

**More Than Just Plan, Prepare, Execute, and  
Assess: Enhancing the Operations Process by  
Integrating the Design and Effects-Based  
Approaches**

**A Monograph**

**by**

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## **Abstract**

More Than Just Plan, Prepare, Execute, and Assess: Enhancing the Operations Process by Integrating the Design and Effects-Based Approaches by Major Bill A. Papanastasiou, United States Army, 69 pages.

With the end of the Cold War and the collapse of the Soviet Union in 1989, the grip of superpower strictures loosened resulting in an increase in complexity and dynamism that marks today's security environment. The rapidly changing and uncertain environmental and strategic realities of the past fifteen years have compelled U.S. operational and strategic leaders to review their understanding of operational art, find extant operational voids, and fill them with new or renewed conceptual approaches.

The aim of this monograph is to conduct an evaluation of the two most predominant experimental theoretical constructs - Effects-Based Approach to Operations (EBAO) and Design - and confront the challenge of integrating practical elements of the two constructs into the cyclic operations process: plan, prepare, execute, and assess. This research finds the two alternative conceptual approaches to operational thought - EBAO and Design - as having considerable irreconcilable differences. Whereas EBAO applies a systems perspective to develop solutions through center of gravity and nodal link analyses, Design focuses on deriving a deeper systemic understanding through heuristic thinking and learning.

In practice, overly reductive and algorithmic additions to the original EBAO concept, such as System of Systems Analysis (SOSA) and Operational Net Assessment (ONA), discredited EBAO in the eyes of numerous U.S. Military senior leaders. Having fallen short on meeting its promise of predictivity, EBAO must return to its original principles to retain any relevancy in today's complex operational environment. Nevertheless, integration is possible considering the similarities in methodological techniques. Of the two approaches Design is the superior approach while operating in complex environments. Complimented by select EBAO elements and offering a broader holistic thinking and learning methodology, Design significantly enhances the commander-driven activities of the operations process. This paper suggests a recommended change to the operations process construct to improve operational praxis.

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## INTRODUCTION

On 14 August 2008, the United States Joint Forces Command (USJFCOM) commander, General James N. Mattis, released a memorandum to the JFCOM staff delineating his indicting assessment of effects-based approach to operations (EBAO). He directs that “USJFCOM will no longer use, sponsor, or export the terms and concepts related to EBO [effects-based operations], ONA [operational net assessment], and SOSA [system-of-systems analysis] in our training, doctrine development, and support of JPME [joint professional military education].”<sup>1</sup> General Mattis argues that during the past seven years U.S. military thought and doctrine were detrimentally influenced by concepts “unproven by history, experimentation, and current operations.” Formed by personal experience and observations of others’ various operational experiences, General Mattis’ assessment of effects-based operations (EBO) reflects his belief that the concepts related to the EBAO approach to operational thinking have generated considerable confusion and inefficiencies in joint planning processes.<sup>2</sup> To convey how deeply concerned he is about the matter, General Mattis concludes his memorandum with the stark reminder of the cost of misapplied concepts in practice is measurable in lives lost and missions failed.

A later section will reveal, there are many advocates in various quarters throughout the military community, primarily the U.S. Army and Marine Corps, who share and support General Mattis’ thoughts and actions. Many of these advocates lean in the direction of another emerging concept - Design. Just as there are plentiful advocates for removing EBO language and concepts from the military lexicon and thinking, there are numerous others who oppose General Mattis’ position. These advocates are primarily from the U.S. Air Force community, the source of the original EBAO concept, and do not wish to see the loss of what they believe to be real progress in

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<sup>1</sup> General James N. Mattis, USMC, “USJFCOM Commander’s Guidance for Effects-based Operations,” *Joint Force Quarterly 51* (4th Quarter, 2008): 108.

<sup>2</sup> Ibid.

operational warfighting since Operation Desert Storm in 1991. Their fears lay in General Mattis' position with respect to Joint Doctrine development.

Though the USJFCOM Commander neither possesses the authority to direct service-specific doctrine development nor has the outright authority to change Joint doctrine, he does have considerable influence on the direction of the latter's publication. The Joint Staff maintains the proclivity for the Joint doctrine process and, thus, controls the staffing of its development and revision. Nevertheless, final publication of Joint doctrine results from a conciliar effort among the Services, Joint Staff, and combatant commands.<sup>3</sup> Therefore, the stage is set for significant professional intellectual discourse over an essential aspect of U.S. operational conceptualization. Undeniably, if there is one beneficial outcome of releasing the FORSCOM Commander's memorandum it is to serve as a catalyst for transformative professional discourse. Sadly, the professional discourse required to share these emerging ideas appears hindered by a lack of mutual comprehension. Advocates of each side of the debate may not fully understand the concepts of the other. Clarification is in order.

