M&S TOOLS FOR THE JTF COMMAND AND STAFF: ENHANCING MISSION ANALYSIS AND TRAINING

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ABSTRACT

As the executors of missions, Joint Task Force (JTF) commanders and staffs face a widening spectrum of specified and implied tasks. These tasks often pertain to missions less focused on traditional military roles of conflict resolution, and more on stability promotion, humanitarian assistance, and peacekeeping operations. Yet, due to the uncertain nature of the environments in which military forces may be deployed, JTF commanders, with limited warning, must be prepared to execute the complete range of military requirements swiftly and effectively. This places a heavy burden on contingency planning and the integration of forces and elements into teams that may have limited time to rehearse missions. This paper describes how modeling and simulations can support JTF commanders and staffs. The paper posits a process by which modeling and simulation tools can be used to accomplish the key functions of mission analysis and current status assessment, and the availability and suitability of current models and simulations to address those functions. In addition, this paper identifies potential collateral benefits incident to using the process and assorted modeling and simulation tools that support the JTF commander and his staff. In short, this paper focuses on what modeling and simulation can do to: analyze the JTF missions, reveal training requirements, accomplish training objectives, and assist in the contingency planning process.

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1.0 Introduction.

As the executors of missions, Joint Task Force (JTF) commanders and staffs face a wide spectrum of specified and implied tasks. These tasks often pertain to missions less focused on traditional military roles of conflict resolution, and more on stability promotion, humanitarian assistance, disaster mitigation, and peacekeeping operations.[1] Yet, due to the uncertain nature of the environments in which military forces may be deployed with limited warning, JTF commanders must be prepared to execute the full spectrum of military requirements swiftly and effectively. [2]

2.0 The Problem.

The combination of an uncertain operational environment, limited warning and vague objectives (in which military components may play a secondary role[3]), places a heavy burden on JTF commanders and staffs. Moreover, many national decision-makers are reluctant to integrate military elements until late in the process since their involvement carries escalatory significance. This provides the JTF commander with limited time for team integration and mission rehearsals.

2.1 *Crucial Assessments*.

In particular, there are four areas which the JTF commander must assess:

- his possible missions,
- his current status in terms of resources, plans and training,
- contingencies,
- team task training.

All of these must be addressed successfully if the JTF commander is to go forward in confidence.

[1] John M. Shalikashvili, National Military Strategy, Executive Summary, (Washington, D.C.: The Joint Staff), 1997. P.1.

[2] Ibid., Pp. 1-2, .

[3] John M. Shalikashvili, National Military Strategy, (Washington, D.C.: The Joint Staff), 1997. P. 4.

3.0 Assistance Through the Use of M&S.

3.1 This paper outlines how modeling and simulation can support JTF commanders and staffs. It addresses the process by which modeling and simulation can be employed to support the key features of both mission analysis and current status assessment. It suggests representative M&S products addressing differing phases of the outline here delineated, comments on their availability, and makes some limited projections on M&S products being developed.[4]

3.2 In addition, this paper identifies some potential collateral benefits through using the suggested process and the assorted modeling and simulation tools.

3.3 In short, this paper focuses on the assistance that modeling and simulation can provide in analyzing the JTF missions, highlighting training requirements, assisting in the contingency planning process, and accomplishing training objectives. This methodology is not intended as a tutorial; the author recognizes the expertise of those who presently execute the difficult tasks implicit in each of the areas delineated. Nor is this paper aimed at a mere identification of the problem. Yet, if the basic analyses bounding missions, probabilities of missions and proportionality of effort are not done first, subsequent efforts likely will be ill focused. This is an outline of a methodology; executing that methodology is a far more extensive undertaking.

4.0 ***Mission Analysis***

4.1 *Defining the Mission*.

The first major task facing a JTF commander is defining his missions to the highest possible degree of resolution. Understanding that each mission is unique, the spectrum of possible

[4] The nature of the mission greatly limits the suitability of model choice. For example, using a conflict resolution model for a mission whose nature primarily is disaster relief or humanitarian assistance is inappropriate.

commitments is very broad, and the objectives often indistinct, makes this effort challenging and critical. No model or simulation independently can specify the missions. However certain M&S applications may help reveal specified and implied tasks. Different M&S products/tools focus on different stages of analysis. Through the iterations of these sundry models and simulations, key facets of an operation typically are revealed in their After Action Reviews (AARs). Often, these key facets, particularly those leading to some repetitive difficulty during game play, are distilled to a check list, matrix or action sequence. Such collections of advisable procedures serve not only as training tools, but frameworks for analysis and guides for future operations.

4.1.1. *Mission Tasks*
The first task of mission analysis is the specified tasks. These usually are composed of a collection of those tasks spelled out by a higher headquarters and those that are obvious adjuncts to the basic mission. As plans are developed which aim at accomplishing the mission and the specified tasks, an expanding array of tasks for subordinate commands and elements is deduced. These become the missions and specified tasks for those lower echelons.

4.1.2 *Application of M&S.*
At this juncture M&S applications become useful. Differing concepts of how to accomplish the mission and specified tasks are modeled and exercised, and the results compared. Although these exercises often confirm what was intuitive to experienced professionals, they occasionally reveal the improbability of courses of action that initially seem promising.

