DIA briefed AMSWG and NDIA M&S Cmte on its support to acquisition programs; see www.ndia.org/divisions/modeling
- MSIC briefed NDIA M&S Cmte on TMAP program and provided instructions on how to request TMAP models; see www.ndia.org/divisions/modeling
- Draft DAG language discusses threat data sources and traceability
- **No method exists “for industry to request government data with specific ‘need to know’ outside a specific contract environment”**
- M&S SC-funded Environmental Scenario Generator project underway
- **Little progress in sharing U.S. system data**
- Joint Rapid Scenario Generation (JRSG) and Joint Data Alternatives (JDA) projects advertise they will address all the Action 4-4 info needs; **time will tell**
- **New DoDI 5000.02 has extensive Data Management section 9.a(3)**

Next steps:

- **Monitor and support JRSG and JDA projects as resources permit**
- **Investigate data sharing policies of OSD, JCS, and other Components**
- **Investigate JSC, PAE, & Service scenario data availability & access**
- **DSB will examine benefits of establishing an capstone M&S capability to inform OSD acquisition decisions; this has data sharing implications**
- **Implement any needed DoD policy, business model, and DAG changes**

Obj. 4: Improve Model & Simulation Use (cont.)

4-5. Foster cost-effective VV&A

4-5(a) Require DoD-wide standardized documentation of VV&A

Lead: OUSD(AT&L); **Support:** OUSD(AT&L)/DS(DDR&E/SE), ODOT&E, Components

Products: Revised policy in DODI 5000.2 and 5000.61; revised guidance in DAG

Completion goal: 2007

- Documentation template established as MIL-STD 3022; positive user feedback
- Draft revision to DoDI 5000.61 requires sharing VV&A info among organizations. MIL-STD 3022 is cited, but mandatory documentation is less, with no format specified
- DoD VV&A Documentation Tool (DVDT) to help draft MIL-STD-3022 VV&A documentation is available thru MSCO homepage, but requires CAC (or ECA) to use and only limited VV&A info must be shared. Fewer than 10 users so far.

Next steps:

- Make DVDT access easier
- Publicize the standard and supporting tool to acquisition PMs (DAG, etc.)
- Make VV&A reports generated using DVDT templates available from catalog
- Establish a commercial documentation standard under SISO

Obj. 4: Improve Model & Simulation Use (cont.)

4-5. Foster cost-effective VV&A

4-5(b) Develop risk-based methodology and associated guidelines for VV&A expenditures

Lead: OUSD(AT&L); **Support:** OUSD(AT&L)/DS(DDR&E/SE), Components
Products: Updated DoDI 5000.61; revised policy and guidance in DoDI 5000.2 and DAG
Completion goal: 2007

- **NAVAIR M&S Enterprise developing M&S VV&A and risk management guidance**
- **On AMSWG recommendation, was explicitly identified by M&S SC as a FY09 “High-Level task”**
- **M&S CO-funded JHU APL project underway to accomplish this action**

Next steps:

- **Assess M&S Enterprise guidance**
- **Oversee M&S CO project, evaluate deliverables and take action as necessary**

Obj. 4: Improve Model & Simulation Use (cont.)

4-5. Foster cost-effective VV&A

4-5(c) Examine a program's VV&A when M&S informs major acquisition decisions and unambiguously state the purpose, key assumptions and significant limitations of each model/simulation when results are presented.

Lead: OUSD(AT&L)/DS(DDR&E/SE) **Support:** DoD Components

Products: Guidance & training for oversight personnel; updates to DAG Chaps 4, 9

Completion goal: 2007

- **Addressed in "M&S Guidance for the Acquisition Workforce" posted on the SE webpage; now hot-linked from DAG**
- **M&S Cell gave initial briefing to SE/ASETS, seeing positive impact**
- **Navy may be addressing this; no other Component activities underway**

Next steps:

- **Strengthen DAPS methodology, broaden teaching on VV&A examination**
- **M&S Cell support SE/ASETS to accomplish during OSD program reviews**
- **Other AMSWG members take action within their Components**

Obj. 4: Improve Model & Simulation Use (cont.)