## **Purpose**

This monograph sets out to fully understand the epistemology of the two primary poles in the debate and then confront the challenge of how to synthesize the various ideas and concepts into the current operational process with the aim of enhancing the operational art. What follows is an examination of the Effects-Based Approach to Operations (EBAO) / Design debate, but as part of the larger intellectual discourse regarding the state of affairs of U.S. operational art within the context of the contemporary operational environment.<sup>4</sup>

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<sup>3</sup> "Joint Doctrine Development: Joint Doctrine Process," Joint Electronic Library, [http://www.dtic.mil/doctrine/joint\\_doctrine\\_development.htm](http://www.dtic.mil/doctrine/joint_doctrine_development.htm) (accessed January 16, 2009).

<sup>4</sup> Initially the research will examine Systemic Operational Design (SOD) - the foundation for subsequent evolutions of the Design approach - and then introduce the latest U.S. Army conceptualization.

The aim of this monograph is to conduct an evaluation of the two most predominate experimental theoretical constructs - EBAO and Design - and confront the challenge of integrating valuable elements of the constructs into the cyclic operations process: plan, prepare, and execute, while assessing throughout. If integration is possible then this paper will suggest a recommended change to the construct of the operations process. The primary question driving this study is how can either or both the EBAO and Design concepts enhance the operations process, thereby improving operational praxis in complex adaptive environments? Presumably, such a study may settle the long-standing debate over the utility of one concept at the expense of the other. Fully understanding both conceptual approaches may provide a far greater range of options for the operational artist. Subsequent relevant questions include:

- What is the nature and character of the contemporary strategic environment?
- What is the nature and character of the threats facing the United States?
- What is the epistemology of each competing theoretical construct?
- What are the theoretical underpinnings of each construct?
- How do the constructs address the nature and character of the contemporary strategic and the array of threats that operate within them?
- What processes, methodologies, or models do the constructs offer as practical approaches to enabling the operational art practitioner?
- What are the similarities among the constructs that point to compatibility with one another and the differences suggesting tension? Are the latter reconcilable or can they co-exist regardless of those differences?

## **Structure**

In an attempt to address the perceived gap in operational thought, a number of sides have joined the debate in the last decade. Some sides with contending ideas and concepts espoused in



EBAO and Design posit that one or the other approach will best serve the advancement of the operational art. Others believe that U.S. military thought has been on the decline for over a decade and, thus, argue for a return to time-honored and tested operational concepts founded on past notable military thinkers such as Carl von Clausewitz and B.H. Liddell Hart and strategic thinkers such as Colin S. Gray. Yet others approach the matter much more objectively and see the enormous value in retaining the best aspects of all concepts presently available. The challenge for those in the latter category is how to integrate seemingly disparate ideas into a contextually smooth, easily understood, and widely practical approach to operational thinking.

Categorically, the structure of the debate lends itself to study by way of a dialectical approach.<sup>5</sup> As the following examination will reveal the varying concepts have considerable similarities and compatibilities. Following a close study of the two main concepts, the research will conclude with a proposal on a way to integrate the ideas and methodologies of the alternative approaches into the current U.S. Army operations process. Before clarifying the EBAO and Design positions, it is necessary to briefly examine two influential aspects of the debate - the contemporary strategic context of the security and operational environment, and the adversarial challenges operating within that context. These contextual realities have driven the need to transform our operational thinking and, thus, are essential to understanding the current debate.

## **THE STRATEGIC CONTEXT**

The strategic security or operational environment<sup>6</sup> consists of the overall composite setting composed of the conditions, circumstances, and influences which affect the employment

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<sup>5</sup> Heinrich Moritz Chalybaus, *Historical Development of Speculative Philosophy: From Kant to Hegel*, trans. Alfred Edersheim, (London: Adams & Company, 1854), 61.

<sup>6</sup> The national level of government refers to the environment in the terms *strategic security*, and the military at the Joint and Service levels refer to the environment as *operational*.

of the nation's instruments of national power.<sup>7</sup> Temporally, the setting's period includes the projected nature of the environment ten to fifteen years into the future. As an illustration of one essential enduring aspect of this nature, a passage from Carl von Clausewitz' Two Letters on Strategy emphasizes the crucial role the political dimension has in war.

In response to a friend who submitted to him a strategic problem for comment, Clausewitz replied, "how is it possible to plan a campaign, whether for one theater of war or several, without indicating the political condition of the belligerents, and the politics of their relationship to each other." What followed was the oft-quoted maxim that for most simply describes the function of war but for a few others describes the inherent ambiguity and complexity of problems in the operational environment. He continued by saying, "War is not an independent phenomenon, but the continuation of politics by different means... According to this point of view, there can be no question of a purely military evaluation of a great strategic issue, nor of a purely military scheme to solve it."<sup>8</sup>

Arguably, Clausewitz' response nearly two centuries ago is as valid today as it was then. However, without accounting for the role of the political dimension in conflict, the current debate over the best approach to exercising operational art is moot, for operational art seeks to develop 'ways' to employ tactical 'means' to achieve strategic (political) 'ends'. Clausewitz understood well the primacy and complexity of political intricacies regarding diplomacy and governance in times of conflict. Modern warfare's most enduring characteristic is that it remains a violent clash among

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<sup>7</sup> U.S. Department of Defense, Joint Publication 3-0 (JP 3-0), *Joint Operations Incorporating Change 1*, (Washington DC: Department of Defense, 17 September 2006 and 13 February 2008), GL-22; U.S. Department of Defense, Joint Publication 1-02 (JP 1-02), *Department of Defense Dictionary of Military and Associated Terms* (Washington DC: Department of Defense, 12 April 2001, as amended through 17 October 2008).

