Effects Based Operations: Objectives to Metrics Methodology– An Example

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INTRODUCTION

Throughout the US Department of Defense, rapid and significant improvements in technologies, and more importantly the information available from these technologies, has produced a host of new ideas regarding the conduct of modern warfare. One of these concepts, effects-based operations (EBO), has become increasingly accepted in air campaign planning speak, and appears to be gaining momentum in today's military literature. While not clearly defined, and far from being fully understood, EBO is an attempt at understanding the complex interactions between the different systems[1] presented to combat decision makers. Once understood, these systems' vulnerabilities can be exploited by warfighters in order to accomplish the originally established campaign objectives.

While seemingly simple on the surface, rating one side's successes and failures during an EBO-centric campaign remains a challenge and there are attempts at augmenting, and in some views supplanting, the traditional military measures of progress in a campaign. In short, EBO attempts to bring with it a wholly new genre for rating objectives accomplishment. Traditional campaign measures are often described as outdated, attrition-based, and unable to capture some of the subtler, yet effective capabilities offered by modern warfare. EBO, when properly implemented, suggests a better means for observing and understanding second and perhaps even third order effects of military activities ranging from traditional destruction to more ethereal information operations. But even with all the growing interest in this new way of looking at an old problem, EBO still lacks a framework for either discussion or implementation.

This paper, proposes an evolutionary approach for applying EBO to the campaign planning process in an organized, straightforward manner, attempting to link the planning process to effects generation. It is through this proposed *Objectives to Metrics Methodology* (OMM), that the factors associated with planning, executing, and measuring wartime activities can be linked to specific, desired effects. The EBO concept is still in its infancy as an accepted approach to doing business, and is subject to widely varying conjectures regarding effectiveness or worse, some truly exotic forms of measurement. Eventually EBO thinking will mature, and more complex approaches may then become understandable, but for now, the simplified framework proposed in this paper lends itself well to a walk-before-run evolution.

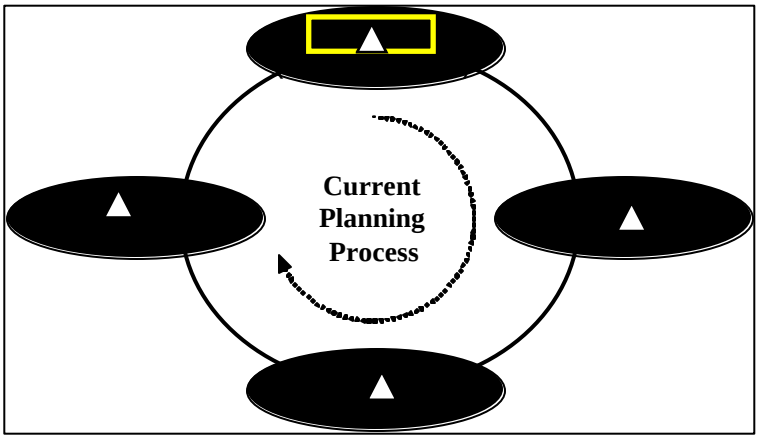
To illustrate this evolutionary view of EBO usage, this paper focuses on the air campaign planning process as it is performed today, then describes how these traditional processes and measures might be applied to provide meaningful, effects-based feedback to planners and decision makers. This paper will explain how, in five clearly defined steps, a decisionmaker is able to link each of his objectives (expressed as an effect) to specific tasks capable of achieving the stated objectives (effects) in a straightforward, measurable manner. One side benefit of this approach is that it marries up the thinking of the decisionmaker with that of the planner, typically a shortfall in the current planning process.

[1] The use of the word system in this instance is meant to describe processes, networks, or social structures that self-integrate and often interact with other systems. A commonly heard phrase to describe these phenomena is a "system of systems."

The OMM approach described in this paper is then tested in a simple, yet formal, analysis. Using an existing, legacy campaign model as the campaign engine for a planning process, the OMM framework is used to both assign warfighting-related tasks to the simulation players as well as measure the progress of various objectives. This preliminary study still focuses on first order outcomes of specific effects, but explains means for dealing with second order effects and how to categorize an opponent's cognitive processes with regard to an effect. The results of this basic analysis and report serve as a progressive step in the direction of true effects-based planning, operations, and metrics, to beneficially apply the rapid advancement in information technologies.