4-6. Assess the use of COTS systems engineering tools (modeling environments) for collaborative architecture development

Lead: OUSD(AT&L)/DS(DDR&E/SE); **Support:** OASD(NII), Components

Products: Revised guidance in DAG; enhanced M&S body of knowledge for dissemination

Completion goal: 2007

- SysML and AP-233 already proving utility in COTS tools (market success)
- UPDM nearing finalization, can help with CADM and DARS weaknesses
- NIST “Systems Engineering Tool Interoperability Plug-fest” underway
- OMG’s Model Interchange Working Group established, as of Jul 09 has run two tests exchanging UML (SysML and UPDM ahead)
- NIST working with Siemens to develop an AP-233 conformance validation tool
- **No known DoD inter-program use of COTS tools for architecture development**

Next steps:

- **Increase DoD awareness of this goal**
- **Propose as a SBIR topic**

Obj. 4: Improve Model & Simulation Use (cont.)

4-7. Define and capture meaningful metrics for M&S utility in acquisition

Co-Leads: OUSD(AT&L), Dept. of the Navy **Support:** OUSD(AT&L)/DS(DDR&E/SE), Components

Products: Metric definitions in DAG; methods to capture and submit data in DAG; data from individual projects in MSIAC, Body of Knowledge, etc.

Completion goal: 2007

- **AEgis Technologies conducted a study for M&S CO on “Metrics for M&S Investments” that was publicly released Mar 09**
- **DoD Acqn M&S Working Group established M&S Metrics Tiger Team (Jul 09)**

Next steps:

- **Review M&S CO/AEgis study, implement recommendations as appropriate**
- **Capture metrics as feasible**
- **Also consider M&S investment arguments based on commercial industry practices and lack of viable alternatives (e.g., security, safety, & battlespace constraints; paucity of live assets)**

Objective 5: Shape the Workforce

5-1. Define required M&S competencies for the acquisition workforce

Co-Leads: DAU and OUSD(AT&L)/DS(DDR&E/SE); **Support:** OUSD(P&R), OUSD(AT&L)/DDRE, OUSD(C)/PA&E (CAPE), Components

Product: Identified lead FIPT; workforce qualification requirements; management process & structure

Completion goal: 2008

- “Educating the M&S Workforce” project completed with Navy and M&S SC funding. AFAMS has published a recommended “Human Capital Strategy”
- Other lists of required M&S Competencies exist (e.g., industry’s M&S Professional Certification Program)
- AMSWG has established a Workforce Shaping Sub-committee

Next steps:

- Integrate M&S knowledge needs from AFAMS Human Capital Strategy with similar list in M&S Professional Certification Program managed by MSPCC
- Place under configuration management
- Advocate use in DoD human capital policies and industry human resource management policies
- Support implementation as appropriate

Objective 5: Shape the Workforce

5-2. Harvest lessons from commercial sector activities in the use of M&S to support product development

Lead: OUSD(AT&L)/DS(DDR&E/SE); **Support:** OUSD(AT&L), Components

Products: Annual update to best practices in DAG and lessons from industry that should be considered by PMs in planning for M&S

Completion goal: Recurring; initial in 2007

- **DDR&E/SE participated in conferences, workshops, and literature review involving commercial industry use of M&S, capturing relevant points**
- **Increasing industry adoption of “Simulation-Based Design (SBD)”**
- **Initial assessment getting stale; regular monitoring and better documentation needed**
- **Proposed FY10 Education Sustainment HLT would fund this task**

Next steps:

- **Support Education Sustainment HLT proposal. If fails, submit as SBIR topic.**
- **Collect and consolidate findings, feed into Action 5-3 (BoK)**

Objective 5: Shape the Workforce

5-3. Assemble and evolve the M&S Body of Knowledge (information set) relevant to acquisition

Lead: OUSD(AT&L); **Support:** OUSD(AT&L)/DS(DDR&E/SE), Components

Product: Information base available to potential M&S users (e.g., PMs, CMs, OTAs); source material for education and training