<sup>8</sup> U.S. Army Command and General Staff College, Combat Studies Institute Reprint, *Carl von Clausewitz: Two Letters on Strategy*, edited and translated by Peter Paret and Daniel Moran, (Fort Leavenworth, KS, 1984), 21-22.

organized groups using armed force, each seeking to mobilize the support of a population to attain political goals or 'ends'.<sup>9</sup>

Most often, conflicts take place along demographic 'fault lines'.<sup>10</sup> In essence, warfare represents a clash between societies, religions, cultures, and identities.<sup>11</sup> These categorizations consist of innumerable human interactions and, thus, are natural systems. Such systems exhibit qualities of non-linearity, instability, disequilibrium, and uncertainty, all of which are key components of evolutionary processes of social systems behavior.<sup>12</sup> In a globalized environment, localized social systems form myriad of ever-larger and more complex interrelated, interactive, and interdependent systems which change at unprecedented rates. Such complex systems exhibit adaptive, dynamic, emergent, and self-organizing qualities. They will resist efforts to predict the outcomes and impacts resulting from external interventions. Thus, the sure promise in both contemporary and future situations is a condition imbued with ambiguity and uncertainty.

Interestingly, military officials and other think-tank experts consider contemporary times to be part of a new 'era' of persistent conflict, as if to suppose that prior to this 'era' the world had not been witnessing continuous conflict somewhere in the world.<sup>13</sup> History, on the other hand, reveals a unique continuity of violence in human nature. Conflict in human history may very well

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<sup>9</sup> JP 3-0, I-6; Rupert Smith, *The Utility of Force: The Art of War in the Modern World*, (London: Penguin Books Ltd, 2005), 17-18.

<sup>10</sup> Samuel P. Huntington, *The Clash of Civilizations and the Remaking of World Order*, (New York: Simon & Schuster Paperbacks, 1996), 207-8.

<sup>11</sup> *Ibid.*, 21; U.S. Army TRADOC Pamphlet 525-5-500, *Commander's Appreciation and Campaign Design*. (Fort Monroe, Virginia: Training and Doctrine Command, 2008), 7.

<sup>12</sup> L. Douglas Kiel and Euel Elliott, *Chaos Theory in the Social Science: Foundations and Applications*, (Ann Arbor, MI: University of Michigan Press, 1997), 2-3.

<sup>13</sup> George W. Casey, Chief of Staff, United States Army, "Persistent Conflict: The New Strategic Environment," an address given to the Los Angeles World Affairs Council on September 27, 2007, <http://www.lawac.org/speech/2007-08/CASEY,Gen.George2007.pdf> (accessed January 19, 2009); Sheryl J. Brown and Kimber M. Schraub, *Resolving Third World Conflict: Challenges for a New Era*, (Washington DC: United States Institute of Peace Press Books, 1992); U.S. Department of Defense, *Quadrennial Defense Review Report*, (Washington, DC, 6 February 2006).

be the norm and times of peace the anomaly. What is different today is the set of trends marking the changing nature of threats.<sup>14</sup>

Current trends such as expanding globalization and rapid technology advancement have the potential to enhance quality of life the world round. However, the increased wealth and prosperity brought on by globalization and a growing economic interdependence tends to remain consolidated among a few while the many remain subject to serious risk during economic troubles or failures.<sup>15</sup> The bifurcation in wealth distribution may lead to conflict, particularly intrastate violence.<sup>16</sup> Likewise, technology has dual consequences. While enabling states and their societies to enjoy access to material goods and services, technology may also become a tool utilized by adversaries for destructive purposes.<sup>17</sup>

Other global trends such as nationalism, unresolved ethnic and cultural conflicts, urbanization, border demarcation disputes, massive demographic changes, resource shortages, climate changes and natural disasters present enormous challenges worldwide. In particular, less prosperous nations and those with weak political and social institutions risk becoming unstable, failing and descending into chaos under the strain of these trends.<sup>18</sup> The uncertainty of these trends becomes more acute when accounting for the unparalleled scale and speed of change throughout the world and the unpredictable interactions among the trends.<sup>19</sup> Regions of instability will invariably witness a spiraling plunge into lawless violence. Lasting and successful solutions

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<sup>14</sup> See Appendix 1 for a detailed description of the array of contemporary threats confronting today's strategic and operational leaders.

<sup>15</sup> Brown and Schraub, 1.

<sup>16</sup> Ralph Peters, "The Culture of Future Conflict," *Parameters* (Winter, 1995-96): 18-27.

<sup>17</sup> U.S. Department of the Army, Field Manual 3-0 (FM 3-0), *Operations*, (Washington, DC: Headquarters, Department of the Army, February 2008), 1-2; Joint Chiefs of Staff, *The National Military Strategy of the United States of America 2004*, (Washington, DC, 2004), 6.