APPROACH: CONCEPT AND METHODOLOGY

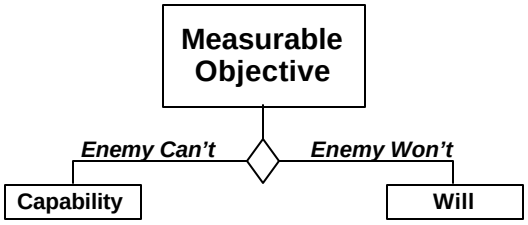
The objective of this paper is to establish a methodology to implement Effects Based Operations into analyses for future Air Force studies and wargames using current processes and tools to minimize the time and cost of developing a completely "new wheel". Additionally, the focus of the methodology presented here is at the operational level of war.



The process begins on familiar ground, with the contemporary planning process we use in developing a plan often described as the Observe, Orient, Decide and Act (OODA) method first coined by John Boyd in 1981. Paraphrasing Boyd's work, *observe* is perceiving and measuring activities against established metrics. *Orient* establishes the desired outcomes through the formulation of objectives. The *decide* step establishes effects and assigns tasks to accomplish them, including the means to accomplish the effects. Finally, *act* (or *attack*) applies the means identified in the *decide* step to achieve the desired effects. The results of the attack step are then observed and compared to the established metrics as the process iterates through each cycle.

Concepts of Can't and Won't

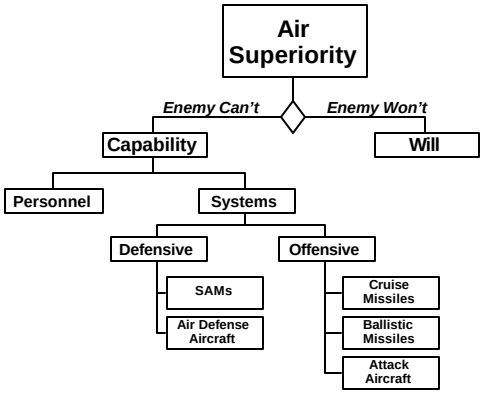
There are two broad conditions under which these desired effects are achieved. First, the enemy *can't* achieve their own desired objectives, and second, the enemy *won't* perform activities in support of their objectives.



The *can't* term speaks primarily to an opponent's capability, as in the case of an enemy not possessing the means either to impede friendly operations or accomplish its own objectives. Attacking capability has historically been used for two reasons. First, such capability can be observed, oriented, and attacked. Second, capability can be quantified (i.e. number of aircraft, number of tanks, and so on). In determining the *can't* part of a particular effect, those pertinent factors that contribute to a particular capability are considered.

For example, when determining capability for the friendly effect of air superiority, we look at those factors that might influence this capability. The air superiority example (figure below) depicts enemy capabilities to conduct offensive and defensive actions that run counter to the friendly air superiority objective. Offensive actions can take the form of the enemy using cruise missiles, theater ballistic missiles or aircraft to attack friendly airbases. Defensively, the enemy

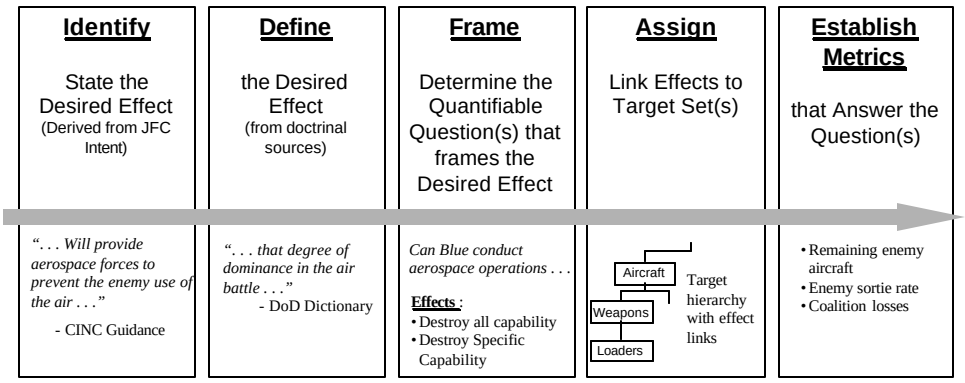
can launch aircraft or surface to air missiles to intercept friendly aircraft. In determining capability, the planner must be creative and consider asymmetric (sapper attack, IO, etc.) attacks as well as symmetric (e.g. air base attack) ones. If enemy capabilities are taken away, then the enemy *can*'t interfere with friendly air activity, thus friendly forces achieving air superiority.



