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New Perspectives on Effects-Based Operations: Annotated Briefing

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JAWP

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June 30, 2001

The essence of an effects-based operation is the comprehensive and explicit linking of actions, military and other, to strategic ends in a campaign. The promise is a more effective and efficient campaign and a higher likelihood that the outcomes of military operations will be in consonance with national goals.

Clearly the idea is not new. The renewed interest in such operations stems from emerging capabilities that can make the conduct of effects-based operations more workable in the future. These capabilities include precision weaponry (kinetic, information, and other) and extensive networks of intelligence, surveillance, reconnaissance, and targeting assets responsive to the Joint Force Commander. They also include tools and resources that enable a more systemic approach to targeting.

The Joint Staff and Joint Forces Command tasked the Joint Advanced Warfighting Program (JAWP) to undertake a study that would help inform the debate and push the current body of conceptual knowledge about effects-based operations (focusing on the operational level of war). The attached paper is a product of this study.

Effects-based operations are not just about air power but are more broadly applicable to military operations in general. Moreover, while some tie effects-based operations to precision strike, the closer linkage is to notions of decision superiority. In that regard, a necessary enabler of effects-based operations is an ability to observe and assess the actual (vs. intended) effects—desirable and otherwise—and to adapt, as real-world adversaries themselves will adapt, during a campaign. Doing this right will depend on our ability to understand and depict adversaries as complex, adaptive systems, and doing so in dimensions beyond just the physical, and be able to update these depictions during a campaign and to use them to help plan and execute campaigns.

Effects-based campaigning holds great promise. The challenge is to turn the theory into something practical and powerful. This will require maturing the conceptual framework, learning from history, and experimenting with enabling capabilities and tools. Joint Forces Command has begun such experimentation in Unified Vision 01—more will be needed. The incorporation of effects-based thinking into our planning and operations will also substantially affect the future selection and training of Joint Force Commanders and their staff, the design of joint command and control systems and organization of headquarters, the creation of reach-back resources, and the role for interagency and multinational partners.

I invite your comments and feedback, which should be directed to:

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Recent and Forthcoming Publications of the Joint Advanced Warfighting Program

Experimentation

Lessons Learned: Commanding a Digital Brigade Combat Team, Rick Lynch, IDA Paper P-3616, June 2001.

US Army and US Marine Corps Interoperability: A Bottom-up Series of Experiments, Rick Lynch, Tom O'Leary, Tom Clemons, and Doug Henderson, IDA Paper P-3537, November 2000.

Experimentation in the Period Between the Two World Wars: Lessons for the Twenty-First Century, Williamson Murray, IDA Document D-2502, October 2000.

Lessons Learned from the First Joint Experiment (J9901), Larry D. Budge and John Fricas, IDA Document D-2496, October 2000.

The Joint Experiment J9901: Attack Operations Against Critical Mobile Targets, Joint Advanced Warfighting Program, September 29, 2000. Prepared for the US Joint Forces Command.

Joint Warfighting Experimentation: Ingredients for Success, James H. Kurtz, IDA Document D-2437, September 2000.

Framework for Joint Experimentation—Transformation's Enabler, Karl Lowe, IDA Document D-2280, January 1999.

Joint Concept Development

Strategic Maneuver, Joseph Sokol, forthcoming, summer 2001.

A Historical Perspective on Effects-Based Operations, Williamson Murray, with Thomas O'Leary, Joel Resnick, Dennis Gleeson, and Gwen Linde, IDA Paper P-3606, forthcoming, June/July 2001.

Taking the Revolution in Military Affairs Downtown: New Approaches to Urban Operations, William J. Hurley, IDA Paper P-3593, forthcoming, summer 2001.

Future Joint Force Headquarters, Scott Schisser, IDA Paper P-3601, forthcoming, June 2001.

Joint Strike Force Operational Concept, Joint Advanced Warfighting Program, IDA Paper P-3578, forthcoming, July 2001.

New Perspectives on Effects-Based Operations: Annotated Briefing, Dennis J. Gleeson, Gwen Linde, Kathleen McGrath, Adrienne Murphy, Williamson Murray, Tom O'Leary, Joel B. Resnick, IDA Document D-2583, June 2001.

Stimulating Breakthrough Change: An Operational Concept for a Future Joint Force, Karl H. Lowe, IDA Paper P-3602, forthcoming, June/July 2001.

War and Urban Terrain in the Twenty-First Century, Williamson Murray, IDA Paper P-3568, November 2000.

Military Operations in Urban Terrain: A Survey of Journal Articles, D. Robert Worley, Alec Wahlman, and Dennis Gleeson, Jr., IDA Document D-2521, October 2000.

Transformation Process

Red Teaming: Shaping the Transformation Process: Annotated Briefing, John Sandoz, IDA Document D-2590, forthcoming, June 2001.

Thinking About Innovation, Williamson Murray, IDA Paper P-3576, forthcoming, June 2001.

Red Teaming: A Means for Transformation, John F. Sandoz, IDA Paper P-3580, January 2001.

Developing Metrics for DoD's Transformation, Joel B. Resnick, IDA Document D-2528, October 2000.

Seminars and Workshop

Workshop on Advanced Technologies for Urban Operations, November 14-15, 2000: Summary of Proceedings, Hurley, William J., IDA Document D-2574, forthcoming, June 2001.

Joint Advanced Warfare Seminar, James H. Kurtz, Daniel E. Moore, and Joel B. Resnick, IDA Document D-2346, July 1999.

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General

FY2000 End of Year Report: Volumes I, II, and III, Theodore S. Gold et al., IDA Paper P-3571, November 2000.

Preface

This document was prepared for the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, under the task order Joint Advanced Warfighting Program (JAWP). It addresses the task order objective of generating advanced joint operational concepts and joint experimentation to assist the Department of Defense in attaining the objectives of Joint Vision 2020. Members of the JAWP contributed to the ideas and review of this report.

The JAWP was established at the Institute for Defense Analyses (IDA) by the Office of the Secretary of Defense and the Joint Staff to serve as a catalyst for stimulating innovation and breakthrough change. The JAWP Team is composed of military personnel on joint assignments from each Service as well as civilian analysts from IDA. The JAWP is located principally in Alexandria, Virginia, and includes an office in Norfolk, Virginia, that facilitates coordination with the United States Joint Forces Command.

This document does not necessarily reflect the views of IDA or the sponsors of the JAWP. Our intent is to stimulate ideas, discussion, and, ultimately, the discovery and innovation that must fuel successful transformation.

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New Perspectives on Effects-Based Operations

The idea of effects-based operations is attractive to many within the defense community. There is much discussion, in both the Services and joint community, about effects-based operations. A worthy aim of these debates is to make the emerging ideas about effects-based operations both consistent and useful to the actual conduct of military operations. If effects-based operations are to become a serious contributor to achieving national goals, then the notion must rest on sound analysis and reasoning and be the subject of an informed debate. The purpose of this annotated briefing is to provide new perspectives on effects-based operations and so to contribute to the debate.

In the fall of 2000, the Operational Plans and Interoperability Directorate (J-7) of the Joint Staff asked the Joint Advanced Warfighting Program (JAWP) at the Institute for Defense Analyses (IDA) to define effects-based operations and begin to develop a set of metrics for effects-based operations. To accomplish this, the JAWP established an effects-based operations team. This annotated briefing represents the team's effort to date, focusing on effects-based operations and the military instrument of national power (in the form of a joint force).

A New Context for Military Operations

The demand side:

- **Growing emphasis on conventional deterrence**
  - Concerned with pre-conflict and post-conflict as well as conflict
  - Need to send a clear message to potential adversaries
  - Need to be able to re-assure ally and coalition friends
- **Contingencies more complex, with more focus on all effects**
  - U.S. involvement in conflicts that don't impact our national survival but do impact adversary's
  - Allies and partners are more important to these types of operations
  - Need to be able to produce the desired future
- **Future requires new ways to fight**
  - Focus more on the effects than on destruction
  - Overcome difficulty in finding relevant targets
  - Fight for information and knowledge dominance
  - Campaigns designed to win the war and the peace

A new context is emerging for military operations. On the demand side of the equation, the strategic context has changed. On the supply side of the picture, new tools and capabilities offer significant opportunities to make effects-based operations possible. Americans live in times of greater ambiguity and change than during either World War II or the Cold War: they now lack a single clear national enemy. Together, the new strategic context and new capabilities make effects-based operations possible.

If the United States cannot think and operate effects based in this new context, one result will be insufficient and inappropriate options available for the National Command Authority in the face of an environment that demands more and broader options. Failure to think and operate effects based will also waste the tremendous potential of the new tools and capabilities.

The Cold War demanded an understanding of deterrence in a nuclear framework, with less attention to conventional deterrence. The US military traditionally focused on conventional threats and preparations for conflict by developing strong offensive capabilities. This approach resulted in inadequate attention to concepts such as conflict prevention and producing the desired post-conflict environment (winning the peace as well as the war).

The Cold War has passed, and today's strategic environment calls for emphasis on conventional deterrence. The preferred course is to prevent crises from escalating to war. An effects-based approach, the more explicit linking of all actions to strategic outcomes, is about

producing desired futures. Effects-based thinking focuses on the entire continuum (peace, pre-conflict, conflict, and post-conflict), and not just on conflict. One of the results of such an approach should be the ability to send clear messages of US flexibility and capability to potential adversaries and thus positively influence their decisions. Failing this, the ability to act decisively with all elements of national power will ensure the ability to restore order and to create a more favorable environment. This also sends a strong message of reassurance to allies and coalition partners.

Future contingencies will be complex and will require a focus on a broad spectrum of effects. US commanders will likely not have the clarity of purpose and strategic goals that their predecessors enjoyed in either World War II or the Cold War. Moreover, the United States is likely to be involved in operations where US national survival is not at stake, but adversary national survival (or adversary political power) is certainly at stake. This asymmetry of interests vastly complicates setting objectives, willingness to sacrifice or inflict casualties, and readiness to commit national will and resources.

It is unlikely that US forces will fight without allies or coalition partners. In fact, allies and partners are even more important in this complicated environment. Partnerships provide both benefits and challenges. Allies can help provide context and sophisticated cultural understanding of the enemy and his environment. However, the political aims and purposes of US allies will differ from or conflict with those of the United States more often than not.

Military thinkers are also now exploring and developing new ways to fight that focus more on effects than on simple destruction (e.g., rapid decisive operations; network-centric warfare; future concepts for urban operations). America's military leaders must be capable of looking beyond the immediate military effects of actions.

Future operations will be knowledge-based and information driven. This will require commanders to fight for decision superiority much as they now fight for air superiority. But information superiority is only an enabling step to the ultimate goal of decision superiority. Effects-based thinking will allow future commanders and their staffs to exploit the initially overwhelming amount of data that robust intelligence, surveillance, and reconnaissance (ISR) and networks will provide. Effects-based thinking will enable commanders to prioritize and fuse data into a context that will ensure the relevancy, timeliness, and accuracy of decisions.

Finally, the new context for military operations demands that joint commanders focus on winning the peace as well as winning the war. This requires an understanding of second- and third-order effects that may not manifest themselves until well after the conflict is over, but that also have significant impact on the post-conflict environment.

A New Context for Military Operations (Continued)

The supply side:

- **New tools permit more sophisticated and timely assessment**
  - Model adversaries as complex, adaptive systems
  - Seek decision-quality knowledge from mass of information
  - Gain better understanding of context through shared commander's intent and situation awareness
- **Effects-based thinking the critical enabler for new capabilities**
  - Precision-thinking, planning, targeting, execution, ISR
  - Stealth, distributed maneuver
  - Info operations, non-kinetic and non-lethal weapons
  - Robust and pervasive ISR with networks and networking
- **Potential for significant synergy, but also potential for mal-employment without effects-based approach**

Great commanders have always attempted to link their actions to desired outcomes. While few have been totally successful in the past, the future holds potential for significant improvement. An expanding array of new tools and capabilities will be an important factor in making successful effects-based campaigns the norm rather than the exception.