<sup>18</sup> FM 3-0, 1-2 to 1-3; U.S. Department of the Army, Field Manual 3-07, *Stability Operations and Support Operations*, (Washington DC: Headquarters, Department of the Army, February 2003), 1-8 to 1-10; Brown and Schraub, 16-20.

<sup>19</sup> U.S. Department of Defense, *National Defense Strategy*, (Washington, DC, June 2008), 4-5.

to these problems will require an abundance of patience, perseverance, will, and the artful employment of all instruments of national power or, rather, a whole-of-government approach.

## **EFFECTS-BASED APPROACH TO OPERATIONS: PREDICTIVITY METHODOLOGY**

In August 1990 United States Central Command Joint Force Air Component Command air planners began developing what has become known as the most successful air campaign in airpower history.<sup>20</sup> Enabled by advances in technology, which included highly precise weapons platforms and ordnance, access to targets through stealth, and the unprecedented ability to share and disseminate information, air planners sought to construct an air campaign to rapidly achieve coalition aims with a relatively low cost in life on both sides. Capitalizing on technological advantages and adaptive attack plans, coalition air power carried out massive simultaneous strikes against the Iraqi integrated air defense system, command, control, communications systems, electrical power generation and transmission systems, weapons of mass destruction facilities and delivery systems, conventional weapons production complexes, Republican Guard formations, transportation network nodes, and more.<sup>21</sup>

What was impressive was that the coalition struck this target array in the first 24 hours. The intent was to rapidly achieve the effects of paralysis in the enemy's capacity to command and control, of neutralizing his capacity to fight, and of undermining his will to resist. Aside from arguments debating the true munitions effectiveness during the 43-day bombing campaign, the air campaign had considerable positive impact in setting the conditions for the final Iraqi defeat.<sup>22</sup>

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<sup>20</sup> Tom Clancy and Chuck Horner, *Every Man a Tiger*, (New York: Putnam, 1999), 564.

<sup>21</sup> David A. Deptula, *Effect Based Operations: Change in the Nature of Warfare*, (Arlington, VA: Aerospace Education Foundation, 2001), 1-2.

<sup>22</sup> U.S. General Accounting Office, "Operation Desert Storm: Evaluation of the Air Campaign," GAO/NSIAD-97-134 (Washington, DC: June 1997), 118-159.

The United States' lop-sided victory during the 1991 Gulf War changed the way militaries around the globe thought of warfare.

## Classical Theoretical Inspiration

The notion that there is an approach to warfare that is economical and risks fewer losses, while exerting greater coercive impact against an adversary, should appeal to both political and military leaders, alike. As revolutionary as this promise may sound, the idea is not novel. Throughout the history of warfare leaders sought to achieve decisive results in the shortest and least expensive way possible. Sun Tzu, nearly 2,400 years ago, stated that "...to win one hundred victories in one hundred battles is not the acme of skill. Your aim must be to take All-under-heaven intact."<sup>23</sup> Adding the temporal factor, he continued by stating that "...those skilled in war subdue the enemy's army without battle. They capture his cities without assaulting them and overthrow his state without protracted operations."<sup>24</sup> The nationalization and industrialization of warfare following the Napoleonic Era made such an endeavor rather difficult, but to some thinkers of the early 20th century such as Giulio Douhet, Billy Mitchell, and Alexander de Seversky, not entirely impossible.<sup>25</sup>

Horrified by the protracted fighting in World War I, Giulio Douhet applied an early form of systems analysis to develop a theoretical approach to defeating an adversary through airpower. Ruling out the need for land combat, Douhet envisioned targeting, albeit massive destruction of, key centers of moral and physical power by air bombardment.<sup>26</sup> Such action promised the net

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<sup>23</sup> Sun Tzu, *The Art of War*, trans. Samuel B. Griffith, (New York: Oxford University Press, 1971), 77. The understanding when referencing all quotes from this text is that it is assumed to be a compilation of military thought from many authors over many generations.

<sup>24</sup> Ibid.

<sup>25</sup> John Buckley, *Air Power in the Age of Total War*, (Bloomington, IN: Indiana University Press, 1999) 3-4.

<sup>26</sup> Giulio Douhet, *The Command of the Air*, trans. Dino Ferrari, (Washington, DC: Office of Air Force History, 1983), 11-21.

effect of the physical and logistical isolation of the enemy's armies and the moral collapse of its populace and government. Though not quite as Sun Tzu idealized, a comprehensive air campaign of selective destruction would preclude the need to repeat the costly and prolonged land combat of earlier modern industrial wars. Douhet envisioned warfare that no longer required the destruction of the enemy state's military power in direct combat in order to bring about defeat. Though in practice, as history from World War II through the Vietnam War reveals, the theory proved inaccurate, particularly, with regards to affecting the intangible characteristics of human behavior - will, morale, and passion.<sup>27</sup>

### **Expansion of the Systems Perspective**

With its widespread introduction in the late 1960's, General Systems Theory (GST), founded by Ludwig von Bertalanffy, now forms the theoretical basis for today's EBAO. GST defines a system "...as a complex of interacting components, concepts, characteristic of organized wholes such as interaction, sum, mechanization, centralization, competition, finality...and to apply them to concrete phenomena."<sup>28</sup> As warfare is uniquely a complex human activity, recent military thinkers turned to a systems perspective in order to better understand its interactive complexity. Bertalanffy realized that the classical sciences were incapable of explaining biological, behavioral, and social phenomenon. The reductionist approach was insufficient to explain the observed realities of these phenomena.<sup>29</sup> Biological entities possessing characteristics such as wholeness, growth, dominance, control, competition, and hierarchical order tended to point toward organization. This notion ran counter to the classical mechanistic

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<sup>27</sup> Robert A. Pape, *Bombing to Win: Air Power and Coercion in War*, (Ithaca, New York: Cornell University Press, 1996), .314-318.