The *won't* term infers an opponent's will, such as the case of enemy commanders or enemy leaders deciding it is not in their best interest to contest friendly operations. Attacking an opponent's will can be very productive (capitulation before conflict) or the most costly (comprehensive destruction not accomplishing objectives) and is solely dependent on the reaction of the enemy leaders. Gauging the will of an enemy is fraught with ambiguities, and history is replete with examples of misinterpreted opponent value systems. In a manner similar to accounting for enemy capabilities (*can't*), the OMM suggests reasons why an enemy elects not to interfere with the effect friendly forces are trying to achieve. Reasons for not interfering might be that the enemy has already achieved their own objectives, is being told not to interfere while waiting for a more opportunistic time, or has determined that their forces are too weak to continue, among others. Any of these could be affected through the use of information operations. Finally, the capability of the enemy to perform its objectives has a significant impact on its will to implement them.

Methodology

The OMM is a five step process designed to link a desired effect (or effects) to a measurable set of metrics. The OMM steps include: identify the objective, define the effect, frame the effect in quantifiable terms, assign target sets to the effect, and finally establish metrics to measure accomplishment of the effect.



Identify the Objectives.

For the purposes of this paper, objectives are identified from the Commander's Intent statement for a given operation. The Commander's Intent statement is generally used to describe the end-state of the operations and a concise purpose of the operations. [JCS Pub 3.0]. Below is an example of a commander's intent statement taken from a recent US Air Forced hosted war game:

> "We will deter Red aggression with a robust flexible deterrent option of C^4ISR and shooter AEF to support White forces while positioning sufficient force structure for follow-on operations. If deterrence fails, we shall conduct parallel and simultaneous operations to gain information and air superiority thereby setting the conditions for the theatre battle. Our operations will be rapid but proportional through maintaining alert and on orbit assets for immediate response. If White is invaded we shall conduct, in concert with White ground forces, operations to halt Red forces and subsequently drive Red forces back to original borders. In all cases we will deter the use of WMD (Weapons of Mass Destruction) weapons."

The above is similar in form to that developed by CINCCENT for Operation Desert Shield/Desert Storm:

> "We will offset the imbalance of ground combat power by using our strength against his weakness. Initially execute deception operations to focus his attention on defense and cause incorrect organization of forces. We will initially attack into the Iraqi homeland using air power to decapitate his leadership, command and control, and eliminate his ability to reinforce Iraqi forces in Kuwait and southern Iraq. We will then gain undisputed air superiority over Kuwait so that we can subsequently and selectively attack Iraqi ground forces with air poer in order to reduce his combat power and destroy reinforcing units. Finally, we wil fix Iraqi forces in place by feints and limited objective attacks followed by armored force penetration and exploitation to seize key lines of communication nodes, which will put us in a position to interdict resupply and remaining reinforcements form Iraq and eliminate forces in Kuwait." [Conduct of the Persian Gulf War, pg 66]

Parsing the first Commander's Intent statement above (from the war game) reveals the following specific objectives applied in accomplishing the intent:

- Deter Red aggression
- Position sufficient forces in theater
- Gain information superiority
- Gain air superiority
- Halt Red's advance
- Drive Red back to the original Red and White border
- Deter the use of WMD weapons

This paper focuses on the fourth effect, gain air superiority, to serve as the example for employing the OMM for planning and execution. The remaining objectives are summarized in Appendix A.

Define the Effect

After objectives for the operation are derived from the Commander's Intent, effects are defined in order to meet the objectives. The OMM approach uses definitions with doctrinal roots because they provide a formally defined, common frame of reference. This established frame is essential to ensure planners define and plan tasks from an accepted position of understanding instead of inventing an entirely new lexicon. If the desired effect is not defined in current doctrinal terms, then the definition should be straightforward to facilitate a broad understanding by the service, joint and combined planners.