Significant strides are being made in developing sophisticated models that will assist in understanding adversaries as complex adaptive systems of systems. Expanding on the successes of infrastructure modeling, new tools will allow commanders to leverage similar capabilities in other domains as well. By learning to understand and model an adversary as a *complex, adaptive system* driven by complex human interactions, rather than just collections of physical targets, it should be possible to focus operations more coherently. And it is more likely that these focused actions will generate the specific, desired effects sought by commanders and their staffs. Faster technical tools for planning, analysis, and decision support will further enable and enhance these models of the adversary.

New ISR tools will certainly provide commanders greater amounts of information, but of equal importance will be analysis tools, such as expert agent models, that will allow commanders and their staffs to quickly mine and fuse information. These resources, combined with an effects-based thought process, will enable more sophisticated and timely analyses, assessments, and unprecedented levels of shared situation awareness and understanding.

In the past, great commanders developed the skills to place a few, seemingly disparate pieces of information into a context that gave them decision superi-

ority. The information tools that future commanders will have should enable them to move beyond drawing inferences from a few pieces of relevant information. They should be able to build a clearer contextual understanding of the battlespace, which will significantly improve their ability to achieve decision superiority.

Effects-based thinking is the critical enabler for emerging new capabilities such as precision guidance, networked ISR systems and stealth. To reach the maximum potential of these new capabilities, planners and commanders must think effects-based. If planners aim to simply destroy enemy facilities and forces, unguided "dumb" bombs will suffice. US forces will not gain the significant benefits of these new capabilities unless the precision of the systems are matched with precision of thinking: analyzing, planning, executing, and assessing the effects of the systems. These new capabilities offer the opportunity to achieve an efficiency of effects that past commanders could never realize.

Additionally, the synergy from the use of multiple "effectors," including information operations and kinetic weapons, opens up new realms of possibilities for non-traditional approaches. For example, information operations, both offensive and defensive, and other non-lethal weapons could achieve significant first-order effects essential for winning the war without the potential collateral second- and third-order effects that could hinder winning the peace. Such capabilities as stealth, precision fires, and maneuver, along with robust and pervasive ISR networks, and networking, will be key enablers for successful future effects-based operations. Of equal importance, however, is that effects-based thinking will ensure new capabilities are employed with maximum efficiency and impact.

New tools and capabilities portend significant potential and synergy for a future joint force, but there is also the potential for mis-employment. These tools and capabilities replace the meat cleaver of the past with a finely honed scalpel. However, it makes no sense to hit the wrong target with precision. Effects-based thinking holds the potential to maximize the possibilities of new levels of precision. Clearly, new technologies and capabilities like stealth, precision munitions, and information operations will require an effects-based approach. Moreover, current and future political environments will demand that the new capabilities and tools will be used to find and attack, traditionally or non-traditionally, targets that matter—and adverse collateral effects simply will not be tolerated.

Description of Effects-Based Thinking

- **The explicit and comprehensive linking of all actions to operational and strategic outcomes**
- **In the face of friction, ambiguity, uncertainty, and an adaptive adversary**
- **Conducted by the joint force commander and staff at all levels of war**
- **Integrated with interagency actions in political, economic, diplomatic arenas**
- **During all military operations ranging from peacetime shaping through war**

As much about how you think about operations as how you employ capabilities

To develop a definition for *effects-based operations*, one needs to develop first a description of *effects-based thinking*. This description would then help provide a basis for developing a joint definition for effects-based operations, and be suitable for including in *Joint Publication 1-02, Department of Defense Dictionary of Military and Associated Terms.*

Effects-based thinking emphasizes

- the importance of linking all actions (political, diplomatic, economic, and military) to operational and strategic outcomes;
- continuous assessment of the effect and adaptation, as needed, of plans and actions to the reality of conflict;
- thinking about the implications of actions and operations in terms of their second-, third-, and n^{th}-order effects; and
- thinking about the implications and consequences of effects over time.

Effects-based thinking rests on a foundation of assessment and adaptation at all levels of warfare and with all elements of national power. It is an innovative way to think about a continuous cycle of analyzing, assessing, planning, and executing military operations in peace and war. Commanders and staffs must *think* effects based, if they are to *operate* effects based.

Effects-based thinking requires the *explicit and comprehensive linking of all actions to operational and strategic outcomes.* To do this, decision-makers should have a clear idea of what they are trying to accomplish, what actions might be taken to realize this desired end-state, how the proposed actions or operations will contribute to the desired end-state, and why the operations will work. Joint force commanders must plan, understand and communicate the

clear linkage between strategic outcomes articulated by the National Command Authority, desired effects, and tactical actions.

Fog, friction, ambiguity, and uncertainty will continue to characterize the arena of all human conflict—military, economic, political, and diplomatic.[1] Adversaries will do their best to avoid defeat—they will react and adapt to actions taken against them and seek to move the conflict to arenas where they have the advantage. Rather than trying to eliminate these factors from warfare, successful commanders have accepted them and learned to work through them. In terms of effects-based operations, this means assessing (and ultimately adapting) operations to the actual realities of conflict.

While the joint force commander does not establish national goals and may only contribute to part of the strategic goals, he is responsible for ensuring that the actions of the joint force are consistent with and complementary to the political, diplomatic, and economic goals. This effort, however, principally focuses on the operational level of war and the role of the joint force commander.

Successful effects-based operations will require cooperation and coordination across all elements of national power. Military actions never exist separately from the realm of politics: even in armed conflict, political and diplomatic actions can still have a profound effect on the enemy.

Effects-based operations are appropriate at all levels of war. Joint force commanders must think about effects not only in conflict but also in peacetime contingency planning, peace-time shaping operations, and operations other than war. In times of conflict, effects-based thinking can enable the joint force to move away from solely destruction- or attrition-based warfare towards a more efficient and focused application of force. Effects-based thinking requires planners and commanders to understand the enemy as a *complex, adaptive system of systems* consisting of all the facets of his national power, not just his military forces.

To conduct effects-based operations, the joint force commander and his staff must think in an effects-based fashion by following a disciplined process of analysis, planning, execution, and assessment while adapting their actions and operations to changes in the environment. This process continuously links the strategic outcomes, the desired effects, and military actions. The concept of effects-based operations is thus as much about how the commander and staff *think* about operations as about how they *employ* military capabilities. Commanders and their staffs will need to consider the effects they aim to achieve, the consequences of the actions they could employ to achieve them, and the necessary means to assess the efficacy of their actions.

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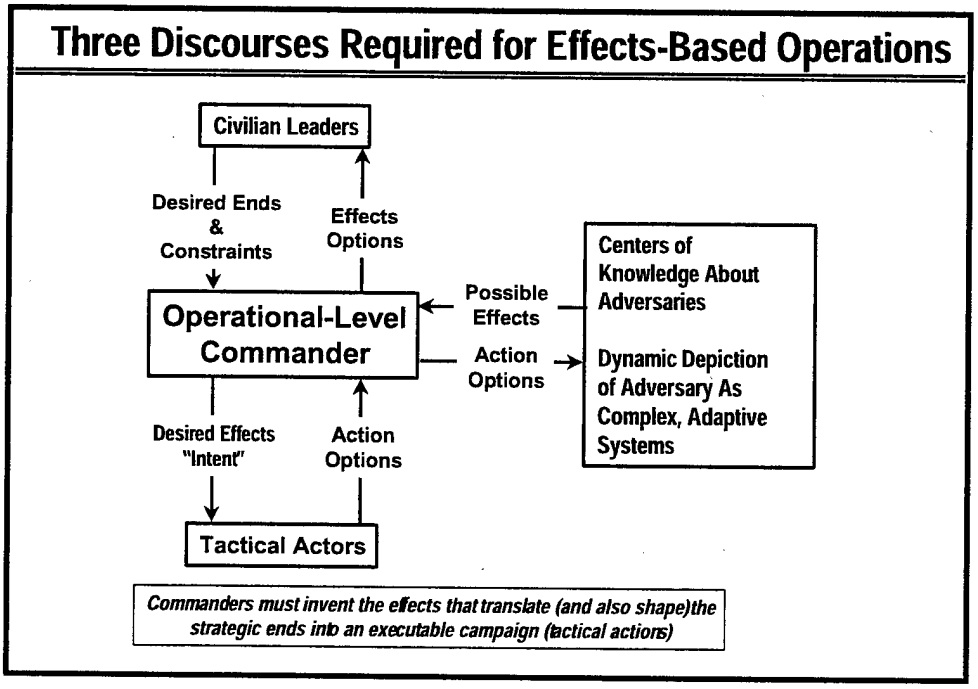
[1] See Barry D. Watts, *Clausewitzian Friction and Future War* (Washington, DC: NDU Press, 1996).



Turning effects-based thinking into effects-based operations will require uncommonly rich interactions between the operational-level commander and the other key actors in a campaign. We use the term "discourse" to characterize the needed interaction in order to emphasize that these interactions must be learning experiences for the participants not only in the planning but in the execution phases of a campaign as well.[2]

The above slide highlights three of these discourses between the operational-level commander and (1) his civilian leaders (the National Command Authorities), (2) his tactical commanders, and (3) the sources of knowledge about the enemy as complex, adaptive systems. These discourses are necessary because there will be multiple perspectives about the current context and the desired outcomes. The discourses fundamentally seek to achieve a common operational vision, which enables an understanding of *what has happened*, *what is happening*, and *what needs to be done* to shape events to produce the desired future.

In this construct of discourse, the strategic bounds the operational while the operational informs the strategic. Likewise, the operational bounds the tactical and the tactical informs the operational. This approach suggests that the flatter the command architecture (or the more networked it is), the greater the potential for discourse to bring the participants to a common operational vision and understanding.

[2] This notion of "discourse" synthesizes ideas from the JAWP's effects-based operations and the ideas and work of Dr. Shimon Naveh, Director of the Israeli Defense Force's Operational Theory Research Institute.

The civilian leadership provides the desired ends and constraints. Rarely will the ends be simple, unambiguous, and constraint-free. More likely, the operational-level commanders will be faced with the daunting challenge of identifying effects that will produce the desired ends (multiple and often competing) within the framed constraints.

Concurrent with this *strategic-operational discourse* is a *complementary operational-tactical discourse.* The operational commander provides desired effects (the commander's intent) to the tactical executors, and they in turn provide action options. The processes of discourse are not discrete. They involve processes of dynamic interaction, which take place from peacetime engagement to crisis response and back to peacetime engagement.

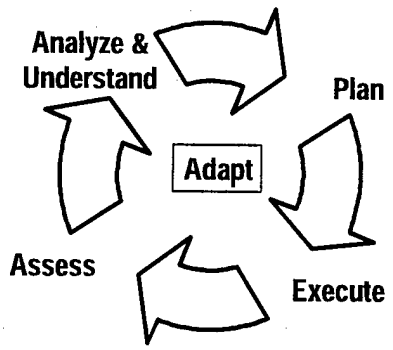
The process of discourse outlined so far has addressed only the traditional chain of command, albeit enriched by the discursive process. Critical to effects-based operations is the ability of Blue to achieve some high-fidelity understanding, or rationalization, of the other key participants. Blue must have the ability to depict an adversary as a complex, adaptive system in multiple domains in order to understand the potential impact and outcome of *desired effects*, *undesired effects*, and *unexpected effects.*

Other discourses are required to complete the picture necessary for effects-based operations, e.g., to understand the effects of the proposed actions on non-adversaries (domestic and allied populace and media). Civilian and military leaders are able to achieve this type of informed discourse by leveraging *centers of knowledge*, e.g., analyses centers, subject matter experts, or *ad hoc* task forces. The key is that these centers of knowledge assist leaders and their staffs in (1) understanding the strategic and operational environments, (2) identifying possible effects and their impact, (3) suggesting "observables" or metrics, and (4) reassessing their "models" of the adversary (based on observing the actual effects versus what was expected).