<sup>28</sup> Ludwig von Bertalanffy, *General Systems Theory: Foundations, Development, Applications*, (New York: George Braziller, 1968), 91.

<sup>29</sup> *Ibid.*, 49.

view of the principle of thermodynamics that indicated a tendency for destruction of order.<sup>30</sup> The new realizations went further to shatter other mechanistic notions in the realms of causality and teleology.

Newtonian mechanics aimed at analyzing physical phenomenon by reducing units ever-smaller and isolating their activity into one-way casual chains. The random play of atoms governed by the laws of causality led to all phenomena. Newtonian theory explained the biological, and by extension behavioral and social, events just the same - products of chance and randomness. Bertalanffy concluded that classical science was insufficient to explain the teleological and directive aspects, which produced adaptive, goal-seeking, and purposive characteristics.<sup>31</sup> What followed was the development of the complementary discipline of cybernetics to explain the flow of information in feedback mechanisms that are at the heart of purposeful teleological behavior of automation, living organisms, and social systems.<sup>32</sup>

Such systems are considered open systems in that they are in a constant state of interaction or exchange of inputs/outputs with the surrounding environment.<sup>33</sup> In contrast, closed systems are largely isolated from surrounding environmental inputs. However, a system may exist self-contained but may cybernetically serve a specific function requiring interaction with the environment under specific conditions.<sup>34</sup> Thus GST, coupled with cybernetics and other complementing theories, formed the theoretical underpinnings of the effort to understand the

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<sup>30</sup> Ibid., 47.

<sup>31</sup> Ibid., 45.

<sup>32</sup> Ibid., 43-44.

<sup>33</sup> Ibid., 141.

<sup>34</sup> As an example, an integrated air defense system is generally a closed system. The system can exist as a self-contained system but its purpose, particularly in an automated mode, is to interact with its environment upon sensing an external threat.



structure, context, and functioning of the operational environment and associated internal systems.<sup>35</sup>

## **Bridging the Gap: Filling the Perceived Void in Operational Art**

The effect-based approach promises to enhance the commander's ability to plan, prepare for, and execute Joint operations in a complex environment against adaptive opponents. Concept writers express the effects-based approach as a way of augmenting a commander's intuition, experience, or judgment. The now defunct<sup>36</sup> Joint document series Commander's Handbook for an Effects-Based Approach to Joint Operations defined EBO as,

"Operations that are planned, executed, assessed, and adapted based on a holistic understanding of the operational environment in order to influence or change system behavior or capabilities using the integrated application of select instruments of power to achieve directed policy aims."<sup>37</sup>

EBAO helps unify actions throughout the operation to attain the desired state through the creation of desired effects. The approach offers more options to commanders in achieving operational and strategic objectives and aims. The broader set of options enable commanders to balance the targeting decisions supporting the immediate requirements of the tactical close fight and the long-term requirements creating operational and strategic effects to bring about the achievement of the

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<sup>35</sup> Other relatively recent theories briefly covered in Bertalanffy's work on GST include information, decision, and game theories. Each of these supports an explanatory need in GST. See Bertalanffy, 90.

<sup>36</sup> Technically, these documents are no longer approved or pre-decisional since the release of General Mattis' memorandum directing the removal of EBO and related terminology and concepts from the lexicon and the practice of Joint operations.

<sup>37</sup> U.S. Joint Forces Command, *Commander's Handbook for an Effects-Based Approach to Joint Operations, Supplement 1*, (Suffolk, VA: Joint Warfighting Center, Joint Concept Development and Experimentation Directorate, 24 February 2006), 1.

desired endstate.<sup>38</sup> Clearly, the effect-based approach intends to provide the operational artist a conceptual tool to improve the unification of efforts across all three perspectives of war - tactics, operational art, and strategy.

## **Organizing Logic of EBAO**

EBAO consists of three processes - planning, execution, and assessment. Within the planning process the Joint Intelligence Preparation of the Operational Environment (JIPOE) constructs a multi-disciplinary and holistic view of the operational environment focused on the tangible elements [nodes] and their interrelationships [links]. This part of the process makes apparent the various systems operating within the operational area. Typically, JIPOE categorizes the construct using the doctrinal operational variables of political, military, economic, social, infrastructure, and information (PMESII) (see Figure 1).<sup>39</sup> In a sense, there exists a hierarchy or subordination of systems. Of equal importance is the determination of whether a system is an open or closed system, as this will determine the degree of complexity.