In the case of our example--Gain air superiority--we turn to the DOD Dictionary for a definition. It states:

> ". . . that degree of dominance in the air battle of one force over another which permits the conduct of operations by the former and its related land, sea, and air forces at a given time and place without prohibitive interference by the opposing forces" [DOD Dictionary]

Describe the Effect in Quantifiable Measures

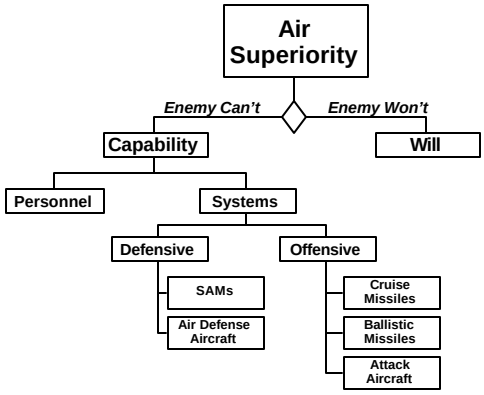
The definition of an effect is reformed into a question to facilitate establishing measurable metrics against a particular objective. In turn, these quantifiable methods help determine if the effects are being accomplished or not. The source of enemy information surrounding these quantifiable metrics is obtained from the information obtained through C^4ISR

In the case of the air superiority example, given the definition above, the question becomes:

> "Can BLUE conduct air operations without interference from RED? "

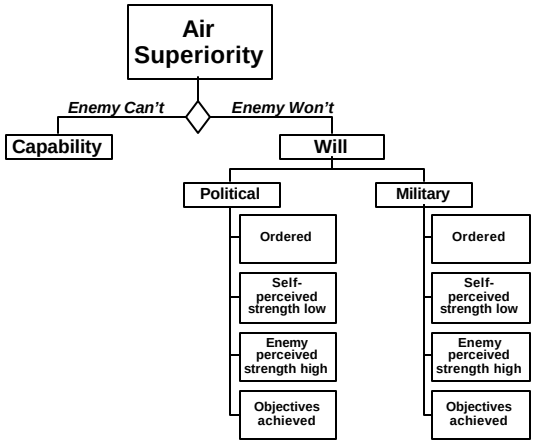
With the question has been framed, planners can focus on real world tasks that can be applied against this question. One method to accomplish this is to examine the ways Red can preclude Blue from positively answering the question. We have taken the approach of there are two core reasons that BLUE can achieve the effect. The first reason is that BLUE can make sure that RED doesn't interfere (Prevention). The second is BLUE insures that RED won't interfere (Coercion). The first reason address the means of RED, the second reason the will.

In the example of air superiority, the "*can't*" can be illustrated by BLUE having an air force and RED as having no capability to prevent BLUE from using it. RED has no aircraft, no surface-to-air defense to prevent BLUE from conducting air operations. In effect, RED's capability is removed. However, RED can use other means to interfere with BLUE air operations. Special operations or terrorist attacks as well as cruise missiles or ground units can be used to interfere with BLUE air operations. Thus it is important that the planner examine



these asymmetric types of attacks as well. Note that the air superiority definition merely states that RED does not interfere with BLUE air operations, but may still conduct operations of its own. This is an important observation because it establishes the quantity of resources required to achieve the air superiority effect.

There are a host of possibilities that can be examined when looking at the "*won't*" side of achieving the air superiority effect. The *won't* boils down to RED being convinced that any interference against BLUE operations would be meaningless or counterproductive to its own objectives, effectively removing RED's will. It could be that RED *won't* do anything because it may have already achieved its objectives, is told not to interfere by higher authority, or feels it has insufficient forces, among other reasons.



Assign Quantifiable Tasks to the Effect

Once quantifiable measures have been applied to the effect, tasks are assigned to various ways BLUE can achieve the effect. This means decomposing each of the *can't* and *won't* ideas above into details from which vulnerabilities and interactions can be identified and prioritized for attack. For example, in the air superiority case, RED can interfere with BLUE air operations either in an offensive or defensive manner. In its offensive force, it can use missiles, aircraft, SOF, or information. With its missile force, missiles and TELs are required to launch. If either is missing then the missile component for RED *can't* interfere with BLUE air operations. Each of the above capabilities can be similarly decomposed. Furthermore, each of the reasons under the *won't* branch of assessing the effect can be decomposed to an effective target set. Note that the term target set can be physical, informational, or psychological.

Once defined, BLUE can then devise methods of mitigating or eliminating each of the elements tied to achieving the effect of air superiority. The methods can be kinetic or not, joint or not, combined or not, depending on the resources required and political and military constraints.

Establish Metrics to Measure Accomplishment of the Effect

Metrics are used to measure progress in achieving an effect. Several metrics should be examined synergistically to conclude that an effect is achieved. The variety of metrics is required not only to fully understand the effect under study, but also to account for the unique viewpoints of individual decision makers in understanding the impact of their planning decisions. Effect accomplishment should also consider duration of the effect, as tasks performed in accomplishing an effect will have varying persistency. Further, this study's observations (though episodic) indicate commanders possess their own unique set of metrics that provide them with enough confidence to be comfortable with achievement of the effect. As a result, this study uses traditional campaign metrics to measure the accomplishment of a given effect.