4.1.3 *Selected M&S Applications*. Some representational M&S applications perhaps useful in this functional stage include:

Plowshares, (a project that uses TERRA [Training for Enemy Rapid Response Allocations] for civil-military emergency planning. Proponent: STRICOM)
CATS [Consequence Assessment Tool Set] (Deals with natural and technological disaster including war. Proponent: DSWA)
DEXES [Deployable Exercise System] (Addresses impact of military force on civil population. Proponent: SOUTHCOM)
EADSIM [Enhanced Air Defense System] (Analytic model for theater-level external air defense scenarios. Proponents: US Army Space and Strategic Defense Command)
FAST-OR [Force Analysis Spreadsheet Tool – Operations-Other-Than-War] (Models non-combat units and support requirements. Proponent: US Army Concepts and Analysis Agency)
HEAT [Headquarters Effectiveness Assessment Tool] (Spreadsheet methodology used to assess the effectiveness of command and control headquarters. Proponent: Joint Interoperable Test Command [JITC])
HASCAL [Hazard Assessment System for Consequence Analysis] (Assesses NBC releases; under development by Defense Nuclear Agency.)
ITEM [Integrated Theater Engagement Model] (Theater-level model for air and naval planning and analysis. Proponent: DSWA)
SPECTRUM [an operations other than war simulation] (Combines conflict with multivariate sociological models including political, economic, and socio-cultural. Proponent: National Simulation Center)

4.2 Implied Mission Tasks

The staffing process and the development of courses of action reveal implied tasks incident to the accomplishment of any mission. These implied tasks have a significant impact on the planning process, the missions to subordinate commands, and all support requirements. Indeed, as the implied tasks are revealed and developed, the criticality of some become so evident as to merit their becoming a defined mission statement for some element.

4.2.1 Common Occurrences; the Tension of Competing Needs.

Occasionally, a situation is revealed that requires special reconsideration or planning assumptions. More often, depending upon the unknowable course of events, secondary contingency plans must be developed. In this fashion, planning considerations themselves become implied tasks. This drive for specificity is characteristic of sound planning. It is the rigor implicit in M&S applications that adds value to this phase. However, this need is countered by the requirement for flexibility. Complete understanding of the present and future circumstances of an operation are remote. Thus, integrating sufficient flexibility in developing contingency plans becomes a key aspect of the planning process.

This paradoxical, often frustrating, situation can be eased by adroit use of M&S. Not only can M&S applications help bound the problems, they can explore far more possible solutions to a far greater depth in shorter time than can other methods.

4.2.2 Selected M&S Applications.

In addition to those M&S tools listed above, the following applications also may be useful in this stage:

FDE [Force Deployment Estimator] (Inter- and intra- theater force development models. Provides first-cut estimate of feasibility of desired deployment of ground, air and sea forces and their sustainment. Proponent: JS/J8)

Janus [not an acronym] (Interactive, multi-sided, near-real-time, force-on-force conflict resolution model. Proponent: National Simulation Center)

JICM [Joint Integrated Contingency Model] (An interactive theater-level model composed of an integrated family of simulations for ground war. Replacement for RSAS. Proponent: RAND corp.)

JFAST [Joint Flow and Analysis System for Transportation] (A support tool for strategic air and sea lift; runs on PC, can link to AMP. Proponent: TRANSCOM)

LPX-MED [External Logistics Processor] (Logistics COA analysis tool. Theater level, medical assets networks and evacuation assets in conventional or NBC environments. Proponent: Studies, Concepts and Analysis Division, JS, J4.)

MIDAS [Model for Intertheater Deployment by Air and Sea] (Analysis model providing planners with intertheater deployment model simulating movement of combat and support units and sustainment. Includes all aspects of air and sea lift and prepositioning. Part of JWARS phase 1. Proponent: JS, J4.)

SIAM [Situational Influence Assessment Module] (A Baysian influence model used to analyze OOTW situations. User: US ACOM, SAIC Corp.)

5.0 Requirements Identification

The second major area in which M&S can assist the JTF commander and his staff is in identifying requirements. As with the mission analysis portion, this is an iterative process incorporating a family of M&S applications dealing with everything from international agreements for allied operations, through terrain and threat analysis and logistic projections, to the sundry requirements for the individual soldier. Some of these requirements are straightforward and quantifiable (e.g., logistics). Others (e.g., training and untested procedural processes) are more difficult to measure.

5.1 *The Three Zones*.
Assessing requirements for the JTF commander essentially coalesces into three major sub-groups to which the assessments are applied. These are:

1. Resources (men, machines, money, supplies, etc.),
2. Plans (deliberate and coordinated procedures mating resources to missions in ways likely to yield intended results),
3. Training (including the training audiences, requisite training modalities, and the extent to which the training audiences are prepared to execute their missions).

5.2 *Identifying Requirements*.
Essentially, identifying requirements is a two-step process overlapped by both the analytic and contingency planning phases. Determining requirements is meaningful only as the needs are compared with present status and the differential assessed.

5.2.1 Focus on the Differential.
The differential between needs and assets, once prioritized by the commander, defines the bounding parameters of contingency planning and the focus of training. Typically, planning and training focus on combat. Yet, the broadening, changing environment of JTF responsibilities suggests involvement mandating other than typically military-centric (i.e., conflict resolution) tasks. Military involvement in such situations may be limited or considerable, and, regardless of scale, may contain a low proportion of combat elements. In circumstances such as disaster relief or humanitarian assistance, military assets and organization may be crucial, but almost wholly non-combat in composition and application.