The idea of "discourse" is a supporting mechanism. It assists commanders in inventing the effects that translate (and also shape) the strategic ends into an executable campaign (tactical actions).

Attributes of Effects-Based Operations

- Focus on decision superiority (not just precision engagement or targeting)
- Applicable in peace and war
- Look beyond the direct, immediate first-order effects
- Attempt to focus on a variety of effects on systems of adversaries and others
- Adaptation at the operational level occurs in a disciplined process
- Include all elements of national power (economic, political, etc.)
- Agility in decision-making to adapt rules and assumptions to reality



This slide is a summary of the most important attributes of effects-based operations. One foundation of effects-based operations is a continuous cycle of analysis and understanding, planning, execution, and assessment. This cycle is much like the "OODA" (*observe, orient, decide, act*) loop first introduced by Colonel John Boyd, except that in this model, the cycle occurs at the operational (rather than tactical) level and is much broader and deeper in terms of time and effects.

Boyd developed his model of decision-making based on his experiences as a fighter pilot in the Korean War. In it, the decision-maker (originally a fighter pilot) would try to reduce the time it took him to go through the cycle. The speed of the decision cycle was relative but, ultimately, the pilot who could sufficiently tighten his cycle to be "inside" the adversary's cycle would eventually make that adversary's decisions irrelevant to the situation at hand.[3] Extrapolating this cycle to the operational level of war (and broadening it to encompass all forms of military operations) results in a useful model of effects-based thinking, and how the joint force commander should employ effects-based operations to realize national goals.

Another crucial element is that the loop is a *continuous process*, not a sequential checklist for a single operation. Commanders need to be able to observe whether or not the actions of their forces are producing the desired outcome, and adjust their actions accordingly. In other words, commanders conducting effects-based operations need to examine continually their assumptions, actions, and operations to ensure they are producing the desired effects. Thus, the focus of effects-based operations is more than just precision en-

[3] D.S. Fadok, *John Boyd and John Warden: Air Power's Quest for Strategic Paralysis* (Maxwell Air Force Base, AL: Air University Press, 1995), pp. 14–17.

gagement or targeting. *Precision engagement* is one tool that might facilitate or enable the causation of effects. *Dominant maneuver* and *information operations* are additional tools to enable military effects-based operations.

Joint force commanders should apply effects-based thinking in *all* military operations, ranging from peacetime planning for conflict and shaping operations to major wars. While the emphasis here has been on effects-based military operations, the interagency aspect is critical to such operations. All elements of national power should contribute to understanding and realizing synergies that result in the effects that will contribute to desired outcomes at the strategic and national levels.

Given that current and future operations are and will be complex, effects-based thinking should look beyond the direct first-order effects of actions: commanders and staffs must anticipate and understand the complexity of effects, effects over time, effects on other than military targets, as well as undesired and unexpected effects. Effects-based operations should focus on a variety of effects on the adversary (characterized as a complex, adaptive system of systems) and others (allies, neutrals, etc.). Thinking in an effects-based fashion, leaders can move from the relatively simplistic focus on the enemy's troops, equipment, and infrastructure to a broader, more realistic consideration of whom US actions might influence (e.g., the adversary, allies, coalition partners, neutrals). Rather than limit operations to attacking and destroying enemy forces, military operations, in conjunction with political, economic, and diplomatic actions, can produce effects on the entire enemy system. Effects-based operations should incorporate all elements of national power and should address all elements of enemy national power.

Conducting effects-based operations requires continuous assessment and adaptation at the operational level. The cycle of analyze and understand, plan, execute, and assess, along with understanding how the desired outcome may or may not be observable, enables this adaptation. Without continuous and timely assessment and a willingness and ability to adapt, operations remain based on pre-conflict rules and assumptions. Agility in decision-making—the capability to adapt rules and assumptions to reality—makes effects-based operations possible.

What Effects-Based Operations Are *Not*

- New — there are examples throughout history
- Limited to traditional approaches of destruction and attrition
- Solely about air power, precision engagement, or kinetic weapons
- *Limited* to notions of nodal targeting or critical target sets
- *Limited* to notions of lifting the fog of war and anticipating the enemy's intentions
- Only concerned with military power
- Just another empty buzzword

There is a great range in the content and quality of arguments spoken and written on effects-based operations. Some present "effects-based operations" without defining and supporting what they mean by "effects-based." Many react negatively to the idea of effects-based operations, based on institutional biases and prejudices.[4]

Some consider effects-based operations to be a revolutionary approach to war. It is not. Throughout history, capable commanders and planners have tried to plan and execute effects-based campaigns. The Romans thought in terms of effects at Masada; Ulysses S. Grant used effects-based thinking during the American Civil War; and the US Army Air Corps Tactical School refined effects-based thinking in the early 1930s.[5] Effects-based thinking is

[4] The concept called "effects-based operations" was first presented by the US Air Force in the early 1990s as a method to plan and conduct an air campaign, based on ideas of parallel warfare, precision strike, and nodal targeting of enemy infrastructure. The perception of many was that the concept overemphasizes strike at the expense of maneuver; some see this concept of effects-based operations as a grab for budget dollars by the US Air Force.

[5] The Roman art of war was ultimately political. For the war that resulted in the destruction of Jerusalem and the capture of Masada, see Flavius Josephus, *The Great Roman–Jewish War, A.D. 55–70*, trans. by William Whiston (New York: Harper Torchbacks, 1960). The most useful source on the evolution of Grant's thinking on the effects he was attempting to achieve remains his memoirs. US Grant, *The Personal Memoirs of US Grant* (New York: Charles L. Webster and Company, 1885). For the development of thinking at the Air Corps Tactical School, see Robert F. Futrell, *Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force 1907-1964* (Maxwell AFB, AL: Air University Press, 1971); Haywood S. Hansell, Jr., *The Air Plan that Defeated Hitler* (Atlanta, GA: Higgins-McArthur/Longino and Porter, 1972); and Barry D. Watts, *The Foundations of US Air Force Doctrine,*

not new, but it is extraordinarily difficult to implement.

Effects-based thinking has the potential to be remarkably different than the traditional military approaches of destruction and attrition. If US forces can exploit this potential, they can move beyond the idea that the only way to win a conflict is to destroy the enemy's forces. Destruction-based operations will then become but one tool in the joint force commander's kit.

Effects-based operations are not just about air power, precision engagement, or kinetic weapons. Many critics view the concept as one pushed by air power and precision engagement advocates to increase the power (or budget share) of certain Services, branches, or weapons systems. In fact, operations with the greatest potential for success will be effects-based operations that involve all aspects of national power (political, military, economic, and diplomatic). Moreover, reliance on a single attribute of national power (such as the military) will inevitably detract from the overall effectiveness of a campaign: it is relatively easy for an adversary to adapt to a single form of attack.

Effects-based operations cannot remain limited to notions of nodal targeting of critical target sets, though planning for critical targets can form a valuable starting point for effects-based thinking. The notion of critical target sets must rest on a detailed understanding of the enemy as a complex, adaptive system of systems. However, the advocates of this approach often articulate a belief that one can identify critical nodes and thus critical target sets, which, when struck, will cause the enemy's actions to conform to US aims. They assume that advances in intelligence, surveillance, and reconnaissance (ISR) systems and in command, control, and communications (C3) systems will make it possible to develop a high fidelity understanding of the battlespace, and thus overcome the uncertainty, fog, friction, and ambiguity that have traditionally characterized military operations.[6] Such an understanding, they argue, will also allow the joint force commander to identify and strike critical targets and target sets, thus bringing about the rapid paralysis of an adversary.

The potential benefits of the success of this notion make it attractive. However, it is not likely that US forces will be able to realize total success in pursuing such a notion. It depends as heavily on understanding the enemy's value system, beliefs, and culture, as much as it depends on modeling physical nodes such as power, water, and information infrastructure. This type of understanding is difficult, at best, to achieve, and US forces would need to have this level of understanding for every potential enemy and contingency in the world.

Furthermore, several other factors could impede the realization of the full potential of this notion. In the real world, it is possible that planners will pick the wrong target sets, or target sets that have effects other than those which they seek. Successful strikes (kinetic or non-kinetic)

The Problem of Friction in War (Maxwell AFB, AL: Air University Press, 1984).

[6] For an argument along these lines, see Admiral William A. Owens (with Edward Offley), *Lifting the Fog of War* (New York: Farrar, Straus, and Giroux, 2000).

could fail to produce the expected effects. Human and machine errors will be factors as long as humans conduct warfare. It is nearly certain that attacks, regardless of how precise, will sometimes miss targets and hit unintended targets, thus causing unexpected (and possibly) undesired effects. Political constraints could limit options for actions (i.e., making some critical targets or target sets off-limits). In addition, as soon as one begins to attack a specific target set—critical or not—the adversary will begin to adapt. This adaptation will inevitably change the nature and character of the target set, with considerable implications in terms of pre-strike assumptions and planning.[7]

Effects-based operations must not remain limited to notions of gaining a clear knowledge and understanding of enemy actions and intentions, and exploiting this awareness to attack enemy vulnerabilities, thus compelling him to behave in a fashion consistent with US aims. Planning for exploitation of an information advantage can form a valuable starting point for effects-based thinking. But the notion that US forces could, in a manner of speaking, lift the fog of war is simply unattainable. At best, they could maintain and continue to exploit information advantages throughout a conflict. As with the notion of critical target sets, US forces will rarely, if ever, be able to realize total success in pursuing this notion.

The model of the enemy may be wrong. US military thinkers are often guilty of "mirror imaging," projecting their own values, culture, and perspectives on adversaries. It is unlikely that many adversaries will react to events in the same fashion that our culture would react. Commanders need to understand what is important to the enemy, and this represents an exceedingly difficult task. The enemy might not know his own intentions or he might remain unclear on his options and plans. Winning the information war may be easier said than done. Regardless of the type or sophistication of the enemy's C3 systems, it is unlikely US forces can immediately and decisively compromise all (or most) of his systems. Even when US intelligence has compromised the enemy's information systems, it may not be possible to use all the intelligence collected for operations.[8] The most obvious reason might be that by so doing, the adversary might learn that his systems have been compromised. As with any operation, the adversary will adapt, often unexpectedly or in unexpected ways. The fact that collection and analytic resources are finite further complicates the ability to understand an adversary's capabilities. US

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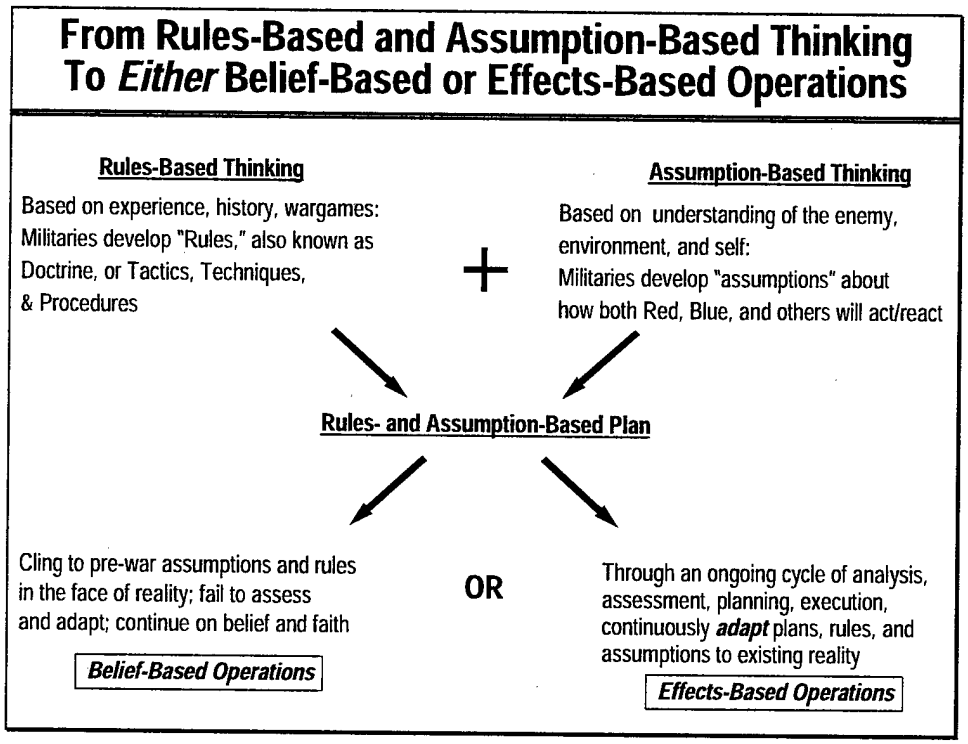
[7] For more information on adaptation, see M. Brown, A. May, and M. Slater, "Defeat Mechanisms: Military Organizations as Complex, Adaptive, Nonlinear Systems," SAIC, 2000, p. 61.