This study uses the following abbreviated list of metrics in assessing the effectiveness of an air campaign for air superiority:

- Enemy sorties
- Enemy encounters or engagements
- Enemy aircraft (potential)
- Friendly airbase status

For any given commander, these may not be comprehensive, but represent a cross section of typical, traditional measures for air superiority. In the list of metrics above, we have included two aspects that need to be addressed. The first aspect is potential (or risk). In this specific case the number of Enemy aircraft remaining pose a potential threat to air superiority, even if not currently in use. This allows the planner to help the commander to anticipate enemy courses of action that could interfere with the commander's desired effects. The second aspect is the cost on friendly forces in achieving the desired effects. Typical air superiority campaign costs include:

- Friendly Sorties Flown
- Friendly Losses
- Allied Sorties Flown
- Allied Losses
- Friendly Airbase Status
- Friendly and Allied Ground Unit Strengths
- Munitions Consumed

Cost measures like these provide the decision maker a balancing mechanism not only for assessing the resource impact of the effect under scrutiny, but also for balancing resource across the spectrum of planned effects. If costs become too high, then the broader effects can be reprioritized to remain within available resources.

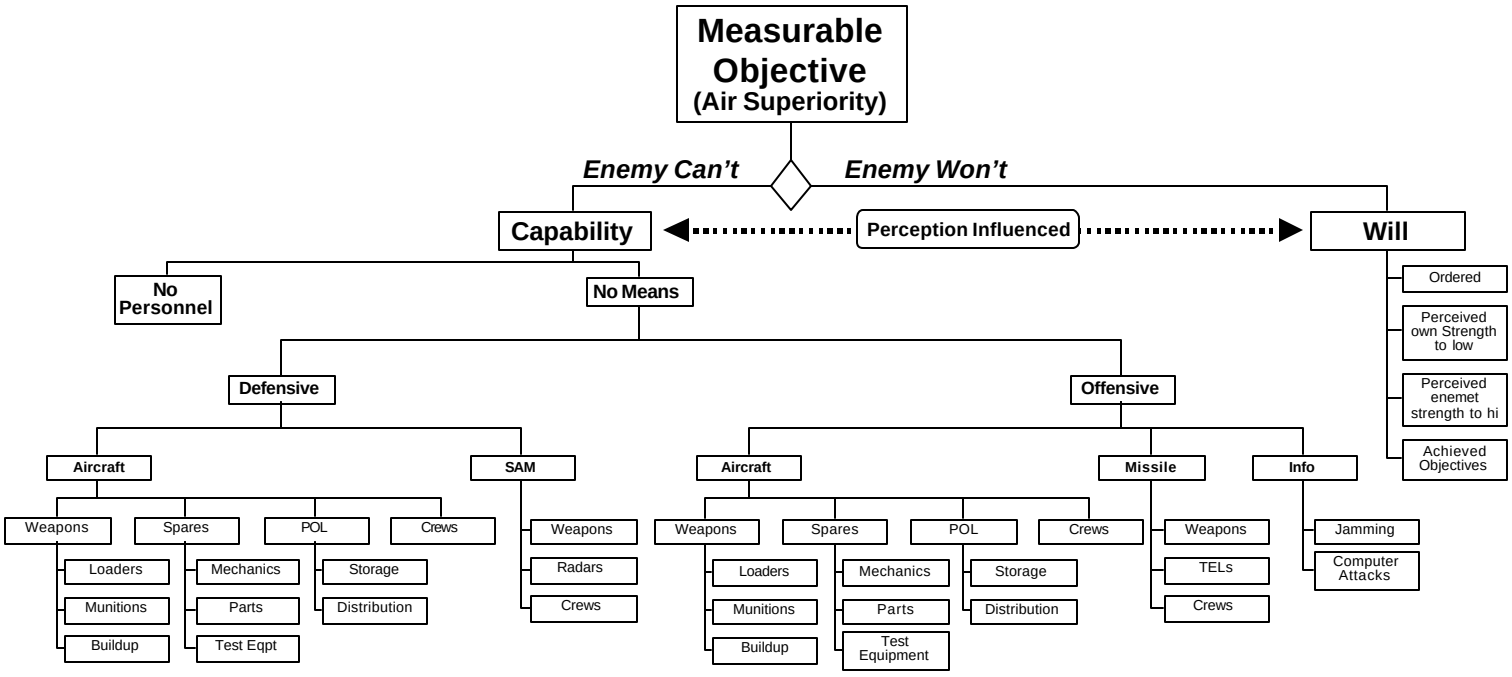
IMPLEMENTING THE PROCESS

What considerations are necessary to implement the above process? A planner should consider how to flesh out the framework described above, assign quantifiable resources against the elements of the framework, and synthesize second order effects.