5.2.2 A Differential in Missions.
This is a significant inferential point. JTF commanders are caught between what they must be able to do, and what they are most likely to be called upon to do. If resources are constrained, it may be challenging to do either well, and difficult or impossible to do both. Uncertainty in allied commitments in such circumstances exacerbate this paradox. A frank assessment of missions, priorities and resources is an absolute necessity. As a means of assessing mission feasibility and reducing the costs (time, fiscal and organizational) involved, the use of M&S applications may not be a luxury, but a necessity.

5.2.3. *First and Second Order Effects.*
The investigation of consequent cause-and-effect relationships may result in more types of missions. In turn, the proliferation of missions generates an increased number of plans and organizational configurations needed to do them successfully.

5.2.4. Breadth of M&S Applications.
M&S applications applicable to this area are numerous, many addressing areas of interest beyond requirement identification. Indeed, almost all the M&S tools suitable for contingency planning possess (to some extent) a dual applicability to resource identification. The following represent some of the M&S tools that may be of use in this phase:

ACPT [Air Campaign Planning Tool] (Planning system for CONOPS, centers of gravity, campaign and air component objectives. Proponent: HQ, USAF)
AMP [Analysis of Mobility Platform] (Support tool for mobilization. Shell for transportation, mobilization and deployment programs; includes TPFDD. Proponent: US TRANSCOM)
ALPS [Area Limitation Planning System] (Sensor planning tool/system including fixed and UAV platforms. Proponent: MITRE)
CATS [Consequence Assessment Tool Set] (Deals with natural and technological disaster including war. Proponent: DSWA)
ELIST [Enhanced Intra-theater Logistics Support Tool] (Analytic tool for transportation planning, usually part of AMP suite. Proponent: CENTCOM, TRANSCOM)
FAST-OR [Force Analysis Spreadsheet Tool - Operations Other Than War] (Models non-combat units and support requirements. Proponent: US Army Concepts and Analysis Agency)
JFAST [Joint Flow and Analysis System for Transportation] (A support tool for strategic air and sea lift; runs on PC, can link to AMP. Proponent: TRANSCOM)
KBLPS [Knowledge Based Logistics Planning Shell] (Assists in calculating logistics requirements, planning allocation and transportation of supply and CSC structure. Proponents: CENTCOM & UNC/CFC Korea)
LOGSIM [Logistics Simulator] (Joint Training Confederation logistics model, interfaces with AWSIM, may be integrated into JSIMS. User: EUCOM.)
OLOGPLN [Operations Logistics Planner] (Can estimate material needs for all classes of supply [except VII or XI] of Army units down to battalion or company level. User: UNC/CFC Korea.)
RESA [Research, Evaluation and Systems Analysis] (Naval warfare training model; used stand alone or as part of the Joint Training Confederation. To be replaced by JSIMS. Used extensively in training with allies. Proponent: USN NRAD.)
SUMMITS [Scenario Unrestricted Mobility Model for Intra-theater Simulation] (Transportation model simulating all phases of intertheater problem from port of departure to tactical assembly area and FEBA. Uses requirements from MIDAS and unit movement data from TACWAR to structure inputs. Current user: Joint Staff.)

5.3 *Comparison to Present Status*.
The second phase of requirements identification is comparing those resources, plans and training identified during the iterative, analytic process to those on hand resources, prepared plans and current training status. Making these comparisons may be more complex than initially perceived since there is a direct relationship between the variables of each functional area. Indeed, the possibility of multiple simultaneous contingencies adds to difficulties in making comparisons since support and logistic aspects largely are dependent upon sustainable flow rates.

5.3.1. Need for Early Analysis.
An early identification and decision of priorities in missions, commitments and resources is necessary to assure sufficient depth of resources, adequate planning factors, and pertinent training for conceptualized mission-specific teams. In fact, given the broadening of mission responsibilities and the enlarged probabilities of multiple tasking of military resources, the philosophical notion of "just in time" resource provisioning may have to be addressed in this phase of operational planning rather than later.

5.3.2. *Precluding Difficulties and Assessing Shortfalls*. Precluding later difficulties incident to over-commitment, resource shortfall, and/or altered priorities will require clarity in objectives and priorities, persistence in preparation, restraint in commitment, and firmness in execution. If there are limitations in logistics, as the "just in time" philosophy suggests, then the "just in case" philosophy must be expanded in the planning and training arenas. Assessing shortfalls in requirements is more than a simple comparison of spread sheets of "required" to "on hand." Indeed, depending upon the priorities and conceptual missions, the scale, duration, or techniques of a mission might be altered because of resource availability. Further, such missions might later be adjusted (expanded or contracted) due to adjustments in resource availability.

5.3.3 Shifting from "What" to "How" and Testing for "If."

Simply put, once decisions have been made as to what is to be done (and in what priority),[5] the next step is determining how they might best be done, and what resources are necessary for such enterprises.

The comparisons between mission requirements and available resources (at the time such an event occurs) are a well-known iterative process of course of action analysis. The findings resulting from this process usually lead to adjustments in plans and resource acquisitions. Yet, there is a need for caution. The earlier in the analytic cycle the process is applied, the lower the precision of the data and the greater the tendency to assume significant factors. Significantly, later refinements often fail to assess the viability of the basic assumptions upon which all else is premised.