[8] During World War II British code breakers compromised to a great extent the highest level ciphers of the German military (the so-called Enigma machine). Nevertheless, for a variety of reasons, the Allies were not always able to act on the information they obtained from these decrypts. The two main factors in this regard were 1) the fear that in certain circumstances the use of Enigma intelligence (code-named "Ultra") might compromise the source, or 2) Allied preconceptions (for example, that the Germans did not have the physical means to launch an offensive in December 1944). For the clearest exposition of the operationalization of Ultra, see Ralph Bennett, *Ultra in the West, The Normandy Campaign, 1944–45* (New York: Charles Scribner's Sons, 1979).

forces simply do not have the resources or time to collect information on all potential adversaries, or on all levels and personalities within a given adversary's structure. Accordingly, when the unexpected occurs, the ability of US forces to sufficiently characterize or understand fully the threat is problematic.

As mentioned previously, effects-based operations should involve all instruments of national power. Military operations will be one element of national-level effects-based operations that integrate several instruments of national power; in many cases, military forces will be in a supporting role to other agencies.

The term "effects-based operations" is not just another empty buzzword. There is real substance to the idea of thinking and operating effects based. However, realizing the full potential of effects-based thinking and operations represents a significant challenge. The concepts and ideas require hard thinking, and executing effects-based operations in the real world is quite difficult. This briefing will now turn to an examination of why effects-based thinking and operations will be so difficult.



Military planning starts with rules and assumptions. Because of this, most military campaigns begin with plans that are either "rules based," "assumption based," or some combination of the two.

To develop the "rules," military organizations look to their institutional experiences, use exercises and wargames, and analyze history. Familiar examples of rules include:

- Two-thirds of the unit up (ready for contact with the enemy) and one-third back (in reserve).
- The offense must have three times the combat power of a defender to initiate offensive action.

Military organizations often express their rules in doctrine or as tactics, techniques, and procedures.

Assumptions differ from rules in that military organizations use their understanding of an enemy, the environment, and their own organizations to make informed estimates about how their organizations will fight, and how the enemy will act and react in times of conflict. Familiar examples of assumptions include "the German fighter defenses will no longer represent a serious threat, once our bomber formations penetrate deep into the Reich," and "the Red Army will collapse when its forces along the frontier are destroyed in the opening moves of Operation Barbarossa."[9]

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[9] For discussion of these issues, see Williamson Murray, *Luftwaffe* (Baltimore, MD: Nautical and Aviation Press, 1985), p. 165; and Williamson Murray and Allan R. Millett, *A War To Be Won, Fighting the Second World War* (Cambridge, MA:

Commanders thus begin campaigns with plans that are rules- and assumption-based for good reason. Rules and assumptions are crucial starting points for all planning. But a well-worn saying is "no plan survives contact with the enemy." Human nature drives commanders and staffs to continue to rely upon pre-war rules and assumptions throughout conflict. To break away from pre-war rules and assumptions is to break away from doctrine that military organizations have proven and validated through wargames and exercises. It is also to break away from concepts and ideas about friendly and enemy actions and reactions that have been developed over time and with much effort. Furthermore, existing military force structures, organizations, and training are based upon these pre-war rules and assumptions. Above all, departing from pre-war rules and assumptions represents breaking away from that which is comfortable and familiar.

Operations become "belief based" when military organizations cling to pre-war rules and assumptions in the face of evidence to the contrary rather than adapting their rules and assumptions to fit reality.[10] The key to success in conducting effects-based operations is to have the ability to assess and adapt—assess that the existing conditions are different from pre-war assumptions and rules, and make appropriate adaptations in plans and actions. It is much easier to see that conditions have changed when one analyzes after the fact; the fog and friction of war ensure that during conflict it will be difficult to see, understand, and assess that reality is different from pre-war assumptions.[11] The ability to adapt, and thus to conduct effects-based operations, is difficult under the best of circumstances.

The notions of developing critical target sets and gaining and exploiting a clear knowledge and understanding of enemy actions and intentions were introduced earlier as starting points for effects-based operations. One can view these notions as plans, based on pre-war assumptions that may or may not prove valid and appropriate during war. If commanders cling to these plans and fail to analyze, assess, and then adapt and execute, as appropriate, new plans, the operations will rest on hope and belief rather than effects and reality.

Harvard University Press, 2000), pp. 117–120.

[10] There are two classic examples of this paradigm, the British in the First World War and the US Army in Vietnam. For the former, see Tim Travers, *The Killing Ground, The British Army, the Western Front, and the Emergence of Modern Warfare, 1900-1918* (London: Allen & Unwin, 1987); for the latter, see Andrew Krepenevich, *The Army in Vietnam* (Baltimore, MD: Johns Hopkins University Press, 1986).

[11] A good example of effective adaptation is the series of adaptations that the German Army went through on the Western Front from 1914 through 1918. See Timothy Lupfer, *The Dynamics of Doctrine: The Changes in German Tactical Doctrine during the First World War* (Leavenworth, KS: Combat Studies Institute, 1981); and G.C. Wynne, *If Germany Attacks: The Battle in Depth in the West* (London: Faber and Faber, Ltd., 1940).

Why Effects-Based Operations Are So Difficult

- **Many could be affected**
- **Desired result is to change enemy actions, not will**
- **Different kinds of effects**
- **War is waged against an adaptive, uncooperative enemy**
- **Effects and time — and timing of effects**

In thinking broadly about effects-based operations, there are other reasons why such operations are difficult. In the end, effects-based operations must involve more than first-order immediate effects, more than tactical effects, more than military actions, and more than targeting and bomb damage assessment.

Effects extend beyond the joint area of operations. They will and can affect many types and groups of people (i.e., diplomatic, information, military, economic) as well as varying strata within those. For example, within the adversary's leadership structure, the political leadership, military leadership, and military personnel all represent potential targets for desired effects. Other targets of effects are often not so obvious. Commanders and planners must consider the effects of their actions on allies, host nation governments and citizens, the US Congress and other political leaders, as well as the US public. Others might even include the United Nations, neutral countries, and non-governmental organizations. Additionally, different levels within political, social, and economic structures might be affected.

Four categories of effects were examined: desired effects on *capabilities*, desired effects on *decisions*, *undesired* effects, and *unexpected* effects. As a result of this examination, it was concluded that the desired result of an effects-based operation is to change an enemy's actions, not his will. US planners cannot count on adversaries changing their cultures, mindsets, or ill feelings about the United States. Regardless of how much US forces bomb and destroy, enemies will still want to strike back, and will take every opportunity to do so. Effects can change enemy actions through effects on enemy *capabilities* or *decisions*.

The desired effects on an enemy's *capabilities* are those that result when Blue forces change the situation and options for an enemy by affecting the enemy's current capability. These effects depend entirely on results from Blue's actions and not on the enemy's mind or

and not on the enemy's mind or will. For example, Blue destroys a Red surface-to-air missile site. Red is no longer capable of launching surface-to-air missiles from that site. Red's inability to fire a missile is independent of its will, its plans, or its assessments. Blue's actions have thus changed Red's actual ability to act.

Desired effects on the enemy's *decisions* aim to change the enemy's assessments of the situation as well as possible options. Such actions target the decisions and thus the behavior of the enemy, allies, neutrals, and others. These actions attempt to deter or coerce, and depend on the enemy's reaction to Blue's actions. They may or may not affect the enemy's will—changing the enemy's action is the goal. For example, Blue destroys several of Red's surface-to-air missile sites, guidance radars, and fighter aircraft. Red still maintains the capability to launch other surface-to-air missiles and fighters, but decides not to because he estimates that he will then lose those surface-to-air missiles sites and fighters. Red still may want to fight: his will has not changed—only his assessment of the situation has changed. Blue's desired effect has been achieved.

Undesired effects are usually easier to recognize after the fact than to predict. Effects on the enemy, allies, neutrals, and US public or political leaders can be undesirable. Destruction without anticipating cascading effects can make conflict termination—winning and maintaining the peace—difficult and costly. Military actions can result in domestic US protests, a weakening national political will, or protests by neutrals or coalition partners. An example of an undesired effect would be an attack on infrastructure that is essential for post-conflict recovery. Consider the destruction of a bridge span to interdict an enemy's lines of communication. While the near-term benefits of such an action might seem obvious (e.g., limiting the enemy's mobility and upsetting his logistical supply routes), the undesired effects of such an action might include:

- Denying the mobility that the bridge provides to US and allied forces, peacekeeping units, and civilian populations.
- Impeding river traffic that might be critical to the region's economic well-being.
- Complicating post-war recovery.

Eliminating enemy leaders may cause a conflict to end but may also result in uncontrollable political turmoil. Commanders should give serious thought to longer-term effects as they relate to winning, or hindering, the peace.

Unexpected effects resulting from the fog of war or chance constitute the final category. One can anticipate some effects as possible but unlikely, while other effects are simply impossible to anticipate. Unexpected effects could interfere with desired effects on enemy capabilities and enemy decisions. While unexpected effects can create new problems, they can also create new opportunities for exploitation. In the latter case, they represent fleeting windows of opportunity. The key is the ability to recognize unexpected effects and their impacts and have the flexibility to respond.

Another reason that effects-based operations are so difficult is that military forces will always conduct such opera-

tions against an adaptive, uncooperative enemy. In fact, the enemy will probably be orchestrating his own effects-based campaign against US interests. As history demonstrates, adversaries are often playing a different game than US forces, using different rules.

Effects and time, and the timing of effects, add interesting complexities that make thinking about and planning actions even more difficult. The briefing will next discuss some of these complexities.

Effects and Time — Timing of Effects

- **Combination of effects — synergy and interference**
- **Manifestation of various effects**
- **Effects to seize and hold the initiative**
- **Timing for effective decisive operations**
- **Continuous pressure on adversary decision making**
- **Complexities of time — uncertainties remain**

Commanders should also consider effects in relation to time. Effects do not follow laws of physics—they can dampen over time, stay the same, or be amplified. Moreover, assessment of effects can change over time. There might be one assessment of effects immediately after an event and that assessment may change over time as trends occur or indirect effects become clear. Timing of effects is also critical. Actions that will result in planned effects at a particular time might accomplish a far different result at later or earlier times.

Effects combine in unique fashion, often depending on the timing of the actions that result in effects. Some effects will work well together and create synergies that amplify each effect. Other effects will interfere with one another and can even cancel desired effects. Different actions will manifest their effects at various times—they will take differing amounts of time to come to fruition.

Actions and effects should not be planned to be rapid for the sake of speed alone. The goal should be the right timing and synchronization of actions and resulting effects—to seize and hold the initiative and thus compress the adversary's freedom of action. Commanders strive to make decisions such that the effects of those decisions are felt when the operational context remains applicable—before adversary decisions and actions render the context invalid.

Timing of actions and effects is critical, and is not a simple matter of how early or fast in a conflict one acts. What is critical is that one understands how to act at the right time. US forces need the flexibility and capability to act early (or late) as is appropriate.