Building Frameworks

In designing a campaign, the CINC and Component Commanders provide goals and objectives that describe desired effects. Once these effects are defined, the planner should devise a framework consisting of the elements comprising each effect. The following tree structure lays out the hierarchical relationship of some key factors contributing to the air superiority effect. The tree structure approach helps visualize the interrelationships of the various factors that contribute to an effect while simultaneously accounting for key factors. Additionally, a tree structure helps identify a set of crucial targets in achieving a portion of the effect. Furthermore, constructing the tree helps the planner determine potential vulnerabilities to attaining a desired effect with an acceptable consumption of resources.

The tree structure looks at the effect from both the *can't* (capabilities) and *won't* (will) aspects to gain insight into the linkages between the two sides of the tree. The resulting tree structure should be sufficiently detailed to define targets and tasks associated with neutralizing them (kinetic or non-kinetic). Clearly the intelligence community is an important contributor to the planner in establishing not only many of the elements in the tree, but also the importance, vulnerability, quantity and location of many elements within the tree. A partial example of a tree structure for the effect Gain Air Superiority is shown below:



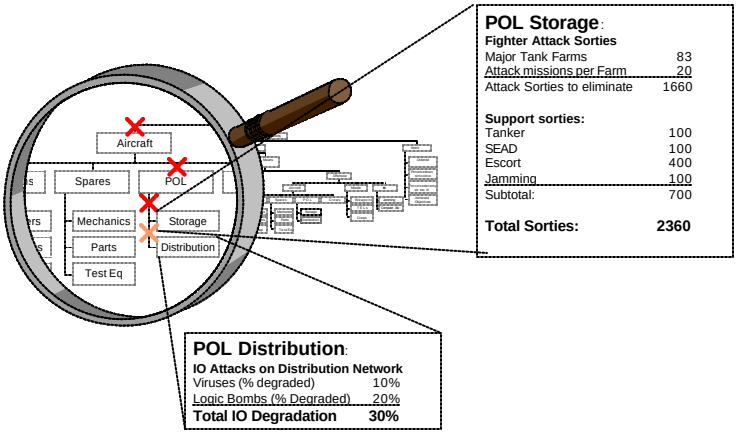
Assigning Resources Against the Framework

Given the basic framework, the planner should then examine the branches of the tree for relevancy. The initial purpose of this exercise is to focus limited resources against key portions of the framework. For each relevant branch in the tree, the planner should construct a table that portrays the contribution of the various instruments of military power to the effect. This process allows the planner to portray a joint solution positing the capabilities of each military component against appropriate targets, supporting the achievement of the desired effect. Note that the term "targets" here refers to physical, informational, and psychological points of view.

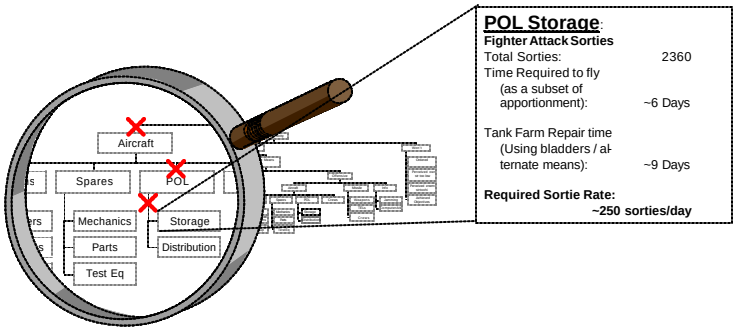
Task Assignment (for given effect)

	Aerospace	Land	Maritime	SOF	Information
Can't					
Capability #1	Task #1	Task #1	Task #1	Task #1	Task #1
Capability #2	Task #2	Task #2	Task #2	Task #2	Task #2
Capability #3	Task #3	Task #3	Task #3	Task #3	Task #3
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
Capability #n	Task #n	Task #n	Task #n	Task #n	Task #n
Won't					
Capability #1	Task #1	Task #1	Task #1	Task #1	Task #1
Capability #2	Task #2	Task #2	Task #2	Task #2	Task #2
Capability #3	Task #3	Task #3	Task #3	Task #3	Task #3
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
Capability #n	Task #n	Task #n	Task #n	Task #n	Task #n