Although there are no known M&S applications that can provide all the answers in this broad, complex area, fortunately there are M&S applications which, as tools, may assist commanders and planners. Specifically, the speed at which some of these tools provide results permits significantly altered concepts to be "tested" and analyzed. However, it should be recognized that no M&S application generates plans.

The cognitive process of conceptualizing a contingency plan remains a human input. Similarly, it takes the man-in-the-loop to meld the products and processes of M&S and maintain proportionality.

5.3.4 *Embedded Problems*.

Proportionality is important as many M&S applications stress specific areas and are constructed along parameters essentially equating to bounding assumptions. This remains true for types of M&S products clustered to produce results in the joint domain. Historically, such clusters of M&S applications carried two imbedded limitations. First, these products were bounded by the same sort of assumptions (often service peculiar). In the absence of a true interface, the results were adjusted to reflect outcomes in keeping with experience and historical data. It was an improvement over fully scripted play, but did not account for random events, or reveal inadequacies in plan design or execution.

The second, and sequential problem evolved from attempts at achieving the ability for applications to work with each other. In this case, trade-offs occasionally were made in data equivalencies, but, more significantly, tinkering was done with the overarching architecture and language of the products. Although this improved the value of the applications, during the exercise process the results often revealed plainly unrealistic irregularities. Unfortunately, the on-site adjustments made for both of these problems often gave "outside" observers the illusion of holistic, seamless continuity. It was the recognition of these shortcomings which led to the ongoing efforts of ALSP and HLA.

5.3.5. *High Value Applications*.

Despite these and other difficulties, M&S applications rapidly can synthesize and compare relative data bases and generate supporting documents such as plan annexes. Such time-consuming exercises such as load planning, Time Phased Force Deployment List (TPFDL) generation, detailed consumption rates, probable critical nodes, expected/projected days of operation for friendly and opposing forces, casualty, personnel, and evacuation projections, multiple transport load calculations, medical requirements, and a host of other staff estimates, all are appropriate for M&S applications.

Nor is this all. Inferential requirements, such as individual training densities and projected personnel demands also are available. For example, the successful execution of a mission requires a certain package of skills. These include skills necessary in the planning, marshaling, movement, execution and recovery stages of any operation. However, the densities of those skills will change not only with respect to the phase of the operation, but also with attrition. M&S applications can assist in identifying those sorts of demands, the probable episodic sequence in which they would occur, and derive the necessary replacement rate to insure continued effectiveness. While not perfect (war, after all, is the province of chance) such tools assist greatly in identifying the probable particulars of concern.

[5] This implies a clear set of priorities, objectives and bounded commitments matched to pre-coordinated limits of authority and a procedure precluding "mission creep." With the blurring of the so-called dividing line between "military" and "non-military" operations, it is critical that an effective means exists to continually reassess current and potential operations, clarify limits of authority, and strengthen coordination protocols.

5.3.6 Fundamental Cautions.

It must be understood that each contingency subjected to examination requires considerable analyses, all of which may be severely disjointed, even uncoupled, should the bounding parameters or assumptions change.

Moreover, there is the tendency of planners to champion their pet project by assuming away probabilities or difficulties. Indeed, the combination of a "make it happen" mandate and a "can do" philosophy often combine to stretch circumstances beyond advisable bounds. However, as M&S applications have no such credos, they damp such tendencies.

More worrisome is the related tendency to "overreach". This situation can be exacerbated by requirements to prepare for the simultaneous execution of more than one contingency, leading to inflexible planning. Difficulties tend to mount since all contingencies are subject to "mission creep." Moreover, the probability of multiple simultaneous commitments of military assets *increases* as conditions worsen. This is due not just to the tendency of one instability to generate or propel another, but because the underlying factors spawning such an initial instability usually affect more than one party. Additionally, there is deliberate activity; adventurous, aggressive leaders often seek to capitalize on the over-commitment of probable opponents. This circumstance directly pertains to and affects US CINCS and JTF commanders.

5.4. Assistance from M&S.

Fortunately, M&S applications again can provide some aid by assisting the JTF commander in sorting out the "A *and* B" contingencies from the "A *or* B" contingencies. Moreover, the analytic, iterative process described above will aid in revealing the extent of shortfalls in the "or" cases, placing the decision to provide for such capabilities in the hands of senior policy makers while damping the tendency of "overreach." As such, such M&S applications can assist in gauging risk, particularly that incident to changing regional and global conditions. This may do an important service in preventing the commitment of US military assets to inadvisable venues, while simultaneously precluding a confusion over the difference between "just in time" versus "just in case" preparations.

The following M&S applications may have applicability in the areas listed below.

- Resources[6]

  AMP [Analysis Mobility Platform]
  CSS/TSS [Combat Service Support Tactical Simulation System] (Training for CSS unit commanders and staffs from echelons above corps to battalion. Stand alone or JTC model. User: EUCOM, Proponent: Army National Simulation Center.)
  ELIST [Enhanced Intra-theater Logistics Support Tool]
  FAST-OR [Force Analysis Spreadsheet Tool - Operations Other Than War]
  FDE [Force Development Estimator]
  JFAST [Joint Flow and Analysis System for Transportation]
  LOGSIM [Logistics Simulator]

- Plans

  CATS [Consequence Assessment Tool Set]
  Plowshares [Civil-Military Emergency Management]
  CAPS [Commander's Analysis & Planning Simulation] (Planning tool & simulation dealing with active defense against ballistic and cruise missiles in TMD missions. Also incorporates BM/C4I pillar. Proponent: BMDO.)
  JICM [Joint Integrated Contingency Model]

- Training[7]

[6] This is a very brief, representational listing. Short descriptions were omitted if provided earlier in this document. Note that some apply to more than one area. Some of these here listed are bundled and others are service specific.