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<sup>38</sup> U.S. Joint Forces Command, *Commander's Handbook for an Effects-Based Approach to Joint Operations*, (Suffolk, VA: Joint Warfighting Center, Joint Concept Development and Experimentation Directorate, 24 February 2006), i, viii-ix. The targeting means includes non-lethal fires.

<sup>39</sup> U.S. Army doctrine expanded the traditional operational variable categories to now include physical environment (terrain) and time - PMESII-PT.

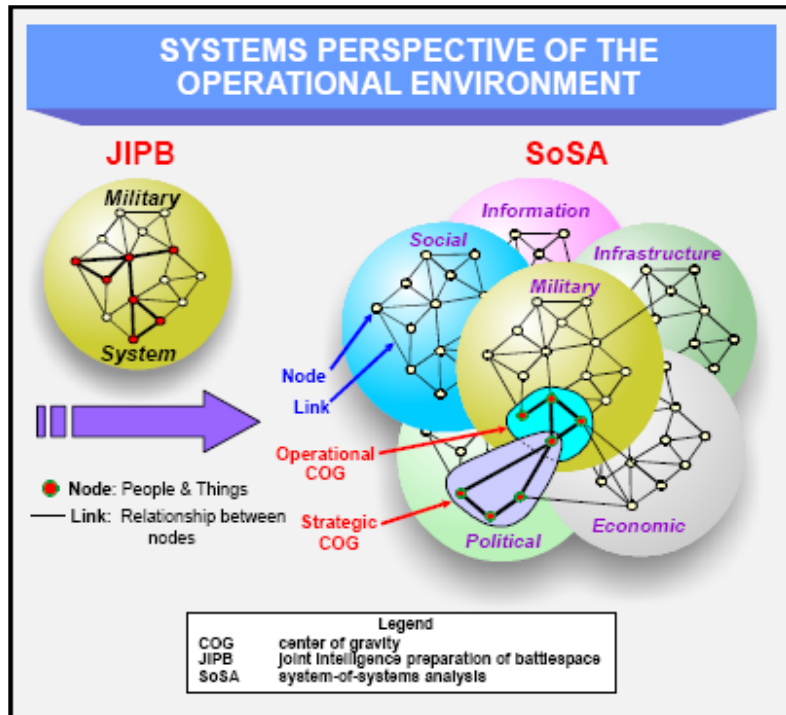


Figure 1. Systems Perspective of the Operational Environment<sup>40</sup>

Further into the planning process planners determine the desired effects to meet operational and strategic aims and the undesired effects requiring avoidance. Planners next determine the measures to gauge the effectiveness of future actions based on the understanding of patterns and behavioral variations. Assessments compare observations against thresholds to discern persistent change and not marginal variations and average deviations.<sup>41</sup> These planning activities complete the mission analysis and set the framework for developing solutions.

Planning subsequently moves to developing options for execution. Possessing an understanding<sup>42</sup> of the effects required to achieve the objectives, planners proceed to match

<sup>40</sup> *Commander's Handbook*, II-2.

<sup>41</sup> *Commander's Handbook*, III-9-10, IV-9-11. These measures are called measure of effectiveness and put simply they answer the question of whether or not the right things are being done.

<sup>42</sup> The JWC acknowledges that it is not possible to understand a system to a deterministic certainty. It recognizes that most systems don't lend themselves to analytical solutions and thus defy accurate mapping (see *Commander's Handbook, Supplement 1*, 4).

available capabilities and resources to potential actions. These actions seek to impact key nodes and links so as to create the desired effects while minimizing undesired effects. As effect-based operations are meant to occur at the operational and strategic levels of war, the actions are unified across the instruments of national power - diplomatic, informational, military, and economic (DIME). In total, the planning process expresses the proposed options for execution in terms of *effect-node-action-resource* (ENAR) linkages.<sup>43</sup>

An analytical tool utilized to determine what the key nodes and linkages are from the nodal-link analysis is the center of gravity (COG) and critical factor analysis (see Figure 2). This analysis assists in determining the sources of friendly and adversarial power along with associated exploitable vulnerabilities.<sup>44</sup> The drawbacks can be significant if the analysis misidentifies the COG and its critical factors. To mitigate such a potential error, the concept writers posit that an integrated multi-disciplinary system-of-systems approach can illuminate the systems, relationships and nodes that comprise the adversarial sources of power or undesired behavior.

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<sup>43</sup> U.S. Joint Forces Command. *Commander's Handbook for an Effects-Based Approach to Joint Operations, Supplement 2*, (Suffolk, VA: Joint Warfighting Center, Joint Concept Development and Experimentation Directorate, 24 February 2006).

<sup>44</sup> *Commander's Handbook*, II-8-11.