Continuous action or continuous effects are not important in and of themselves. The goal should be continuous pressure on adversary decision-making, making adversary decisions and actions irrelevant and driving the adversary to decision paralysis.

Despite extensive planning and deep thinking about the many variables of time and effects, uncertainties will remain—especially in the confusion of war.

The next section of this briefing examines effects-based operations throughout history—looking at complex interactions of actual adversaries—and illuminates and clarifies many of the difficulties in conducting such operations.

Historical Perspective

- **Historically, some military campaigns have been characterized by**
  - Planning for specific operational and psychological effects
  - Adapting to changing political and operational realities during the course of war
- **Even the most successful of these campaigns have been complex and difficult to plan, execute, and assess**
  - Military operations have complex effects at and on each level of war
  - Unexpected effects can be both positive and negative and can dominate the outcome
  - Leaders have been unable to assess accurately and adapt in a timely fashion

History offers a useful perspective on thinking about effects-based operations in the future. Only history can provide a sense of the complexity and ambiguities both in the planning for and in the conduct of military operations. In fact, a number of campaigns have pursued an effects-based approach in defeating their opponents. However, there have also been a number of occasions when—even where victorious—military organizations have not based their planning on effects. The results have almost invariably been horrendous casualty bills.

The great difficulty confronting commanders and their staffs is the fact that they fight human opponents—in other words, adaptive adversaries who have had their own agendas and approaches to war. Moreover, military organizations, no matter how thoughtfully they have prepared for war, invariably make a number of errors in judgment. There is simply no way to predict completely what the enemy may do, nor can military organizations fully understand how technological and other changes will affect the battlefield. They cannot possibly replicate the conditions of war in peacetime.

The inevitable result is that military organizations have to base their planning in peacetime on assumptions about what the enemy might do and what might "work." There is also a natural tendency to believe that certain rules provide a guide to military actions in the tactical and operational arenas. In many cases, these assumptions and rules continue to play a role in the perception of the leadership even after wars begin. The Germans designed the Schlieffen Plan, executed in 1914, on the assumption that the French could not react in time to counter the massive blow that would come through Belgium and outflank the main French defenses.[12] Similarly, the French launched their ill-fated Nivelle offensive in 1917 against German positions on the Chemin des Dames on

[12] For an account of the Schlieffen Plan, see Barbara W. Tuchman, *The Guns of August* (New York: Macmillan, 1962).

the assumption that their new offensive tactics could achieve a breakthrough.[13]

In both cases, however, the opponents adapted. In the case of the Schlieffen Plan, the French managed to transfer substantial forces to their left wing, enabling them to defeat the Germans on the Marne; the French received considerable help from the fact that the logistic assumptions, on which the Germans had based their planning, completely collapsed. In the case of the French attack on the Chemin des Dames, the French could not have possibly calculated that the Germans would come up with an entirely new tactical system of defense—a defense in depth—which completely vitiated the recently developed French offensive tactical system.

The impact of a rule-based approach to war can have an equally negative effect. While the "rules" indicate that a three-to-one numerical advantage favors the attacker, there have been a number of cases in military history where the attacker, despite such a numerical advantage, has gone down to ignominious defeat. Eighth Air Force commanders believed in 1943 that bomber formations of over 300 aircraft would allow them to penetrate deep into German airspace without suffering prohibitive casualties.[14] They were wrong.

Unfortunately, military commanders and organizations, all too often, have persisted in basing further military operations on their assumptions and rules, despite the harsh realities of the battlefield. Thus, in fall 1917, in the battle of Passchendaele, Sir Douglas Haig persisted in committing his forces under tactical and weather conditions that promised only heavy losses (as evidenced by earlier operations on the Western Front) because prewar assumptions still guided his thinking.[15] Haig's assumption-based approach mutated into a belief-based operation.

Even military campaigns that rest on effects-based thinking have been extraordinarily difficult to execute because the enemy is a complex, adaptive system of systems that will change and transform itself when confronted by our actions. Thus, perhaps the most important attribute of effects-based operations is the capacity of military organizations, planners, and commanders to alter and adapt their assumptions and rules when confronted by the realities of the battlefield. The briefing will next examine three conflicts where commanders had varying levels of success in adapting to the realities of the battlefield.

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[13] There is no good account in English on the French side of the Nivelle offensive. For the German side, see Wynne, *If Germany Attacks.*

[14] Lt. Gen. Ira Eaker, commander of Eighth Air Force wrote to his boss, General "Tooey" Spaatz that "the fourth phase will be a demonstration that bombardment in force—a minimum of 300 bombers—can effectively attack any German target and return without excessive or uneconomical losses." Letter from Eaker to Spaatz quoted in Thomas Fabyanic, "A Critique of United States Air War Planning," St. Louis University dissertation, 1972, pp. 129–130.

[15] The most thorough examination of the battle of Passchendaele is Robin Prior and Trevor Wilson, *Passchendaele, The Untold Story* (New Haven, CT: Yale University Press, 1996); see also Leon Wolff, *In Flanders Fields, The 1917 Campaign* (New York: Time Incorporated, 1958).

Adaptation of Union Operational and Strategic Concepts During the US Civil War

- **Initial approach of Union forces was to win a decisive battlefield victory**
  - Desired effect: achieve collapse of southern will
    - Operational means: win decisive single battle, e.g., First Bull Run
- **Second approach was to capture crucial enemy territory**
  - Desired effect: open up the Mississippi River and split the Confederacy
    - Operational means: outflank Vicksburg to the south and live off the land
- **Third approach was to use Union invading forces to capture South's industrial resources**
  - Desired effect: undermine southern will to continue war by destroying military organizations (armies) and eliminating industrial production
    - Operational means: hammer and destroy main Southern armies and capture Richmond
- **Fourth approach was to use invading forces to ravage the countryside**
  - Desired effect: destroy the morale of southern armies and willingness of common soldiers to continue the war
    - Operational means: lay waste to the countryside, e.g., "Chimneyvilles"

At the beginning of the American Civil War, political and military leaders in the North assumed that a single decisive victory would be sufficient to shatter the South's morale. Thus, their aim was to seek and win such a battle. U.S. Grant admitted in his memoirs that he held such a belief until the Battle of Shiloh.[16] Robert E. Lee persisted in the assumption that a single decisive victory would win the Civil war through the Battle of Gettysburg. Both leaders were wrong, but the North adapted its approach.

The second approach the Union pursued was to seize territory on the assumption that Union forces would eventually be able to strangle the Confederacy and damage Southern morale sufficiently to end the war. In the Vicksburg campaign, Grant cut his army entirely loose from its lines of communication in the belief that he could live off the land in central Mississippi. The result was a second striking victory—the effects of which led not only to the opening of the Mississippi River but to the destruction of a second major Confederate army in the west.[17] But neither achievement resulted in the slightest wavering in the South's determination to see the war through to final victory.

By spring 1864, Grant had become the commander-in-chief of all Union armies. He devised a strategy with two larger effects in mind: the first aimed to achieve the absolute destruction of the Confederate Armies in a campaign that would directly target both the Army of Northern Virginia and the Army of Tennessee. But

[16] Grant, *Personal Memoirs*, p. 191.

[17] For the Vicksburg campaign, see James R. Arnold, *Grant Wins the War, Decision at Vicksburg* (New York: James Wiley & Sons, 1997).

Grant's plan also targeted the South's main industrial centers (Richmond and Atlanta), as well as the main ports through which blockade runners were bringing substantial military equipment for the Southern armies. This campaign, however, depended on more than just the movement of the Army of the Potomac under Grant and the armies in the west under Major General William T. Sherman. Major General Benjamin Butler was to lead the Army of the James to capture Petersburg and thus cut Richmond off from its supplies. At the same time Major General Nathaniel Banks was to attack the great port of Mobile, thus freezing a substantial portion of Southern ground forces in its defense. Finally, Major General Franz Sigel was to keep the Confederate forces in the Shenandoah out of the fight.[18]

In the larger sense, Grant's operational strategy for the 1864 campaign failed largely because the efforts of Butler, Banks, and Sigel turned out to be abject failures. But Grant never criticized Lincoln for having saddled him with political generals who were operationally and tactically inept. He realized that those three political generals were absolutely necessary to help the pro-Union political coalition re-elect Lincoln in the upcoming election. Military victories would not lead to the desired strategic and political effects if the pro-Southern Democratic Party under its nominee George McClellan (former commander of the Army of the Potomac) were to win the election.

By late summer 1864, both Grant and Sherman had battered Southern armies back to Richmond and Atlanta, but while they had inflicted massive losses on the Confederate armies, they had not yet broken the will of the Confederate people. It was at this point in the war that the Union high command unleashed its armies on the Southern people to break their morale. Sherman's "March to the Sea" and then north through South Carolina—along with General Phil Sheridan's devastation of the Shenandoah valley—created a path of wreckage that led to increasing numbers of desertions and eventually to the collapse of Southern morale—military as well as civilian. The effects that these operations aimed at achieving were explicitly understood by those executing the strategy. As a Alabamian major on Sherman's staff commented in fall 1864:

> This Union and its government must be sustained, at any and every cost; to sustain it we must wage war upon and destroy the organized rebel forces—must cut off their supplies, destroy their communications…[and] produce among the people of Georgia a thorough conviction of the personal misery that attends war, and the utter helplessness and inability of their 'rulers,' State or Confederate, to protect them…If that terror and grief and even want shall help to paralyze their husbands and fathers who are fighting us…it is a mercy in the end.[19]

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[18] Grant laid out his plan for the campaign in two letters of instruction he wrote to Major General William T. Sherman, commanding Military Division of the Mississippi (4 April 1864), and Major General George G. Meade, commanding the Army of the Potomac (9 April 1864). The letters are in Grant, *Memoirs*, pp. 366–369.

[19] Quoted in James M. McPherson's *Battle Cry of Freedom*, Oxford, UK: Oxford University Press, 1988, pp. 810–811.

Grant's ultimate success is a story of assessment and adaptation at the operational and strategic levels. The Union leadership altered its approach and the effects it aimed to achieve during the course of the war. Its initial assumptions were undoubtedly wrong, and the interim assessments also proved faulty both in terms of effects achieved and operational concepts. In the end, by successfully adapting to the actual conditions of war, the Union got it right, but at enormous cost to victors and vanquished alike. By 1864, the context and assumptions had undergone great changes. However, it is worth noting that what worked in 1864 would have been inconceivable, and probably unacceptable, to the Union's political and military leaders in 1861.

For another example of adaptation to the realities of war, the briefing will next examine Eighth Air Force's strategic bombing campaign of 1943–44.

Strategic Bombing: Eighth Air Force, 1943–1944

- **1943: Strategic bombing effort based on pre-war assumptions and ideology**
  - Unescorted bomber formations attacked critical nodes in German industry
    - Desired effect: collapse of German war economy
  - Effect:
    - Two tragedies over Schweinfurt
    - US crew loss rate approximately 30% per month from April 1943 to October 1943
    - Germans figured out ways to adapt to Allies' actions
- **1944: Adaptation stimulated by heavy losses and technological innovations**
  - Long-range fighter escorts enabled US bomber formations to attack German aircraft production facilities
    - Effect: direct attacks failed; fighter production increased threefold
  - Eighth Air Force went after Luftwaffe fighter force at the same time
    - Effect: devastating loss of experienced German fighter pilots in four months
    - Effect: gained air superiority which enabled Allied air forces to cripple transportation network in France (helped Overlord) and destroy much of German petroleum production

The US Army Air Force's campaign to destroy the German war economy from the air began in spring 1943. By this point, its force structure of heavy bombers had reached a level that the leaders of Eighth Air Force believed would be sufficient to conduct a campaign based on prewar assumptions and planning.