[7] See the latest listing in Joint Training Confederation documents. List shown here includes legacy and current applications.

AWSIM [Air Warfare Simulation] (JTC air combat model. User: US ACOM.)

BBS [Brigade/Battalion Battle Simulation] (Training model for maneuver brigade and battalion commanders. Due to be replaced by JSIMS. Users: all Army divisions; Proponent: Army National Simulation Center.)

CBS [Corps Battle Simulation] (Army ground combat simulation model. User: US ACOM, Proponent: Army National Simulation Center.)

CSS/TSS [Combat Service Support Tactical Simulation System]

ITEM [Integrated Theater Engagement Model]

JCATS [Joint Conflict and Tactical Simulation] (Primarily high resolution, tactical level team trainer, ground and amphibious war. Replaced JTS, JCM and UCCATS. Users: all USMC MEFs; Proponent: JS/J8)

Janus [Not an acronym] (Analysis program used as an exercise driver and combat developments tool. Interactive, near-real-time model developed to explore relationship of combat and tactical processes. Plays land, sea and air operations usually at battalion or brigade level. Users: JWFC, SOCOM, SOUTHCOM, USAREUR, all Army divisions Proponent: National Simulation Center.)

JTFS [Joint Task Force Simulation Model] (Training simulation for nontraditional military activities and operations. JCM, a Janus variant, is being developed as the primary exercise driver for JTFS. JCM's naval, air and intelligence capabilities have been improved to allow its use as a driver for joint exercises. User: PACOM.)

JTLS [Joint Theater Level Simulation] (Interactive simulation modeling multi-sided air, ground, and air combat with logistical, special operations and intelligence support. Simulates coalition warfare at operation level. Used in CONPLAN analysis. Users: SOCOM, SOUTHCOM. Proponent: JWFC.)

JSIMS [Joint Simulation System] (Core of common joint representations and interfaces with air/space, land and sea warfare functionality; supports unified/specified commands, services and JTF training in all phases of military operations. HLA compliant. In development. Proponents: JSIMS JPO & JWFC.)

JCATS [Joint Conflict and Tactical Simulation] (Joint, multi-sided, interactive, entity-level high resolution conflict simulation. Replaces JTS and JCM. Proponent: JWFC.)

MTWS [MAGTF Tactical Warfare Simulation] (Training model developed for USMC to train C2 functions. Simulates all current platforms, systems and doctrinal situations. Proponent: JWFC, US ACOM.

RESA [Research, Evaluation & Systems Analysis Model]

TACSIM [Tactical Simulation] (Training model, primarily for intelligence collection and dissemination. Models tasking, collection and reporting function of US reconnaissance assets. Needs SCI facility. Users: US ACOM, JWFC, USFK, USAEUR. Proponent: STRICOM.)

TEXIS [Theater Exercise Intelligence Simulation] (A collateral-security derivative of the compartmented TACSIM, but with no "national assets" modeling. Interfaced to AWSIM simulation and the NWARS at the Blue Flag facility. Users: USACOM.)

UCCATS [Urban Combat Computer Assisted Training System] (Training model used as an exercise driver and skill development tool. Intended for training leaders through battalion level in urban warfare. Conventional, unconventional warfare and special operations. Being replaced by JCATS. User: USAREUR.)

6.0 ***Contingency Planning***

6.1 Maintaining Perspective.
In part, contingency planning already has been incorporated in this process and addressed above. Yet, it is likely that many of the contingency plans developed thus far were premised on a stand-alone, single commitment assumption. Moreover, it is probable that an additional assumption was
made that should a multiple commitment occur, resources would be provided speedily for such an eventuality or that a withdrawal-reengage sequence would take place. Such assumptions may be unwarranted.

6.2 Needed: A Continual Effort.
The quite considerable effort required to develop a first set of workable contingency plans requires matching efforts in refinement and coordination. Such integration is a challenging, more complex process than its predecessor, and subject to the vagaries of (among others) arbitrary budget process, altered policy emphasis, and a changing strategic milieu. However, neither the widening scope nor the growing complexity of the missions are likely to slacken. [8]

6.3 Earlier Methods Inadequate.
The luxury of a single, overarching "one size fits all" plan is neither appropriate nor affordable. Nor, for that matter, are options of a single credible (stand alone) plan or the so-called "flexible force package" (essentially a make-it-up-as-you-go-along process). The former does not address multiple simultaneous contingencies, and the latter is both time consuming and wasteful. Yet, because of the effort involved, there will be a tendency to avoid such work by rationalizing (e.g., "Perfection is the enemy of good enough"). Significantly, the multiple stages of this iterative process are not seeking "perfection," but a collection of integrated, prioritized, sensible plans. Nothing less than this is "good enough."

6.4 M&S Tools a Mixed Bag.
To assist the JTF commander there is a wide spectrum of M&S applications addressing military contingencies, conflict resolution, and conflict outcomes. There is a lesser number of applications that address operations other than war (either military or civil resource centric). There are few applications addressing such commitments from an interagency or international (e.g., UN, NGO, PVO, etc.) perspective.