Completion goal: Recurring; initial in 2006

- “Educating the Work Force About M&S” project, AFAMS build a BoK and 7 universities developed courses comprising an important BoK
- Certified M&S Professional Certification program has a BoK
- Knowledge is still being developed (e.g., best practices)
- **No integration of this knowledge and only limited configuration management**
- Proposed FY10 Education Sustainment HLT calls for integration of the above knowledge via a Consolidated BoK Index at SimSummit website, integration and CM of ETWF knowledge, and regular enrichment of the total BoK

Next steps:

- **Support HLT proposal and establishment of O&M funds to sustain the BoK**
- **Establish effective BoK configuration management processes**
- **Make additional knowledge inputs as they become available**

Obj. 5: Shape the Workforce (cont.)

5-4. Educate and train the workforce to achieve required M&S competencies

5-4(a) Provide M&S knowledge via an expanded set of DAU courses, the Defense Acquisition Guide, and on-line CLMs

Lead: DAU; **Support:** OUSD(AT&L), OUSD(AT&L)/DS(DDR&E/SE), Components
Product: Expanded set of DAU courses, improved M&S guidance in the Defense Acquisition Guide, on line Continuous Learning Modules; a better educated workforce

Completion goal: 2009

- CLM on “M&S for Systems Engineering” released, has >6500 graduates
- CLM on “M&S for Test & Evaluation” released, has >6600 graduates
- Drafted “M&S Guidance for the Acquisition Workforce,” which is posted on the DDR&E/SE webpage; now hot-linked from DAG
- Six CLMs developed under “Educating the Workforce” project are being reviewed and provided to DAU

Next steps:

- Review and update existing CLMs; bring additional CLMs online
- Make DAU course changes based on integrated BoK (Action 5-3)
- Update DAG-linked M&S Guidance document

Obj. 5: Shape the Workforce (cont.)

5-4. Educate and train the workforce to achieve required M&S competencies

5-4(b) Provide M&S knowledge via conferences, workshops, and assist visits

Lead: OUSD(AT&L)/DS(DDR&E/SE); **Support:** OUSD(AT&L), DAU, Components

Product: Annual outreach program; a better educated and trained workforce

Completion goal: Recurring; initial in 2006

- Initial AMSWG Outreach Plan (06) identifies audiences, subjects and means
- NDIA M&S Committee meetings have been an excellent information source
- Additional materials (e.g., best practices) in work
- **Resource constrained**
- Proposed FY10 Education Sustainment HLT includes development and implementation of M&S Education Outreach

Next steps:

- **Support Educ. Sustainment HLT and establishment of O&M funds to do this**
- **Advertise and expand assist visits**
- **Hold workshops once recommended practices are in hand**

Obj. 5: Shape the Workforce (cont.)

5-5. Improve the knowledge and expertise available through the MSIAC to make it of greater utility to the acquisition community

Lead: OUSD(AT&L); **Support:** OUSD(AT&L)/DS(DDR&E/SE), OUSD(P&R), OUSD(C)/PA&E (CAPE), Components

Product: Plan of action with coordinated MSIAC CONOPS & staffing requirement; list of knowledge shortfalls that MSIAC will take on; success criteria & process to bring MSIAC up to criteria

Completion goal: 2008

- **Only preliminary conversations with MSIAC contractor thus far**
- **No plan of action by MSIAC; they want AMSWG to tell them what to do**
- **M&S Cell resource constrained**

Next steps:

- **Develop a plan of action to improve the M&S Information Analysis Center's usefulness to the acquisition community**

Way Ahead

- ❑ Ensure programs know about and can access deliverables
- ❑ Continue cooperation with Component M&S activities
- ❑ Continue cooperatively executing the AMSMP
- ❑ Provide direct assistance to programs
 - E.g., at the request of DDR&E/SE/ASETS, M&S Cell conducted M&S review of Joint Light Tactical Vehicle and FCS
- ❑ Continue to educate and learn via outreach
 - Conferences and workshops, both defense & commercial
- ❑ Support development of useful standards
 - SISO, OMG, ISO, W3C Data Semantics WG, etc.
- ❑ Pursue additional resources (both people and \$)
- ❑ Update AMSMP to refine vision and reflect accomplishments, fact of life changes, and newly-identified needs.