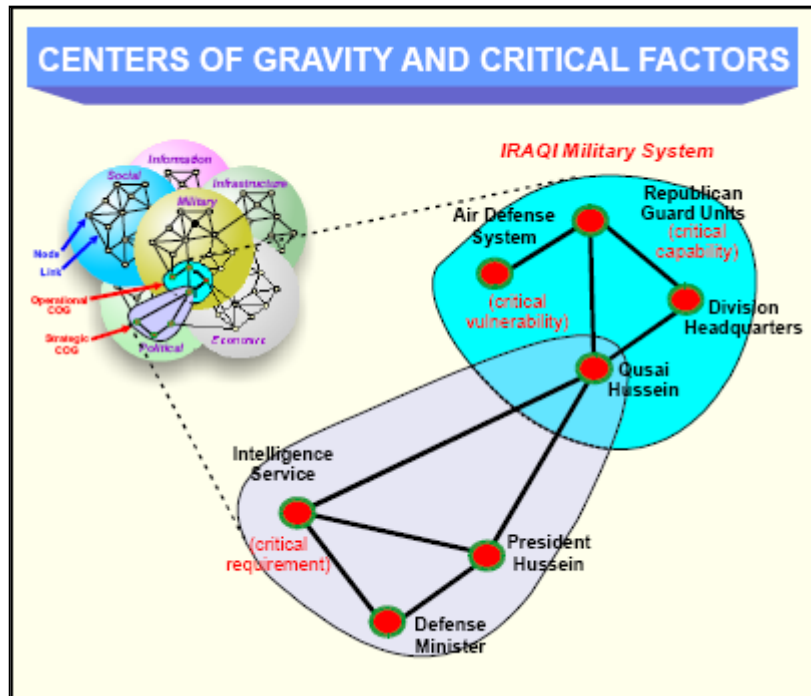


Figure 2. Centers of Gravity and Critical Factors<sup>45</sup>

The execution and assessment processes are closely related. By observing the former, the latter enables maintenance of an adaptive stance. In addition to measures of effectiveness, measures of performance gauge how correctly the executor performed the actions or tasks.<sup>46</sup> The feedback gleaned enables friendly adaptation in response to an ever-changing environment and adaptive adversary. The continuous understanding of the operational environment developed throughout the EBAO process of processes in addition to products such as the ENAR analysis forms the totality of the "image" of reality in the operational area or the operational net assessment (ONA). Later expansion of the EBAO concept intended to leverage automation technology to create a comprehensive database that represented the ONA.<sup>47</sup>

<sup>45</sup> *Commander's Handbook*, II-9.

<sup>46</sup> JP 3-0, IV-33.

<sup>47</sup> *Commander's Handbook, Supplement 2*.

The current EBAO concept emerging from lessons learned during OPERATION DESERT STORM had roots in the tactical USAF targeting process. The systems approach employed to bring about the collapse of the Iraqi integrated air defense system initiated a decade's long exploration into expanding the use of effects-based targeting. Undeniably, the essential enabler of the effects-based targeting was the extraordinary advancement in precision-guided munitions.<sup>48</sup> The development of munitions with an ability to accurately identify and discriminately engage key adversarial capabilities permitted the production of desired effects aligned with the commander's objectives.

EBAO advocates argue these effects would reach beyond simply the immediate destruction of materiel and the tactical level. Enabled by systems analysis and high technology lethal or nonlethal capabilities, effect-based operations could reduce undesired negative effects, such as collateral damage and outraged public opinion, and create predetermined second-order effects at the operational and strategic levels of war.<sup>49</sup> These effects would serve to bridge the gap between national strategic objectives and tactical actions.<sup>50</sup> The advances in weapons technology and their use in recent conflicts such as DESERT STORM and the war against Serbia over Kosovo in 1999 resurrected the view that an effects-based strategy built on, but not limited to, airpower can control an adversary without having to destroy his military capacity and compel him to bend to the senior commanders' or the political leaders' will.<sup>51</sup>

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<sup>48</sup> Richard P. Hallion, "Precision Guided Munitions and the New Era of Warfare," APSC Paper Number 53, Air Power Studies Center, Royal Australian Air Force, 1995, <http://www.fas.org/man/dod-101/sys/smart/docs/paper53.htm> (accessed 25 January 2009); Williamson Murray and Kevin Woods, *Thoughts on Effects-Based Operations, Strategy, and the Conduct of War*, (Alexandria, VA: Institute for Defense Analyses - Joint Advanced Warfighting Program, 2004), 1.

<sup>49</sup> T.W. Beagle, *Effects-Based Targeting: Another Empty Promise?* (master's thesis, Air University, School of Advanced Airpower Studies, Maxwell Air Force Base, June 2000), 12-15; Joint Warfighting Center. Joint Concept Development and Experimentation Directorate, *Commander's Handbook for an Effects-Based Approach to Joint Operations*. 24 February 2006, I-1, I-3, II 1-11.

<sup>50</sup> *Commander's Handbook*, I-7.

<sup>51</sup> Hallion.