These doctrinal assumptions, developed at the Air Corps Tactical School in the late 1920s and 1930s, posited that large formations of heavy bombers, all equipped with large numbers of defensive machine guns, could fly deep into enemy-held territory and, through precision bombing, destroy crucial nodes in the enemy's economic system, the destruction of which would lead to the collapse of his production. Above all, the theory rested on the belief that enemy defensive forces—fighters as well as flak—would not be able to inflict "unacceptable" casualty rates on the attacking bomber formations.[20]

It is worth noting that the Royal Air Force Fighter Command had defeated the *Luftwaffe*'s massive aerial assault on the British Isles in late summer 1940 by inflicting an "unacceptable" level of casualties on German bomber formations—even when they were accompanied by escort fighters.

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[20] The Germans had attempted a daylight strategic bombing offensive against the British in 1940 and failed. American observers paid virtually no attention to the British defenses, but reported the *Luftwaffe's* defeat was the result of insufficient defensive armament on German bombers, their small size, and their poor formation discipline (Murray, *Luftwaffe*, p. 60). For a more complete examination of effects of the Combined Bomber Offensive (British as well as American efforts), see Williamson Murray, "Reflections on the Combined Bomber Offensive," *Militärgeschichtliche Mitteillungen*, 1992.

But American observers entirely dismissed the *Luftwaffe*'s defeat as being irrelevant to their own plans and assumptions. Thus in April 1943, large formations of American bombers began to probe the German air defenses. By June, Eighth Air Force's bombers began reaching deeper into the Reich, far beyond the range of the longest-range fighters in the Allied inventory. From April through August, great air battles swirled across the Reich's airspace with heavy losses on both sides. Crew losses in Eighth's bomber units reached over 30 percent per month.[21]

The summer effort culminated with a massive, two-pronged attack on the ball bearing factories at Schweinfurt and the Messerschmidt aircraft factory at Regensburg on August 17, 1943. The losses suffered by the unescorted bomber formations were disastrous: nearly 20 percent of the attacking formations were lost—60 bombers, with nearly 30 bombers written off after landing. So heavy were Eighth Air Force losses that Lt. Gen. Ira Eaker was forced to reduce attacks in September to rebuild the force strength.[22] By this point, the Eighth's efforts were beginning to come close to a belief-based effort. Significantly, Eaker failed to place long-range escort fighters at the top of his priorities until after a second disaster in the skies over Schweinfurt in late October. In contrast, Major General James Doolittle, commander of US bombers in the Mediterranean, wrote his superiors as early as May 1943 that only the provision of long-range escort fighters would allow the continuation of bomber operations.[23]

The attacks on Schweinfurt failed to achieve the hoped-for effect of significantly slowing German war production, although the initial attack did considerably worry Albert Speer, the Nazi Minister of Armaments.[24] But the Germans discovered that they did possess considerable reserves of ball bearings, the Swiss and the Swedes were willing to step in and make good German production losses, and there were alternatives to ball bearings.[25] Thus, despite the heavy losses and the damage done to the factories at Schweinfurt, the Eighth Air Force's efforts were for naught.

After the second disastrous attack on Schweinfurt in late October, Eighth Air Force limited its attacks to the fringes of Nazi Germany, where its bombers could receive support from Allied escort fighters. By February 1944, the strength of Eighth in Britain had substantially changed. Now there were nearly three times the number of bombers, but most important of all, the Allies now fortuitously possessed a long-range escort fighter, the P-51 "Mustang," with sufficient range to reach Berlin. Eighth Air Force could resume its long-range bombing missions, this time protected during

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21 Crew losses in Eighth Air Force by month: April, 20 percent; May, 37.6 percent; June, 38.3; July, 34.7; August, 31.3; September, 20.3; October 37.4. Murray, *Luftwaffe,* p. 170.

22 For the most detailed examination of the attacks on Schweinfurt both in their military and economic ramifications, see Friedhelm Golüke, *Schweinfurt und der strategische Luftkrieg 1943* (Padeborn: Ferdinand Schoningh, 1980).

23 Murray, *Luftwaffe*, p. 157.

24 Albert Speer, *Inside the Third Reich* (New York: Macmillan, 1970), p. 285.

25 Murray, "Reflections on the Combined Bomber Offensive," p. 81.

the entire course of the mission by escort fighters.[26]

The initial target of the effort was the German aircraft industry producing single-engine fighters. In 1944, from February through April, great air battles again filled German airspace as huge formations of American bombers attacked aircraft engine and production facilities. Ironically, during this period the Germans were able to increase their production of fighters by a factor of nearly three. But this success proved irrelevant: the great air battles killed off a substantial portion of the *Luftwaffe*'s experienced pilots. By May 1944, the Americans had won the battle of air supremacy over the *Reich*.[27] While the *Luftwaffe* at times remained a dangerous opponent, it would never again challenge Allied bomber formations on a consistent basis.

The unintended effects of the *Luftwaffe*'s collapse proved crucial to the success of the Allied effort in the war's last year. The Allies possessed complete air superiority over the Normandy beaches. Equally important, over the course of the spring, Allied air power wrecked the French transportation network, making it exceedingly difficult for the Germans to reinforce or supply their forces during the ferocious fighting of June and July. Finally, beginning in May 1944, Eighth Air Force's bombers began a systematic campaign against German petroleum facilities that not only devastated the *Wehrmacht*'s ability to maneuver but severely limited the ability to train new pilots or even tank crews.[28]

Eighth Air Force's campaign against German industry raises a number of interesting points about the conduct of effects-based operations.

- First, the persistence of Eighth's leadership in believing that unescorted bomber formations could survive in deep-penetration raids suggests an effort that had become entirely based on hope and faith by October 1943, in the face of hard evidence.
- Second, the attack on the German ball bearing industry failed largely because the enemy adapted to the bombing attacks in a fashion that prevented the attacks from realizing their sought-after effects.
- Third, the attacks in spring 1944 failed to achieve the aimed-for effect of destroying German fighter production but had the unexpected effect of providing Eighth Air Force the opportunity for destroying the effectiveness of the *Luftwaffe*'s fighter force by killing off its experienced pilots. With most of its best pilots dead or maimed, the *Luftwaffe* was no longer capable of challenging Eighth Air Force.

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26 On the history of the P-51 development, see Bernard M. Boylan, "The Development of the American Long-Range Escort Fighter," University of Missouri dissertation, 1955.

27 Over the period from January 1944 through May 1944, the *Luftwaffe* lost the following percentages of its fighter pilots: January, 12.1 percent; February, 17.9; March, 21.7; April, 20.1; May 25. Over this period, the *Luftwaffe*'s average strength of fighter pilots available for duty was 2,283; during the same period it lost 2,262 pilots killed, maimed, or missing. Murray, *Luftwaffe*, p. 228.

28 Murray, *Luftwaffe*, pp. 257–262.

The resulting air superiority allowed the conduct of precision attacks that had the effect of destroying the transportation system (a major enabler in Allied victory in France) and the petroleum producing facilities in the *Reich*, which severely hobbled the *Wehrmacht*'s ability not only to fight but also to train.

Forty-five years later, US forces again attempted an effects-based operation, this time in the Gulf War. The briefing will next examine parts of that conflict.

Gulf War

- **Opening night air operations**
  - Desired effect: achieve air superiority
    - Operational means: destabilize, suppress, and destroy Iraqi integrated air defense system
  - Effect: achieved total air superiority above 10,000 feet for rest of Gulf War
- **Kuwaiti theater air operations**
  - Desired effect: kill pre-calculated numbers of armored vehicles and troops; mechanistically attrit Iraqi tank numbers by 50% to enable coalition ground offensive
    - Operational means: bombings in designated kill boxes
  - Effect: unexpectedly significant impact on Iraqi Army morale, but evidence not available until after the ground offensive began
    - Number of tanks killed was not decisive; effect on Iraqi morale was
- **Linkage between military effects and desired political outcomes**
  - Desired outcomes from war not clear or not known
  - Terms of surrender drafted by CINC and very late

Gulf War commanders extensively used effects-based thinking during both the planning and execution of OPERATION DESERT STORM. However, such thinking was largely focused on the strategic air campaign against Iraq; there is little evidence that it influenced either the air war in the Kuwaiti Theater of Operations (KTO) or the ground offensive. An examination of portions of the Gulf War does offer some instructive lessons about how an effects-based approach can have a significant effect on the outcomes of military operations.

In the air campaign against Iraq, there was a consistent effort by US air planners throughout the war to think through the implications of both immediate and long-term effects that the air campaign might achieve. In particular, the planning for the first night's attack on the Iraqi integrated air defense system aimed at affecting individual components sufficiently to degrade overall system performance significantly rather than achieve the total destruction of targets. For example, the aircraft attacking the individual sector operating centers (SOCs) of the integrated air defense system dropped single 2,000-pound laser-guided bombs (LGBs) on each SOC, where six LGBs would have been necessary to destroy completely each individual site. *But one hit was sufficient to persuade the survivors that they no longer wanted to be inside the building.* Such carefully planned attacks during the first night of the war entirely wrecked the ability of the Iraqi air defenses to operate as an integrated system.[29]

The air campaign against Iraqi forces in the KTO stands out in stark contrast to the effects-based air operations conducted against the Iraqi homeland. In the KTO, the planners charged with conducting air operations appear to have identi-

[29] Eliot Cohen, ed., *Gulf War Airpower Survey*, vol. 2, Report 1, *Operations* (Washington, DC: Government Printing Office), pp. 118–136.

fied the effort entirely in quantitative efforts: tons of ordnance dropped in each "kill box," the percentage of targets (i.e., tanks, artillery pieces) destroyed, the number of sorties launched against particular areas. This is not to say that the air attacks did not achieve impressive effects. They did—in the end, they broke the back of the Iraqi Army's morale, which had a significant impact on the ease of the ground campaign. But there is little evidence that the planning aimed at either specific or general effects.[30]

Finally, in terms of thinking through the outcome, it is interesting to note that when the Iraqis requested an armistice, the commander in chief, General Norman Schwarzkopf, was largely unprepared to impose terms that reflected the long-term goals of the United States. *Without a clear idea of the outcome the US military forces wanted to achieve (beyond the liberation of Kuwait), is it any surprise then that the resulting peace was so unsatisfactory to the long-term interests of the United States?*[31]

[30] Cohen, *Gulf War Air Power Survey*, pp. 118–136.

[31] General Norman Schwarzkopf, *It Doesn't Take a Hero* (New York: Bantam Books, 1992), pp. 479–483. In this autobiography, recalling the time when he was seeking guidance and review from the US government (Departments of State and Defense and the White House) on the upcoming talks at Safwan, Schwarzkopf stated "If need be, I would go to Safwan and wing it." This is not a good example of a clearly communicated and understood strategic goal or desired political outcome.

What History Suggests

- **Most campaigns have remained rules based or assumption based**
  - Campaign plans have taken on their own lives (often based on pre-war assumptions)
  - Little ability to perform real operational-level assessment and adaptation
  - The cost to the "winner" has often been much higher than it needed to be
- **Clausewitz was right**
  - Action and outcome have a complex relationship
  - Chance is a major factor
  - Unexpected effects often are as significant as intended effects
- **Without timely assessment and a willingness to adapt, operations remain "belief based"**

Most campaigns have remained rules based or assumption based, for various reasons. Campaign plans have taken on their own lives, often based on pre-war assumptions, as commanders and staffs fail to adapt to reality. Often, staffs and commanders have rationalized away or ignored indications and warnings that contradict expected outcomes. Moreover, commanders in the past had little ability to perform real operational-level assessment and adaptation. Too often, they have discouraged tactical-level assessment and adaptation.

Metrics developed were input measures that did not provide real indications of success. The result of an inability to assess and adapt, or an inability to find and evaluate the right metrics, has been that the cost to the "winner" was much higher than needed, especially in terms of lives. An analysis of the historical parameters of effects-based operations concluded in the not-so-blinding realization that Clausewitz was right: *action and outcome have a complex relationship that is not linear.* There is not necessarily "an equal and opposite reaction to every action"; some actions have effects that are insignificant, and others have effects that expand and cascade well beyond what one might expect. In all human conflict, chance is a major factor. Unexpected effects often are as significant as intended effects, and often are more difficult to observe and understand. Unexpected effects can open "windows of opportunity" for either the United States or its adversary, and thus signal potential either for significant gain or impending catastrophe.