Q & A

A Decade of Studies on M&S Support to Acquisition

1. *Final Report of the Acquisition Task Force on M&S, 1994*
Sponsor: DDR&E (Dr. Anita Jones); Chair: VADM T. Parker, USN (Ret.)
2. *Naval Research Advisory Committee Report on M&S, 1994*
Sponsor: ASN(RDA); Chair: Dr. Delores Etter
3. *Collaborative Virtual Prototyping Assessment for Common Support Aircraft, 1995*
Sponsor: Naval Air Systems Command; conducted by JHU APL and NSMC
4. *Collaborative Virtual Prototyping Sector Study, 1996*
North American Technology & Industrial Base Organization; sponsor: NAVAIR
5. *Application of M&S to Acquisition of Major Weapon Systems, 1996*
American Defense Preparedness Association; sponsor: Navy Acqn. Reform Exec.
6. *Effectiveness of M&S in Weapon System Acquisition, 1996*
Sponsor: DTSE&E (Dr. Pat Sanders); conducted by SAIC (A. Patenaude)
7. *Technology for USN and USMC, Vol. 9: M&S, 1997*
Naval Studies Board, National Research Council; sponsor: CNO
8. *A Road Map for Simulation Based Acquisition, 1998*
Joint SBA Task Force (JHU APL lead); sponsor: Acquisition Council of EXCIMS

A Decade of Studies on M&S Support to Acquisition

9. *M&S for Analyzing Advanced Combat Concepts*, 1999
Defense Science Board Task Force (Co-chairs: L. Welch, T. Gold)
10. *Advanced Engineering Environments*, 1999
National Research Council; sponsor: NASA
11. *Survey of M&S in Acquisition*, 1999 and 2002
Sponsor: DOT&E/LFT&E; conducted by Hicks & Associates (A. Hillegas)
12. *Test and Evaluation*, 1999
Defense Science Board Task Force (Chair: C. Fields)
13. *“SIMTECH 2007” Workshop Report*, 2000
Military Operations Research Society (Chair: S. Starr)
14. *M&S in Manufacturing and Defense Systems Acquisition*, 2002
National Research Council; sponsor: DMSO
15. *M&S Support to the New DoD Acquisition Process*, 2004
NDIA Systems Engineering Div. M&S Committee; sponsor: PD, USD(AT&L)DS
16. *Missile Defense Phase III M&S*, 2004
Defense Science Board Task Force (Chair: W. Schneider)

Assessment Highlights

- ❑ Widespread use of M&S in acquisition, but usually stove-piped
- ❑ Many M&S representation gaps and deficiencies
- ❑ Acquisition staffs mostly uninformed about M&S capabilities and limitations
- ❑ No requirement to document planned M&S support to acquisition
- ❑ No effective business model for developing, using, and maintaining M&S capabilities
- ❑ Weak contractual guidelines for M&S and data needs
- ❑ Lack of agreed standards for sharing info, interoperating M&S tools
- ❑ Hard to discover reusable M&S tools and data, insufficient info to evaluate reuse candidates, and lack of reuse incentives = little reuse
- ❑ Virtual ranges take too long to assemble; aren't kept readily available
- ❑ Validation often weak or non-existent; documentation and examination inconsistent

Desired Acquisition Environment: Key CJSCI 3170.01E Policies

- ^{AE1} Joint concepts-centric capabilities identification process to allow joint forces to meet the full range of military operations and challenges...
- ^{AE2} Assess existing and proposed capabilities in light of their contribution to future joint allied and coalition operations. ... Produce capability proposals that ^{AE3} consider the full range of DOTMLPF solutions in order to advance joint warfighting in a unilateral and multinational context.
- ^{AE4} New solution sets...crafted to deliver technologically sound, testable, sustainable and affordable increments of militarily useful capability.
- The ^{AE5} FoS and SoS solutions may also require systems delivered by multiple sponsors/materiel developers. ^{AE6}
- The process to identify capability gaps and potential solutions must be supported by a robust analytical process ^{AE7}
- JCIDS implements a capabilities-based approach that...requires a ^{AE8} collaborative process that utilizes joint concepts and integrated architectures to ^{AE9} identify prioritized capability gaps and ^{AE10} integrated DOTMLPF and policy approaches to resolve those gaps