The total esources required to achieve each effect may differ from the total forces required to eliminate each cell of an effect framework. The framework structure allows planners to visualize dependencies between different levels in the framework's hierarchy. As is depicted to the right, certain elements of the framework are critical to higher-level elements. Elimination of a single element in the hierarchy may accomplish major portions of the desired effect. Once these economies are realized and planned for, actual resource expenditures (e.g. sorties) can be computed. From the total force, force flow can then be determined. If forces required exceed forces available to the planner, then the planner needs to revisit the forces tasked against effects and the time required to achieve the effects which might resulting in an extended plan timeline.



So far this example describes an effect at a given instant in time. Factors such as redundancy and reconstitution should be addressed to ensure the viability of the tasks chosen to cause an effect. The example at right provides the planner a much clearer assessment of total resource expenditure for accomplishing this effect. An additional estimate will still be



required to account for the delay between the start of actions against a particular framework, and when the results of those actions might be measured. This latency may be unacceptable. This could require the planner to look at other approaches within the framework that might produce more desirable impacts.

Second Order Effects

Second order effects are consequences of a task or tasks on other effects beyond the original effect intended. For example, a bridge is targeted for destruction to hinder the enemy from crossing an operationally important river. A second order effect is the prevention of friendly counter-attacking forces from crossing the same bridge at a later stage in the campaign. Another secondary order effect is the reduction of resupply of enemy units due to bridge destruction. Note that accomplishing one action in pursuit of an effect may have negative ramifications on other effects.

In OMM, the planner can examine multiple effect frameworks to find potential second order effect opportunities, or to avoid negative unintended effects. The elements within the frameworks may be repeated across several frameworks adding further refinement to the planner's expected resource requirements and timeline estimates.[2] While the complexities of examining every possible second order effect currently outweigh the time available to examine them using this approach creates better informed key campaign decisions.

Campaign level simulations are useful in helping the planner gain insight into these second order effects. Campaign models often contain detail relevant to the metrics for each effect and offer outcomes which result from interacting tasks for each effect. In addition, these simulations can show the metrics for each effect over time, thereby giving the planner insight as to the duration and subsequent costs of the campaign.

USING THE APPROACH WITH MODELING AND SIMULATION

Models and simulations are important tools in supporting this approach. In particular, campaign level models help the planner assess the achievement of effects for a given plan. Campaign level tools are useful in that they either have or can be made to accommodate the various tree structures and the interactions postulated in this process. For example, campaign models have algorithms that produce the metrics of a given effect for a given operational strategy after simulating a series of complex interactions over a period of time.

Simulations also help synchronize and sequence the effects into an orderly plan and tend to depict time or events in an orderly manner. These characteristics help planners orchestrate and then visualize the tasks for each effect in an efficient and effective way. While the whole process of establishing relationships and producing effects measures is challenging, the

[2] The POL attacks used in the Gain Air Superiority example might also impact the ability of enemy ground forces to maneuver if both frameworks share the same target sets. This secondary effect could be assessed using frameworks from both Gain Air Superiority and Halt Red Advance.

campaign simulation speeds up the process of producing and assessing effects based on various resource applications. Campaign simulations can monitor and collect data for all modeled effects simultaneously. This helps the planner understand the temporal impacts of achieving an effect, or at least understanding where diminishing returns for given metrics exist. In addition, the data helps the planner discover the magnitude and impact of second order effects.

Today's campaign simulation tools have been developed and modified to accommodate some of the changes in concepts over the last 10 to 20 years. While still primarily focusing on capabilities rather than will, these models can also be used to portray will effects by simply adjusting the input data to account for these decision making impacts. For example, in certain models, unit breakpoints (when they cease being effective) are used as input. Units can also be forced to retreat or rout as deemed appropriate by the campaign analyst. Airpower's effectiveness can be altered depending on the nature of IW, SOF or other attacks. Those areas not covered by models, then as now, can be represented as special events during the simulation (for example: a strategic air attack pause as in Kosovo and Vietnam or a sapper attack on a communications node), inserted by the analyst.