6.5 Assistance Needed.
Considering his requirements, the JTF commander may require considerable assistance in identifying the appropriate mix of those M&S tools available for particular issues, and even then, find those available inadequate. Such shortfalls in M&S applications are not necessarily evidence of a lack of appreciation for the needs, but indicative of the nature of M&S as a growing field, whose applications, while accelerating, have yet to address all requirements.
Although the JTF commander may see his role as a warrior as his primary responsibility, the probability of an actual execution of that role is lower than involvement in other-than-combat tasks. The more likely commitments of military resources suggest a plethora of tasks all having low concentrations of fighting elements and even lower probabilities of actual combat. Thus, the currently available M&S tools are an asymmetrical match to the probable needs.

6.6 An Expanding Menu of Options.
The following M&S applications may be of use to planners in developing contingency plans both during the initial and iterative, coordinating stages.

[8] ". . . the only responsible strategy for the United States is one of international engagement." ". . . being ready also means being prepared to conduct a broad range of military missions, including new ones, with out spreading U.S. military forces too thin." U.S. Department of State, "A New Strategy for a New Era," from 1995 Annual Defense Report, (Washington, D.C.: US Government Printing Office), p. 3.

AFMSS [Air Force Mission Support System] (Mission planning system used for Air Force, Army and Special Operations planners at squadron level. Interfaces with Wing Command and Control System (WCCS). Proponent: USAF Theater Battle Management Core Systems [TBMCS].)
CATS [Contingency Analysis Tool Set]
COAST [Course of Action Selection Tool] (Supports comparative analysis of proposed COAs based on user-selected criteria and fuzzy logic algorithm. Can be applied to non-military scenarios
FAST-OR [Force Analysis Spreadsheet Tool - Operations Other Than War]
ELIST [Enhanced Intra-theater Logistics Support Tool]
FDE [Force Deployment Estimator]
FORCEGEN [Force Generation Model]
GDAS [Global Deployment Analysis System] (Theater analysis model for deployment; determined requirements for the transportation analytical process, CONUS mobilization stations to theater tactical assembly areas, detailed network world map display, schedules to achieve efficient deployment. Proponent: CAA.)
JFAST [Joint Flow and Analysis System for Transportation]
KBLPS [Knowledge Based Logistics Planning Shell]
LOGGEN [Logistics Generator]
MIDAS [Model for Intertheater Deployment by Air and Sea]
OLOGPN [Operations Logistic Planner]
TAM [Theater Analysis Model] Provides results of military conflict incidental to the conduct of politico-military games. Addresses conventional combat with provisions for logistic and WMD effects. PC-based. Deals with force capabilities and requirements. Useful for assessing quantitative and qualitative issues. Aids in assessing COAs and resource planning. Users: PACOM, SOUTHCOM. Proponent: JS, J8.)
TAMPS [Tactical Aircraft Mission Planning System] (Provides flight path comparisons, strip charts, fuel usage, and visualization of threats and terrain. User: STRATCOM.)

7.0 Team Task Training.

7.1 Sequential Process Dictates Order, Modality, and Scope.
Team task training is a particular problem set for the JTF commander. By the time the commander and staff have progressed through the process delineated above, the questions for training do not concern "if," but "how," "when," "where," "who," and "to what extent." And, to these, M&S applications can contribute.

7.2 The Individual.
Of training's multiple dimensions the easiest requirements to address are those relating to individual qualification. Long experience, robust proven programs, and intensive management for all services resulted in demonstrably competent, consistent combat-related skills at the individual level. Indeed, the integration of the personnel system in terms of skills is the hallmark of the military's applied function system. M&S applications to this arena are well established and the results highly valid.

7.3 *Crews, Teams, and Units.*
At the next level of training, that of crews, teams and units, considerable integration of simulators, simulations, modeling and a wide variety of combinations thereof is amply evident. This integration spans a gamut from crew member to corps level entities. Most current military training attention is focused somewhere in this zone, since the results and team training benefits are coupled to scenarios usually focused on conflict resolution.

7.4 *Limited Funding Narrows Training Focus.*
The focus on combat training is unsurprising; military units train to fight and the majority of units fall into categories somewhere in the range described. The services, from whose budgets training is funded, concentrate on their primary task - fighting and winning the nation's wars. Allocations of time or money to other-than-preparation-for-*war* are on a zero-sum basis. Hence, training focused on other-than-combat situations largely has been left to other

agencies, and often treated on an exceptional (and unwelcome) basis.

7.5 A Changed Milieu Dictates Changed Training.

However, despite historical proclivities in training, the broadening of the spectrum of involvement is forcing reconsideration of training requirements. Among the first steps for JTF commanders are determining what team types, compositions and skills are needed for those tasks, and then go about forming and training those teams. For this, the JTF commander and staff must refer to the mission analyses done earlier in this process, extract those training modalities and skill requirement densities, and survey the available processes to determine present and projected shortfalls. It would be surprising if the JTF commander were able to locate and use all the tools necessary to accomplish this task, and even more remarkable if, (assuming he had those tools), he could accomplish all required training.