^{AE11}

Desired Acquisition Environment: DoDD 5000.1 Acquisition Policies

“The primary objective of Defense acquisition is to acquire ^{AE12} quality products that satisfy user needs with measurable improvements to mission capability and operational support, in a ^{AE13} timely manner, and at a ^{AE14} fair and reasonable price.” ^{AE15}

Governing policies:

- Flexibility, ^{AE16} Responsiveness (time-phased capabilities, evolutionary acquisition), Innovation, ^{AE17} Discipline, Streamlined Effective Management
- Armaments Cooperation; ^{AE18} Collaboration; Competition; ^{AE19} Cost and Affordability; Cost Realism; Cost Sharing; Financial Management; Independent OTAs; Information Assurance; Information Superiority;
- ^{AE20} Integrated T&E; Intelligence Support; ^{AE21} Interoperability; ^{AE22} Knowledge-Based Acquisition; Legal Compliance; Performance-Based Acquisition;
- ^{AE23} Performance-Based Logistics; Products Services and Technologies [seek ^{AE24} most cost-effective solution over the system's life cycle], Professional Workforce, Program Information [complete, current, tailored]; Program Stability; R&D Protection; Safety; Small Business Participation; Software Intensive Systems; Streamlined Organizations; ^{AE25} Systems Engineering;
- ^{AE26} Technology Development and Transition; Total Systems Approach ^{AE27}
- Oct 04 policy memo: Technical reviews ... shall be event-driven ^{AE28}

Necessary Systems Engineering Capabilities

(which M&S can affect; derived from Desired Acquisition Environment)

- SE1.** Early, continuing systems engineering from an SoS/FoS capabilities perspective; seamless transition from JCIDS to acquisition
(AE1-3,5,9-11,16,20,21,25,27)
- SE2.** Lifecycle-wide exploration of the maximum available trade space, including time-phased requirements and technology insertion
(AE1-5,7,10,11,13,16,19,23-27)
- SE3.** Collaboration among all stake holders (multiple gov't and contractor organizations) for key enterprise-level SE decisions (AE6-8,10,18,22,25,27)
- SE4.** Rapid assessment of concept/design alternatives (AE2,4,7,10,14,16,19,25,28)
- SE5.** Comprehensive, accurate, event-based assessment of technical baselines; avoidance of costly fixes for problems discovered late
(AE2-4,7,9,10,12-17,19,20,22,24-26,28)
- SE6.** Focused, effective & efficient testing; including at the capability level
(AE1,2,4,5,9-11,13,15,19-22,25)
- SE7.** Appropriate reuse of all resources – information, software tools, expertise, facilities, ranges, etc. – across programs & organizations
(AE4,14,15,19,24,25)

Needed M&S Capabilities (1 of 2)

(derived from Needed Systems Engineering Capabilities)

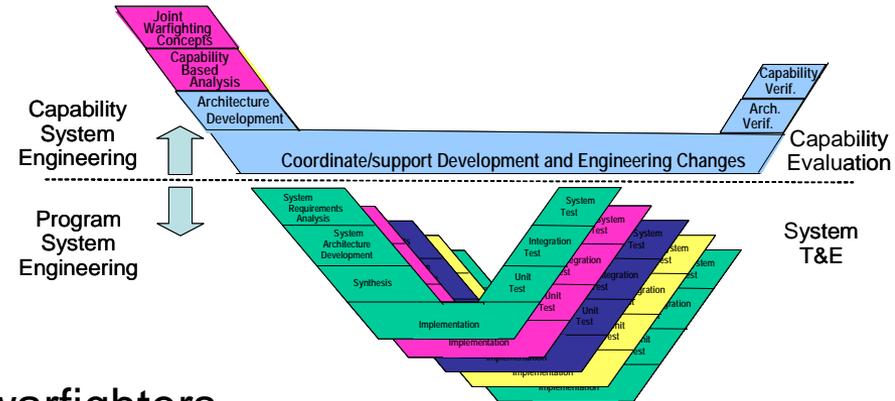
MS1. Model-based systems engineering/design (SE1,2,4,5)