The challenge is to recognize that the window of opportunity is open, and adapt actions to take advantage.[32] *The bottom line: Without timely assessment and a willingness to adapt from original rules and assumptions, operations remain belief based.*

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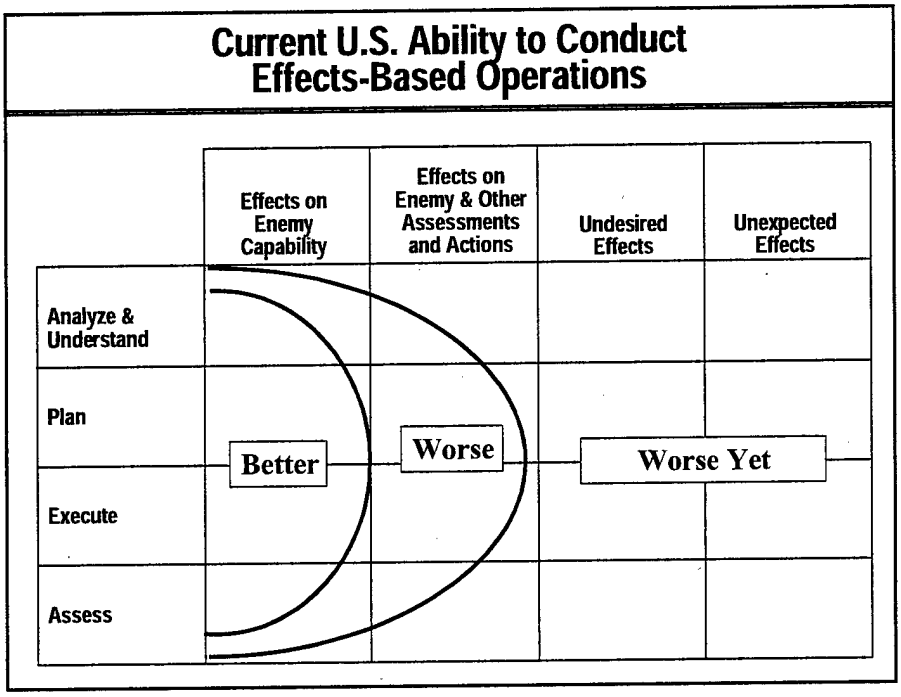
[32] The whole principle on which the German approach to leadership rested was a belief that officers must take advantage of evolving tactical situations without reference to their superiors.



Given this historical analysis of effects-based operations, and what was concluded about effects-based thinking, the next task was to examine how well US joint forces currently conduct effects-based operations. This slide roughly sketches a simplified impression of what is a multi-dimensional problem—US forces' current capability to conduct military-related effects-based operations. The chart arrays each facet in the cycle of effects-based thinking (analyze and understand, plan, execute, and assess) against four kinds of effects (effects on enemy capability, effects on enemy actions, undesired effects, and unexpected effects).

While US forces have superb capabilities for finding and attacking many types of an enemy's military capabilities and their supporting physical infrastructure, there are many physical targets that are still difficult to destroy or neutralize (e.g., mobile, hard and deeply buried targets and mobile missiles). US forces are better at planning and executing than analyzing and understanding effects over time and effects on other than immediate military targets. More disturbing, they are not as proficient at understanding enemy assessments, at analyzing and understanding effects over time, or assessing the effects.

The US military needs much work with regards to considering, anticipating, and adapting to unexpected and undesired effects. US forces are better at planning and executing destruction- and attrition-based missions than anticipating the undesired effects (especially post-war recovery problems and social impact) caused by that destruction. US forces place a great deal of reliance on reliable and predictable technology and precision, but when the unexpected occurs, the military culture is sometimes mentally incapable of adapting.

What Might Be Possible With Effects-Based Operations?

- **Mission accomplishment at lower cost in lives (theirs & ours)**
- **Campaigns with greater coherence across the tactical, operational, and strategic levels**
- **Lesser likelihood of catastrophic surprise or miscalculation**
- **Clear message of U.S. flexibility to potential adversaries**

Effects-based thinking in planning, conducting, and assessing operations holds great potential for future military campaigns. Yet even the best execution of effects-based operations will not yield peace in our time, allow bloodless conflicts, or guarantee quick and easy wars. Nevertheless, effects-based thinking might lead to quicker, less costly mission accomplishment, at a lower cost in American, allied, adversary, and other lives. Planning and operating in an effects-based fashion should result in campaigns with greater coherence and clear linkage between strategic goals, operational effects, and tactical actions.

Through early recognition of and agility to adapt to unexpected effects, effects-based thinking holds the potential of lessening the possibility of catastrophic surprise or miscalculation. Effects-based thinking—and planning and executing effects-based operations—sends a clear message to potential adversaries: US joint forces are agile, adaptive, and willing to change plans and actions to ensure that they adapt to battlefield conditions and contribute to desired outcomes.

Why Are Effects-Based Operations Worth Doing?

- **Could you tell the difference after the campaign?**
  - If no, then what's the use?
- **A look back at an effects-based campaign should reveal**
  - Clear linkage between actions, effects, desired strategic outcome
    - Clear communication and understanding of the connections between military and political leaders
    - Integration of elements of national power
  - Continuous adaptation at the operational level

If effects-based operations are significantly different from other operations, and are worth doing, then the difference between an effects-based campaign and any other should be obvious. If an observer cannot see such a difference, little benefit is to be gained in pursuing effects-based operations.

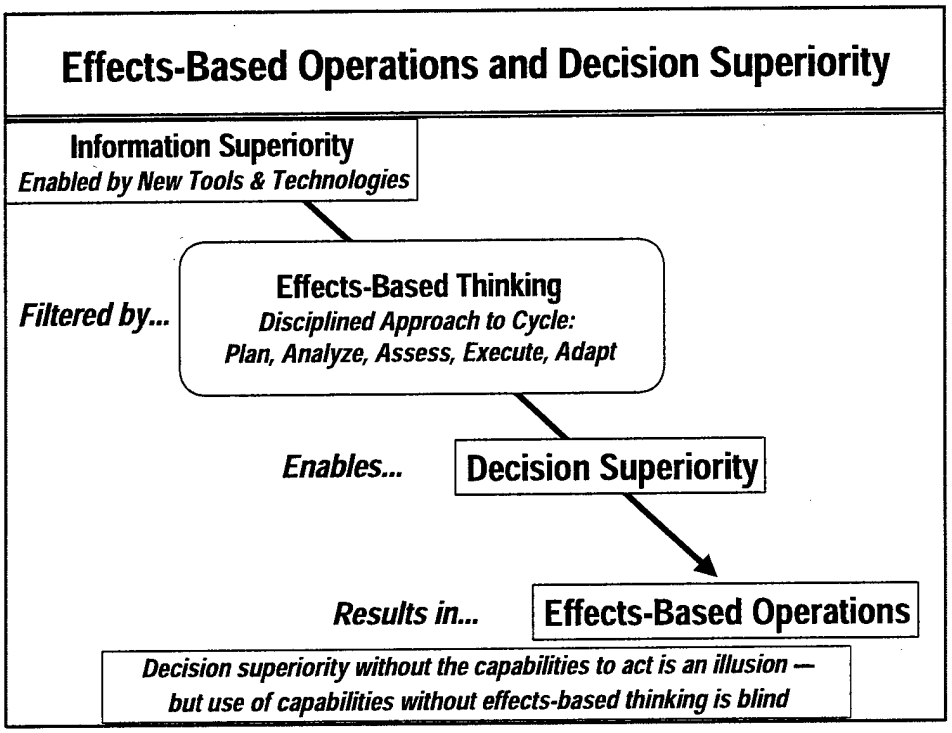
An historical analysis of an effects-based campaign should reveal several characteristics. First is a clear linkage between actions, effects, and desired strategic outcomes. This should be apparent through clear understanding between military and political leaders and the integration of various elements of national power. The example presented earlier about the Gulf War is the opposite of what we should expect to observe about linkages. A joint force commander who remains uncertain about the desired outcome of US victory hours before surrender negotiations, with little guidance from political leadership, is not executing the military element of a national level effects-based operation.

The analysis should also reveal continuous adaptation at the operational level. One of the best examples is the performance of the German army in its 1940 invasion of France. The Germans planned for maximum flexibility.[33] They knew that they faced great uncertainty about many critical problems—where the French reserves were, whether the French would defend the Ardennes, where and when the breakthrough would occur, for example. The Germans planned to adapt to actual conditions encountered as the operation unfolded.

Linkage between actions, effects, and strategic outcomes, and continuous adaptation at the operational level, should be

[33] For an examination of how the Germans approached the French campaign, see Murray and Millett, *A War To Be Won*, pp. 58–62, 66–71. For the most complete examination of the 1940 campaign, see Karl-Heinz Frieser, *Blitzkrieg-Legende: Der Westfeldzug 1940* (München: R. Oldenbourg Verlag, 1995).

clear in both historical and future effects-based operations. The briefing will next examine the new context for military operations that will make thinking and operating effects based more critical for US forces in the future.



Many of the new tools and capabilities previously discussed involve information gathering, processing, modeling, understanding, and usage. *Joint Vision 2020* posits information superiority, "...the capability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary's ability to do the same," as a key enabler of Full Spectrum Dominance.[34] *Joint Vision 2020* further introduced the concept of decision superiority:

> Information superiority provides the joint force a competitive advantage only when it is effectively translated into superior knowledge and decisions. The joint force must be able to take advantage of superior information converted to superior knowledge to achieve "decision superiority"—better decisions arrived at and implemented faster than an opponent can react, or in a noncombat situation, at a tempo that allows the force to shape the situation or react to changes and accomplish its mission. Decision superiority does not automatically result from information superiority. Organizational and doctrinal adaptation, relevant training and experience, and the proper command and control mechanisms and tools are equally necessary.[35]

How can the joint force commander and staff process and filter the masses of data into information that enables timely, effective decision-making? What are the organizational and doctrinal adaptations

[34] Chairman, Joint Chiefs of Staff, *Joint Vision 2020*, (Washington, DC: US Government Printing Office, 2000), p. 8.

[35] *Joint Vision 2020*, p. 10–11

and relevant training and experience mentioned in *Joint Vision 2020* that will enable the commander to transform information superiority into decision superiority?

Effects-based thinking is the filter and linkage between information superiority and decision superiority. Developing joint force headquarters staff processes and organizations to operate effects based and training commanders and staffs to think effects based are the organizational, doctrinal, and training adaptations proposed in Joint Vision 2020. The joint force commander and staff should use effects-based thinking to determine what type of information to gather. The joint force commander and staff should be educated and trained to think and operate effects based—constantly assessing and adapting. Effects-based thinking must be the way to think about, analyze, understand, and use the information gathered with new tools and technologies. The results would be filtered, timely, decision-quality information—the advantage Joint Vision 2020 calls "decision superiority."

How Can Effects-Based Operations Become Useful To The Future Joint Force Commander?

- **How should a joint force commander organize, staff, and operate his headquarters for effects-based operations?**
  - How to depict the enemy as a complex, adaptive system of systems?
  - How to fuse and deliver decision-quality information?
  - What information is needed for planning, analysis, assessment?
  - What kind of people, with what kind of education and training, are best at thinking effects based?
  - How best to use emerging capabilities to think and operate effects based?
  - How best to organize the joint force headquarters for effects-based operations?
- **Effects-based operations experimentation should focus on how to operate, organize, and staff the joint force headquarters**

Can these theories about effects-based operations be useful to the future joint force commander? Any theoretical work is of little use if there is no practical application in future conflict. Several questions narrow the focus and better elucidate the potential applications of effects-based thinking. The briefing will next examine these questions, and a possible experimental campaign that could begin to explore the issues. The briefing will look more closely at one critical application—how to measure success, failure, or progress of effects-based operations.