7.6 Present JTF Configuration Asymmetrical to Probable Obligations.

Presently, the several JTF commands illustrate a mixed configuration. All have a mandate to fight. However, personnel skill sets, equipment, training modalities, teaming arrangements, and organizational processes may be diffused in focus, incorporating tasks other than combat. This reflects a changing strategic milieu showing a shift in strategy from "warfighting" to "engagement," a broader spectrum in which warfighting is only one of several tasks. Yet, much training is needed to insure the ultimate mission (fight and win the nation's wars). Simultaneously, much training (and organization) is needed to accomplish emerging needs. Unfortunately, neither the probability of fighting, nor the training being conducted to prepare for that mission, matches the emerging needs.[9] That said, in many areas, the individual and team skills acquired may be applied to non-combat tasks. For example, a bulldozer operator, heavy lift helicopter pilot or power generation specialist may perform his function in support of a disaster relief mission just as well as in a combat environment. Both of these aspects have been noted, yet there has been little assistance to enhance training that can successfully address the scope of the present and emerging, enlarging requirements.

7.7 *A Changing Allied Contribution*. The capability of military assets in essentially non-combat operations has not gone unnoticed in other agencies or among allies. Indeed, the Germans, Austrians, Belgians, French and British all are making adjustments to their forces in terms of personnel and equipment to broaden their focus to specifically include disaster relief and humanitarian assistance capabilities. Similarly, the US National Guard is making such adjustments.

7.7 Implications Provide No Relief.

Given its present and projected roles, it is unlikely that the US will be able to decline significant participation in operations requiring such commitments of military resources if it wishes to retain the full scope of its present leadership position.[10] Moreover, since being enunciated by then Secretary of Defense Caspar Weinberger, it is U.S. policy not to embark upon military engagements except as a member of a coalition. Thus, far from being able to avoid engagement, the likelihood of involvement has risen. Simultaneously, the decline in military structure by allies places a greater burden on the U.S. for providing the combat assets in military contingencies.[11] In short, both the probabilities and the scope of commitment have increased. It is not a case of "either-or," but of "and."

7.8 No Rest for the Weary.

Despite the broadening, increasingly complex milieu, the JTF commander does not have sufficient assets to perform mutually exclusive missions across such a spectrum.

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[9] From commentary by Dr. David Haut, USPACOM during Joint Modeling and Simulation Executive Panel (JMSEP) meeting, July 22, 1998, Monterey, CA.

[10] See U.S. Department of State, "A New Strategy for a New Era," from 1995 Annual Defense Report, (Washington, D.C.: US Government Printing Office), p. 3.

[11] Although beyond the scope of this document, the use of military assets in operations carries the additional risk of being perceived as an escalatory step, and by that, expanding JTF involvement in a military sense. This places the JTF commander in a reactive posture and vulnerable to so-called "tar-baby" effects.

worse, projected budget strictures will limit his resources base further.

7.9 Doing Double Duty.
Simply, the JTF commander must be able to perform a wider variety of tasks with the same or fewer assets. His only choice is through forming specific teams, often composed of the same resources. This places the JTF commander in an awkward position; those same resources must be available should another contingency occur - particularly one mandating his execution of his primary warfighting mission. [12]

7.10 Compounding Problems.
7.10.1 More Teams Means More Training.
Moreover, the growing number of missions is indicative of the number of types and complexities of teams. This requires a greater percentage of days devoted to training (of all kinds), yet there is insufficient budget, time, training resources, etc. to meet all requirements. Significantly, as the list of missions grows, the number of personnel is not increasing, in percentage terms, military budgets are the lowest since the 1930s, and allied contributions are waning. Although individual and lower level crew, team and detachment skills probably are adequate, incorporating non-military elements, pre-arranging commitments and coordination, and training the whole team is quite another matter.

7.10.2 Support Requirements Made More Difficult.
Additionally, supporting such varied and numerous teams may prove challenging (e.g., logistics and training areas). Special considerations (e.g., environmental impact) may make field training exercises (FTX) unaffordable. Even coordinating a command field exercise (CFX) or command post exercise (CPX) potentially may be too problematical from a political perspective if an interagency or allied team is required.

7.11 M&S Offers Some Relief.
Fortunately, there are M&S applications such as computer assisted exercises (CAX) addressing different facets of these problems. Since team procedures are one key area, these may be configured, exercised, stressed and evaluated through a variety of applications (e.g., DEXES or Plowshares). The difficulties incident to bringing all teams members physically together may be overcome to some extent through virtual training, particularly via a distance learning/electronic netting configuration. One such application (among several) is the USAF Distributed Mission Training (DMT) program. The ongoing efforts to bring compliance in architecture among the several M&S applications shows promise in allowing several disparate applications to interact cooperatively. Indeed, this is a goal of mandating High Level Architecture (HLA) compliance. Several conceptually broader exercise series are ongoing that combine civil and military resources.

For example, the US CINCPAC teaming with the Center for Excellence conducted such an exercise in April, '98. The Federal Emergency Management Agency (FEMA) and National Guard assets exercised along the same lines, and a US-sponsored multi-nation exercise series, through the Partnership for Peace program, aiming at using military assets for civil disaster relief is ongoing as of this writing. Notably, the focus of all was on disaster assistance and humanitarian relief. These show promise by disclosing how to manage complex emergencies, integrate efforts, and resolve procedural and priority conflicts.

7.12 Training-Specific M&S Assistance.
Because military training has perhaps more M&S applications than any other area, listing all the M&S applications is inadvisable and perhaps counterproductive. Many of the legacy systems no longer are available (although they may still have some utility), there have been many modifications to systems (often resulting in their incorporation into joint or advanced/improved forms), and many applications currently are undergoing some form of modification or improvement. The following sampling includes some applications that may be used for various purposes:

[12] In recognition of the speed at which a crisis can evolve and the regions in which such crises may occur, the U.S. military is attempting to streamline its logistics and transportation capabilities incorporating improvements in speed, lower consumption rates, and less materiel. As of this writing, efforts are underway to model these improvements along the so-called revolution in business affairs changing a so-called "just in case" philosophy to a "just in time" modality.