(Emerging concept under INCOSE, OMG, etc.; growing suite of COTS tools)

- Modeling environments to analyze requirements, develop system and software architectures, and perform detailed design (e.g. CAD, S/W)

MS2. M&S-enabled collaborative engineering environments (SE1,2,3,4,5,6)

- Interoperable M&S, data management, & manufacturing
 - M&S as a communication means
- Full range of M&S assessments
 - Models, simulations, and distributed live-virtual-constructive simulation federations, with option to immerse warfighters
- Traceability for coherence and decision analysis



MS3. Model-Test-Fix-Model process across the life-cycle (SE4,5,6)

- Better test planning, more effective tests
- Increased M&S validity; credible surrogates; reuse savings

Needed M&S Capabilities (2 of 2)

- MS4.** M&S knowledge to formulate an effective acquisition strategy (SE2,3,4,5,7)
 - Ready access to M&S expertise and information about capabilities and gaps, reusable resources, lessons-learned, etc.
- MS5.** Disciplined M&S planning & employment (SE2,4,5,7)
 - Rigorous analysis of M&S requirements, alternatives, best course
 - Efficient configuration/initialization, execution and post-run analysis
 - Avoid inappropriate use; maximize cost-effective reuse across lifecycle
- MS6.** Efficient development/evolution of credible M&S tools (SE2,3,5,7)
 - A systems engineering approach with appropriate V&V
- MS7.** Access to authoritative, understandable data needed for M&S representations (SE2,3,4,5,7)
 - Reducing a major time and cost burden that inhibits M&S use
- MS8.** Inspection of M&S used to inform acquisition decisions (SE2,5,7)
 - Examine capabilities and limitations (VV&A) of M&S
 - During lead-up to program/technical reviews, OTRRs, DABs, etc.

Gaps

1. Management

- G1.** Robust but confused landscape of M&S activities; no clearly designated leadership or effective coordinating mechanism (MS1-8)
 - Current EXCIMS ineffective; little coordination for capabilities/SoS/FoS
- G2.** Inadequate constancy of purpose because time to fix problems >> tour length; “DoD has an attention deficit disorder” (MS2-7)
- G3.** Gov’t acquisition guidelines don’t promote M&S use or reuse (MS1-6)
- G4.** No DoD requirement for formal M&S planning to support acquisition (other than T&E) (MS1-5)
- G5.** No contractual guidelines regarding M&S and the data it needs (MS1-8)
- G6.** Gov’t typically doesn’t give contractors meaningful M&S guidance (MS1,2,6,8)
- G7.** Most DoD M&S takes a project, vice an enterprise, approach (MS2,3,6,7)
- G8.** No consensus on value of integrated architectures, nor responsibility for (MS1,2)
- G9.** Managing distributed collaboration is very hard (MS1-8)
- G10.** Public law precludes OT based solely on M&S, but no clear guidance on use for SoS/FoS T&E (MS2,3,5,6,8)

Gaps

2. Architecture/standards/technical framework

- G11.** No standard modeling notation (like UML v2.0) for capturing full range of information critical to system engineering (e.g., structure, behavior, requirements hierarchy/traceability, test cases, verification results) (MS1,2,6,7)
- G12.** No standard for interchanging systems engineering information (same examples as above) (MS1,2,6,7)
- G13.** No conceptual framework (like Open System Interconnect protocol stack) for data interchange (MS1,2,3,6,7)
- G14.** Lack of agreement on a common distributed simulation standard increases complexity and cost, limits simulation interoperability (MS2,5,6)
- G15.** DoDAF v1.0 is difficult to use for architecting due to lack of data-centricity and executability; some products of marginal value (MS1,2,6,7)
- G16.** Use of DoD-unique standards limits their user base, quality, COTS tool support, and opportunities for reuse (MS1,2,5,6)

Gaps

3. Model/simulation capabilities & use

G17. Many M&S tool gaps and deficiencies (MS1,2,3,5,7)

- What's modeled (e.g., urban warfare, comm networks, threats, system sustainment)
- Fidelity, granularity, interoperability
- Only limited consensus on common models to be used across a domain

G18. No good way to develop and maintain widely-needed M&S tools that cut across programs (MS5,6)

- Not incorporating mods by other organizations into “street version,” etc.