OBSERVATIONS

Measuring resource expenditure in the accomplishment of a particular effect is key to this process. First, resource calculations can help determine whether or not an objective is even achievable within resource constraints. Second, the impact of desired effects on competing resources must be assessed. In cases where the available combined resources exceed desired effects, reallocation of resources and sequencing of tasks is required. Third, second order impacts (both positive and negative) may impact other planned effects. Comparing frameworks for the different effects will help avoid negative effects and combine positive ones.

Effects based operations, like many other aspects of warfare planning, are vulnerable to descriptive versus prescriptive metrics. This OMM attempts to drive the process toward prescriptive metrics, but possesses some caveats. First, EBO could serve as a universal approach for any conflict allowing for only one way of performing it. This could result in a mechanical EBO checklist based solely on mathematical precepts. Second, a codified EBO process could become so predictable it could become vulnerable to exploitation by the enemy. The proposed OMM recognizes each potential conflict is unique, and requires careful construction of the relationships within a framework, as well as the relationships between frameworks, to be useful.

THE ROAD AHEAD

OMM was used during the pre-game analysis for two recent Title X wargames: Global Engagement V and Navy Global 2001. In these pregame analyses, we were assigned effects to be accomplished and a basic concept of operations to conduct. From these starting conditions, we devised metrics from which decision makers could determine a) if the metrics we chose were appropriate and b) whether these metrics contributed to developing a method among the decision makers to determine or "see" effects, as they desire, are fulfilled. The responses from senior officials was generally favorable, but the real test of this approach lies in it usability to a planning staff.

Cross framework relationships, and their associated effects, are still difficult to assess. On a planning staff, the division of effort might result in different offices producing different frameworks. Without a common methodology and lexicon, key relationships between frameworks, as well as their presumed economies of scale, may be missed. The current target numbering system (Bomb Encyclopedia?) might provide a common reference between frameworks if they are developed down to the target level, but this approach has not been investigated.

APPENDIX A EFFECTS AND METRICS			
Objective	Define Effect	Question	Metrics
• Deter Red aggression	Red does not conduct hostile acts against Blue or Blue coalition (i.e. White or Green)	Is Red attacking Blue, White or Green?	• Number of attacking Red aircraft over AOI • Number of Red ground units in AOI (on-line or reserves) • FLOT Movement • Red military facility activity • Number of "incidents" (ground, air, naval, IO, SOF)
• Position sufficient forces in theater	Red does not interfere with Blue buildup in theater	Is Red interfering with Blue build-up?	• Percent time APODs are closed • Percent time SPODs are closed • Number of computer "incidents" related to force flow • Number of political "incidents" related to force flow

APPENDIX A EFFECTS AND METRICS			
Objective	Define Effect	Question	Metrics
• Gain information superiority	"(DOD) The capability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary's ability to do the same." DOD Dictionary "Information superiority is attained through efforts directed at integrating various measures to gain, exploit, deny, degrade, disrupt, deceive, or destroy the adversary's information and its functions while protecting friendly information." AFDD 2-5, p 27	(1) Can Blue collect, process, and disseminate an uninterrupted flow of information? (2) Can Blue exploit Red's ability to collect, process, and disseminate an uninterrupted flow of information? (3) Can Blue deny Red's ability to collect, process, and disseminate an uninterrupted flow of information?	• Messages that are Available • Messages that are Timely • Messages that are Accurate
• Achieve Air Superiority	". . . that degree of dominance in the air battle of one force over another which permits the conduct of operations by the former and its related land, sea, and air forces at a given time and place without prohibitive interference by the opposing forces" DOD Dictionary	Can BLUE conduct air operations without interference from RED?	• Red sorties • Red encounters or engagements • Red aircraft (potential) • Coalition aircraft (casualties)
• Halt Red's advance	Enemy ground advance is stopped or redirected to a militarily unimportant direction	Is Red Stopped?	• FLOT movement rate (to measure how far and who) • Strength of units at distance • Transportation infrastructure status • Coalition losses

APPENDIX A EFFECTS AND METRICS			
Objective	Define Effect	Question	Metrics
• Drive Red back to the original Red and White border	Enemy ground units are on their side of the international boundary between Red and White	Are Red ground units on their side of the border?	• FLOT location (to measure how far and who) • Strength of units at distance • Coalition losses
• Deter the use of WMD weapons	Not allowing the use of WMD weapons by Red	Are WMD weapons being used?	• Number of Red WMD weapons shot • Number of Red WMD weapons • Number of Red WMD sites • Number of Red delivery devices • State of command and control of Red WMD systems and launching authorities • Coalition losses due to WMD