CATS [Consequences Assessment Tool Set]
COAST [Course of Action Selection Tool]
DEXES [Deployable Exercise System]
CAM [Consequences Analysis Model]
ITEM [Integrated Theater Engagement Model]
Janus
JCATS [Joint Conflict and Tactical Simulation]
JSIMS [Joint Simulation System] (Training model under development to replace the ALSP Confederation of models. Initial focus is on training support. Based on joint HLA and will have common force (land, sea, air) representations and environments. Proponent: JSIMS JPO & JWFC.)
NSS [Naval Simulation System] (New family of Navy theater-level analysis models. Used for ISR/C4I. Land, sea, air functionality; will incorporate TAMPS for STW mission planning. Users: CINCPACFLT, OPNAV N81. Proponent: SPAWAR 31.)
SIAM [Situational Influence Assessment Model]
SPECTRUM [Operations Other Than War Simulation]
TACSIM [Tactical Simulation]
TAM [Theater Analysis Model]
TARGET [Theater-level Analysis Replanning and Graphical Execution Tool Kit] (Planning system providing multimedia, graphical capability supporting real-time collaborative planning between supported and supporting CINCs and their subordinate JTF commanders. Includes multiple analysis tools to support planning.)

To these should be added communications centric applications such as NAM (Network Assessment Model) and HEAT (Headquarters Effectiveness Assessment Tool).

8.0 ***M&S Capabilities and Shortfalls.***

8.1 General Characteristics.
M&S tools are capable of addressing data in accordance with the algorithms of their programs. There is no model or simulation which generates missions, specified tasks, or (other than inferentially) implied tasks. Most analysis at this stage will result from an iterative process requiring man-in-the-loop presence at several discrete points. Significantly, the M&S tools available for integrating other-than-combat entities, civil structures, and/or private entities are limited in number, fragmentary in scope, and, evidently, capable of integration with other applications only with difficulty.

8.2 *Specific Considerations*.
8.2.1 *Resource availability*.
The resources addressed at this stage relate to the availability of adequate, appropriate M&S tools, personnel who know how to use those tools, and hardware and software in suitable type and density to make M&S viable to the necessary training population. Implicitly, this includes a command climate conducive to the use of M&S applications. At a later point, these applications become part of the resources related directly to operational support.

8.2.2 *Procedural Adequacy*.
Just as a military unit is an *organization* of the men, materials and procedures for conflict, so also analyses via M&S require procedural organization. Such organization is critical when considering any contingency requiring more than just military assets. Significantly, while the probabilities of such a contingency are virtually certain, it is unclear that the available protocols addressing the integration of other-than-military entities are fully adequate. Indeed, there seems a major shortfall in the availability of M&S tools addressing the integration of civil and military

assets in other-than-war situations. Yet, it is unclear why this should be so; examples of such integration abound. For example, the US Army Corps of Engineers has operated in a context of civil-military collaboration since the early 1920s. Fortunately, this shortfall in integrating M&S tools is being addressed.[13]

8.2.3 *Funding adequacy/Time availability*. Typically, M&S applications are not in the public domain; they are proprietary assets of some organization, government or private. (For example, the Joint Integrated Contingency Model [JICM] was developed and licensed for use by RAND Corporation.) Assuming that a particular application might be a precise fit to needs, there still remain the requirements of obtaining access and paying for its use. The more usual scenario is that no precise fit of capabilities to needs is evident, requiring adjustment of the algorithms. Similar adjustments might be required for databases before much value can be extracted. The time (and fiscal) expenditures involved may well exceed the other use costs associated with the application. Although adjustments can be minor or major, depending upon a host of factors, all incur fiscal costs and impose time parameters.[14] The JTF planner should be aware that the ideal M&S application may not exist, all available choices carry both direct and indirect expenditures, and the time required to adapt those available applications to the tasks at hand may be greater than initially perceived.

9.0 ***Conclusion.***

This paper discussed JTF issues and processes for which M&S can provide support. Specifically, it addressed the process from mission analysis through team training and noted those areas where modeling and simulation applications can support the key requirements incident to that spectrum. M&S products were suggested addressing the different phases, general availability and suitability was inferred, and some brief description of key considerations at each stage of the process was provided. IAdditionally, some potential collateral benefits, as well as some present and potential difficulties facing the JTF commander were noted. In short, through delineating a methodology, this paper focused on what modeling and simulation can do to analyze the JTF missions, reveal training requirements, assist in the contingency planning process, and accomplish training objectives.

[13] For example, creating of a Virtual Information Center combining the military assets of USCINCPAC with the Center for Excellence (a colloquium of academic, private and civil government entities) and focusing on problems such as disaster relief and humanitarian assistance is one such effort. Another, larger effort is the Global Disaster Information Network (GDIN) initiative.

[14] In addition to the almost certain need to populate the databases, typically, there is a requirement to train the users in the application. Further, more complex adjustments may include the architecture, communications systems (especially for distributed simulations), the type and density of operating equipment, and security parameters. These difficulties significantly expand with inter agency and/or allied participation.