G19. M&S developers, not M&S users, tend to drive M&S development (MS6)

G20. In general, architecture development (modeling) is lagging, not collaborative, and not exploiting COTS SE tools (modeling environments) (MS1,2)

G21. No readily-available distributed M&S infrastructure (e.g., JDEP) (MS2,5)

G22. Hard to get security certification for multi-organization (company/Service) distributed simulation (MS2,3,5,6)

G23. Hard to get approval and security certification for M&S involving multiple compartmented programs (SAPs) (MS2,3,5,6,7)

Gaps

4. Trustworthiness/VV&A

G24. Post-development model validation expensive and slow (MS2,3,5,8)

G25. VV&A often weak or non-existent; documentation inconsistent (MS2,3,5,8)

- Plans to use M&S to avoid testing costs often rejected due to poor/no validation

G26. VV&A usually not enforced and also not examined during program reviews (MS2,3,5,6,8)

G27. Models and sims often not updated to reflect empirical evidence (e.g., test results) (MS2,3,5,8)

Gaps

5. Sharing/reuse and protection of tools & information

- G28.** Little reuse; only 7% of models & sims used on >1 program (MS2,5,6)
- G29.** Concurrent engineering requires an integrated process, data sharing and a coherent tool set, but <20% of programs have such a collaborative environment (MS2,7)
- G30.** Hard to discover reusable resources (software, info, services) (MS2,4,5,7)
 - M&S repositories are not integrated, lack an effective search capability, and are mostly empty
 - MSIAC knowledge/expertise is lacking
- G31.** Insufficient info (metadata) to evaluate data/reuse candidates (MS2,4,5,7)
- G32.** Hard to obtain reusable resources (MS2,4,5,7)
 - Industry to gov't: To protect proprietary info & competitive advantage
 - Gov't to industry: Contractual liabilities associated with GFE/GFI
 - Gov't to gov't: Concerns about misuse; cost to deliver and guide
- G33.** No incentives to encourage reuse (MS2,3,5,6)
 - Negative incentives include cost to make reusable, workload assisting users, vulnerability to criticism

[plus approval and security certification gaps 22 & 23 listed under M&S use]

Gaps

6. Research/S&T/tech base

G34. Conceptual foundation of M&S weak (MS5,6)

- E.g., theoretical understanding of modern warfare, human behavior, relating M&S at different granularities, dealing with uncertainty, agent-based modeling and generative analysis

G35. Little acquisition community input to DoD S&T management regarding needed M&S-related research (MS2,5,6)

7. Business model, metrics & ROI, funding and incentives

G36. No business model for how M&S capabilities should be developed, used and maintained (MS1-8)

G37. Metrics are critical to keep interest and funding up, but metrics regarding M&S use and cost-effectiveness are inadequate (MS1-8)

- M&S funding difficult to identify; most embedded within other PEs

G38. Too little funding (MS2-7)