The questions addressed would be assured if the larger question of how a joint force commander should organize, staff, and operate his headquarters for effects-based operations.

- How to fuse and deliver decision-quality information to the joint force commander?
  - What is the required knowledge set?
  - What information is needed?
  - What decision support and modeling tools are needed?
- What information is needed for planning, analysis, and assessment?
  - What observables, or metrics, are needed to determine progress, success, or failure in operating effects based?
- What kind of people, with what kind of education and training, are best at thinking effects based?
  - What are the implications, and requirements, for leader and staff development?
- How best to use emerging capabilities to think and operate effects based?
- How best to organize the joint force headquarters for effects-based operations?
  - What processes and organization will best enable the com-

mander and staff to think and operate effects based?

A critical question that goes beyond the scope of the organization of joint force headquarters is:

- How to depict the enemy as a complex, adaptive system of systems?
  - What modeling and simulation could assist in this task?
  - Could "warfare analysis centers" broaden from their present focus on physical systems into other domains, such as information, social, economic, and political networks?
  - How could these centers adapt as the enemy adapts? As the enemy adapts, how can the joint force commander and staff reach back for new information, and adapt in turn?

Clearly, these questions are not all-inclusive, but they provide an excellent starting point and frame of reference.

Potential Experimental Campaign

- **Develop theory and foundation for effects-based operations — done and to "experimentation quality"**
- **Develop concepts for doing effects-based operations**
  - Develop a process for an effects-based approach in joint force headquarters
    - How does the joint force headquarters plan, execute, analyze, assess effects based?
  - Develop organization concepts for effects-based operations in joint force headquarters
    - What organization structures would support the concept for effects-based operations?
    - What staff would support the concept for effects-based operations?
- **Refine concepts through experimentation**
  - Seminars and wargames with former and current CINCs
  - Get others to use concepts for effects-based process and organization in experiments on operational concepts
- **Implement — make concepts useful to joint force commanders**

An experimental campaign to look at effects-based operations could proceed in the following steps:

- Develop the theory and intellectual foundation for effects-based operations. That task is completed—to "experimentation quality."[36]
- Develop concepts for doing effects-based operations.
- Refine the concepts through iterative experimentation.[37]
- Implement the concepts.

The steps should be iterative—experimenters should take the results of each step and revisit previous steps to strengthen and refine concepts and theory.

[36] "Experimentation quality" is of sufficient precision, depth, and clarity to begin joint experimentation activities. The next step is to develop a concept of "implementation quality"—of sufficient precision, depth, and clarity to implement as doctrine in operational military forces.

[37] Joint Forces Command's recently completed Unified Vision 01 has begun this process. Particularly interesting are the concept of Operational Net Assessment and the development of an Effects Based Tasking Order template.

How to Understand Success, Failure, or Progress in Effects-Based Operations

- **Metrics or measures of effects-based operations could provide**
  - Tool for joint force commander and staff to conduct continuous campaign-level assessment and thus adaptation
  - Clearer understanding of why EBO are different, more effective, more efficient
- **What should metrics for effects-based operations measure?**
  - Context
  - Process
  - Outcome
- **Must also address unexpected and undesired effects**
- **No easy template — metrics will be situation dependent**
- **Goal should be to develop options that are both executable and observable**

It is interesting to contemplate how to actually think in an effects-based fashion and how to conduct effects-based operations in the real world. A further step in understanding how to conduct real effects-based operations is to develop metrics. If US planners can understand the measures for success and failure, perhaps they can reach a closer understanding of how to achieve success.

In considering metrics for effects-based operations, the team asked two questions:

- What should be measured?
- Whom should the metrics support?

The answer to the second question intuitively seemed to be the joint force commander or his staff (or senior decision-makers in the interagency setting). However, determining *what* to measure was far more complicated. Rather than start with specifics to measure (i.e., a checklist), the team started by considering what type of questions the joint force commander and staff would need to ask; these questions could provide the framework for thinking about metrics.

Three broad areas for inquiry emerge. First, the "context." Here, commanders would consider the larger political, social, diplomatic, and economic context. Some basic questions are as follows:

- What are the desired strategic outcomes that effects are meant to achieve?
- What is the enemy trying to achieve? What strategies might he employ in support of his objectives?
- What changes in the environment could influence the nature and character of the national objectives or the joint force's operations?

The next area considered was "process." Here, commanders would consider how

to measure effectiveness in conducting effects-based operations. The intent is to determine how well the joint force is doing at the cycle of analysis and understanding, assessment, planning, execution, adaptation. Some questions the joint force commander and his staff might ask are:

- What indicators are important to assessing the effectiveness of the joint force?
- Are the pre-war assumptions valid?
- If the pre-war assumptions are invalid, has the joint force adapted to meet the existing reality?

The final area considered was "outcome." Here, commanders would consider whether the effects are leading to the desired outcome. Some of the questions might be as follow:

- What reasons does the joint force have to believe its operations are being effective?
- What other factors could produce the outcomes that are being witnessed?
- How might the joint force adapt its operations to make them more effective?

It is important to keep in mind that being able to observe the desired outcome is the ultimate goal of metrics. This requires commanders and their staffs to think beyond Blue inputs and focus on the effect that the output of their actions is having on Red. To do this, commanders and their staff must also think from the enemy's perspective and within the enemy's context. It certainly would be useful to fully understand the metrics the enemy is using. What does the enemy consider a measure of success or failure? This level of knowledge will require understanding the enemy as a complex, adaptive system of systems in all domains, not just the military or physical.

What Effects-Based Operations Metrics Are *Not*

- **Kill ratios**
- **Body counts**
- **Weapons counts**
- **Territory seized**
- **Vehicles destroyed**
- **Numbers of POWs captured**
- **Distances advanced**
- **Sortie rates**
- **Tons of ordnance delivered**

As noted in the beginning of this brief, the J-7 asked the JAWP to develop a set of metrics for effects-based operations. This is a remarkably challenging task because it demands that the effects-based decision-makers move away from metrics that they may have been familiar and comfortable with in the past. Metrics for effects-based operations are not yet clearly defined, nor are these metrics clearly understood. In past conflicts, staffs and planners used measures such as kill ratios, body counts, weapons counts, territory seized, distances advanced, sortie rates, tons of ordnance delivered, and vehicles destroyed to gauge success or failure. They chose such metrics because they were clear to see and appeared easy to measure—not because they actually measured the success or failure of effects.

Each of these measures shares common features. None measures or describes or illuminates the linkage between actions and strategic outcomes. Each is perceived as important to US forces, but is not necessarily important to an enemy. Each concerns measures of military operations, and does not address other facets of national power (either the United States' or the enemy's).

Most of these metrics are quantitative and measure physical processes, the destruction of physical things, or the alterations of physical processes. None are qualitative or describe human processes. If effects-based operations are concerned with changing human decisions and behavior, metrics for effects-based operations must address human interactions. *In summary, what is easy to measure is probably not appropriate, while what is appropriate is not easy to measure.*

Potential DOTMLPF Implications

- **New tactics, techniques, and procedures for campaign-level assessment**
- **Possible next step to new operational-level joint doctrine**
- **Intelligence, surveillance, and reconnaissance capabilities and organizational integration**
- **Training of joint force commanders and staffs**
- **Planning, assessment, and analysis tools and simulations**
- **Professional military education — leader development**
- **Culture that encourages adaptation and agility**

It important to consider also the potential effects on doctrine, organization, training, materiel, leadership, personnel, and facilities (DOTMLPF). Similar to the examination of metrics, this analysis is preliminary and much additional work remains to be done.

Most profoundly, effects-based operations are the result of a different way to think about war and strategy. Effects-based operations would require a new operational-level joint doctrine. Assessment at the campaign level would be a foundation of effects-based operations, and would drive a new way of thinking about the organization and integration of ISR systems. Effects-based operations will benefit from and generate materiel changes, but more significant are the changes in how to think about war and strategy, which will necessitate significant changes in leader training, doctrine, and education.[38] Effects-based operations must also rest on an organizational and leadership culture that demands agility in decision-making and willingness to adapt rules, assumptions, and plans dynamically. Technological change makes effects-based operations possible to conduct as never before. However, military organizations do not need to wait for technological change before moving towards effects-based thinking. This can be done by developing supporting joint doctrine and establishing the requisite leader development and education program.

[38] This means systemic cultural changes in the way the Services prepare for, think about, and conduct war. Such changes have always been difficult to do in the past, and they will be difficult to instill in the current US military. But that is no reason not to try, because the rewards for success in cultural change can be substantial.

Effects-Based Operations Summary

- **EBO attempt an explicit and comprehensive linking — from planning through execution to assessment — of actions (military and other) to strategic ends in a campaign**
- **Effects can be direct, indirect, unintended, undesirable, unexpected**
- **Must account for fog, friction, ambiguity, uncertainty, and adaptive adversaries**
- **Involves a disciplined decision process, and a willingness to adapt assumptions, rules, and decision to new information**
- **Without feedback, assessment, and adaptation, operations remain rules or assumption based or become belief based**
- **More work remains to make the concepts of effects-based thinking and effects-based operations useful to current and future joint force commanders and staffs**

Emerging capabilities should allow the more effective development and execution of an effects-based campaign

This annotated briefing has provided new perspectives on effects-based operations and will contribute to the debate on the topic. Four basic questions were addressed:

- What are effects-based operations?
- Why are they so difficult?
- Why are they worth doing?
- How can effects-based operations be made useful to the joint force commander?

There is real substance and significant potential benefit in thinking and operating effects based. Some commanders have successfully operated and thought effects based, but it has been unusual. The goal is to make what has been rare more normal—for every joint force commander and staff to think and plan effects based in peace and war. Much work remains—to explore processes, organizations, tools, and capabilities, to enable joint force commanders and staffs to understand and conduct effects-based operations.

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Acronyms and Abbreviations

C2	command, control, and communications
C3	command, control, communications, and computers
CINC	commander in chief
DOTMLPF	doctrine, organization, training, materiel, leadership, personnel, and facilities
EBO	effects-based operations
IDA	Institute for Defense Analyses
ISR	intelligence, surveillance, and reconnaissance
J-7	Operational Plans and Interoperability Directorate, Joint Staff
JAWP	Joint Advanced Warfighting Program
KTO	Kuwait Theater of Operations
LGB	laser-guided bomb
OODA	observation, orientation, decision, and action
SOC	sector operating center
US	United States

Notes

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13. ABSTRACT (Maximum 200 words)

This annotated briefing represents the JAWP thinking on metrics for effects-based operations to date, focusing on effects-based operations and the military instrument of national power (in the form of a joint force). The team addressed four basic questions: What are effects-based operations? Why are they so difficult? Why are they worth doing? What comes next? The JAWP Team leveraged current effects-based operations work from a number of organizations, but to highlight the critical elements of successful effects-based campaigns, the team members turned to history. They examined historical case studies from ancient to modern warfare across the spectrum of operations. That work resulted in several expanded ideas. More than just linking planned actions to strategic outcomes, there must be an operational assessment and feedback mechanism. Adversaries must be viewed as complex, adaptive systems of systems in dimensions beyond just the physical. Staffs must provide their commander's courses of actions that are not only executable, but also where the intended effects are observable. The emerging notion of information superiority is powerful, but decision superiority is of crucial importance. Only an effects-based approach will allow a commander to progress from information to decision superiority. Much work remains—and the JAWP team is continuing to work to explore processes, organizations, tools, and capabilities to enable joint force commanders and staffs to understand and conduct effects-based operations.

14. SUBJECT TERMS Effects-based operations, metrics, joint forces, joint force commanders, US Civil War, U.S. Grant, World War II, air campaign, Eighth Air Force, Gulf War, doctrine, organization, training, material, leadership, personnel, and facilities (DOTLMPF).	15. NO. OF PAGES 72 16. PRICE CODE

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