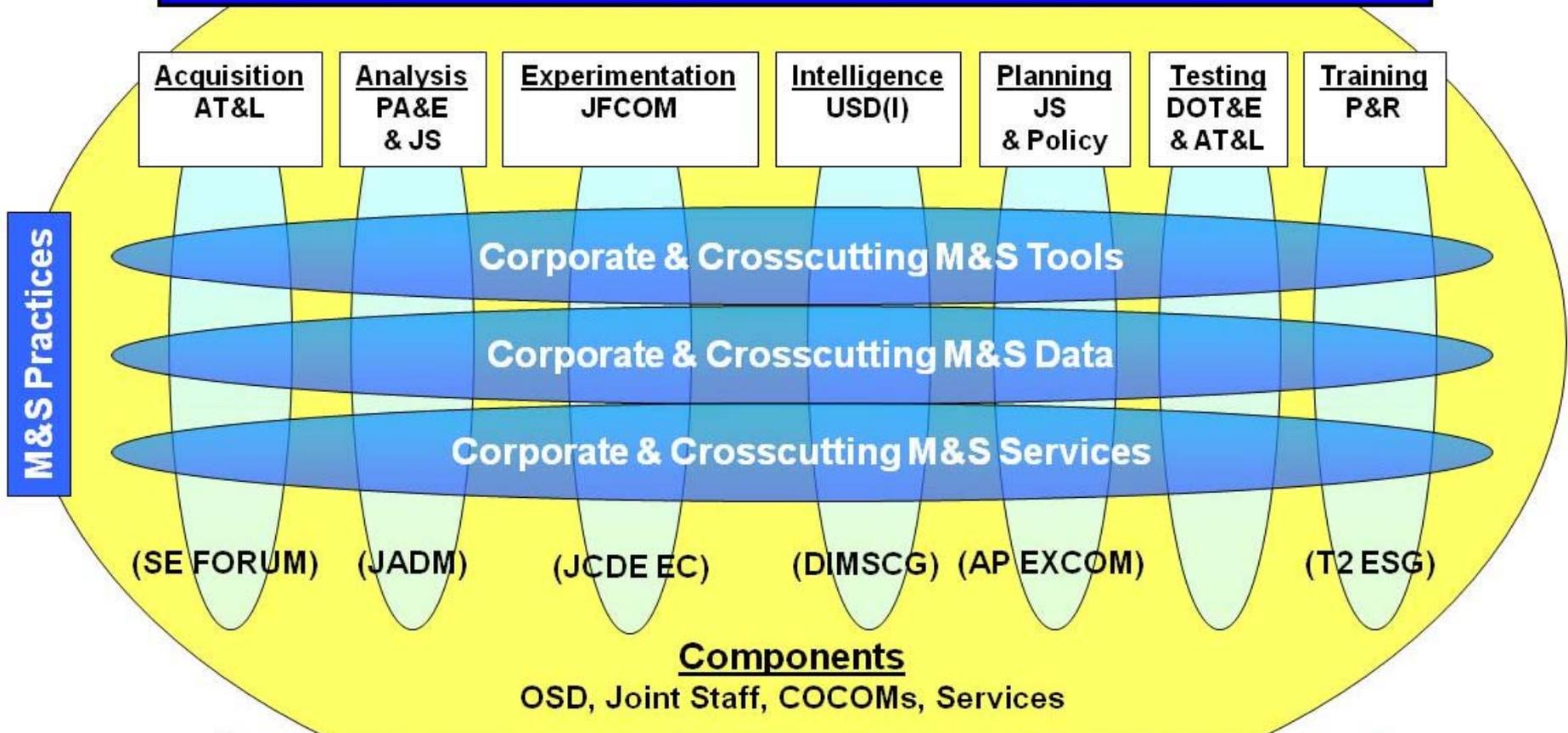
Gaps

8. Workforce Shaping

- G39.** Body of knowledge for M&S support to acquisition is deficient, not managed (MS1,2,4-6,8)
- G40.** Acqn community managers and staffs mostly uninformed about M&S capabilities and limitations (MS1-8)
 - Weak acquisition personnel understanding of commercial M&S activities (“We don’t get out enough”)
 - Not enough M&S experts (no career path [except Army], no formal education or training)
- G41.** M&S developers lack understanding of modeling best practices, abstraction techniques, context dependencies, etc. (MS3,6)
- G42.** M&S users often not adequately trained (MS1,2,4,5,8)
- G43.** Insufficient M&S education options (MS2,4,5,6,8)

DoD Modeling & Simulation (M&S) Governance

M&S Management Structure Organized by Communities.
Designed to Support & Integrate M&S Activities across the Department.
Led by a 1 to 2 Star M&S Steering Committee (M&S SC) to provide governance.



Goal: Establish corporate M&S management to address DoD goals:
Leads/guides/shepherds the \$Bs in DoD M&S investments; adds value
thru metrics & ROI-driven priorities; and seeks to provide transparency.