An outgrowth of the mid-1990s systems perspective in military thought was a concept leveraging the extraordinary advancements in information technology to improve military effectiveness. Coining the emerging concept as Network-Centric Warfare (NCW), researchers in the United States Department of Defense sought in the early 2000's to adapt evolving commercial applications of Information Age technology into military operational capabilities. NCW is an "information superiority-enabled" approach to warfare in a rapidly changing environment that seeks to improve information sharing and situational awareness by networking sensors and combat capabilities. Moreover, the networking enhances collaboration and speed of command and offers a degree of self-synchronization. The net result is an increase in combat power, mission effectiveness, and massed effects without the massing of combat platforms.<sup>52</sup>

Essentially, an effects-based approach precludes the need for a strategy based on annihilation or attrition. The claim holds up well in a conventional conflict against a well-developed adversarial state built around well-established institutions and highly structured tangible systems. The question remains on how effective the EBAO is against a stateless unconventional opponent, whose composition is amorphous and internal relationships are ambiguous and multi-dimensional.

## **SYSTEMIC OPERATIONAL DESIGN: THINKING AND LEARNING METHODOLOGY**

This section explores the evolution of operational Design thought in the United States Military through three successive stages: the introduction of systems thinking and operational thought in the U.S. Army following the Vietnam War, the initiation in 2005 of formal

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<sup>52</sup> U.S. Department of Defense, *Network Centric Warfare: Developing and Leveraging Information Superiority*, Command and Control Research Program, (Washington, DC, 1999), 2; U.S. Department of Defense, *The Implementation of Network-Centric Warfare*, Command and Control Research Program, (Washington, DC, 2005), 7; David S. Alberts and Richard E. Hayes, *Power to the Edge: Command...Control...in the Information Age*, Command and Control Research Program, Department of Defense Center for Advanced Concepts and Technology, June 2003, 157-158.

experimentation with the Systemic Operational Design (SOD) concept as developed by the Israeli BG (ret.) Shimon Naveh between 1995-2006, and the still evolving U.S. adaptation of SOD. This examination reveals the notable collaboration among various United States, Israeli, and Australian military organizations and thinkers in forming the theoretical underpinnings of the current Design concept.

## **Rediscovery of Operational Art: Integration of Systems Thinking**

The roots of the current U.S. operational Design concept lie with the transformation of U.S. military thought on the operational dimension that began in the Vietnam War's wake. Influenced sharply by the mark of failure as a result of the Vietnam experience, U.S. Army military leaders seized on the opportunity for radical reform of the Army.<sup>53</sup> Transformation in military thought took the form of a series of stages in doctrinal development from the 1976 doctrine of Active Defense within the conceptual construct of Central Battle to Air-Land Battle to Network-Centric Warfare. Active Defense and Central Battle sought to address the demands of confronting the WARSAW Pact heavy armored forces in Central Europe. The doctrine centered on leveraging a systems approach and applying overwhelming combined arms firepower to defeat the enemy along the forward edge of the battlefield.<sup>54</sup> The doctrine's fatal flaw was the emphasis on winning the fight against the first echelon - the "first battle" - through lateral maneuver.

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<sup>53</sup> The reform began in earnest with the establishment of the Army's Training and Doctrine Command (TRADOC) under the notable leadership of General William E. Depuy and later General Donn A. Starry. The two officers were instrumental in reshaping the Army as a professional all-volunteer fighting force equipped with new generations of weapons systems and warfighting doctrine.

<sup>54</sup> Shimon Naveh, *In Pursuit of Military Excellence: The evolution of operational theory*, (London: Frank CASS, 1997), 287-292. Shimon Naveh's sets out to "offer a scientific interpretation of the intermediate field of military knowledge situated between strategy and tactics, better known as operational art, and to trace the evolution of operational awareness and its culmination in a full-fledged theory." Naveh approached his study using a theoretical framework built around General Systems theory to analyze the evolution and application of operational art within a historical context. The culmination he sought came in the form of the United States' application of AirLand Battle in 1991 during Operation Desert Storm. (p. xiii); U.S. Department of the Army, Field Manual 100-5 (FM 100-5), *Operations*, (Washington, DC: Headquarters, Department of the Army, 1 July 1976).



However, the doctrine failed to address the subsequent echelons in the Soviet organizational pattern of offensive operations.<sup>55</sup> The inability to reconcile the problem of dealing with the sheer mass of the Soviet force structure proved the death knell of Active Defense tactics executed within the framework of Central Battle. What grew out of the ashes of a defensive mindset was a rediscovery of the offensive.

The development of the Extended Battlefield concept integrated far greater Joint synergy and a deeper physical and time dimension. Air-Land Battle (ALB) was the cognitive transformation from a defensive mindset to an offensive one aimed at attacking through the entire depth of the enemy maneuver system. This approach viewed modern warfare according to a systems logic. This rationale explained military organizations as systems that, through systemic interactions, manifested themselves in the form of operational maneuver.<sup>56</sup>

In short, ALB espoused methods of dynamic air/ground operational maneuver across the depth of space, time, purpose, and resources as the most effective way to disrupt the adversarial system so as to achieve desired strategic aims.<sup>57</sup> Undoubtedly, the extraordinary military performance in OPERATION DESERT STORM represented the maturation of U.S. military thought into a truly substantive operational theory proven in combat. The resulting victory guaranteed that the ALB systems perspective was to remain a key component of military theory and doctrine through the 1990s and into the 21st century.

With the rapid advancements in technology coupled with the rapidly changing global security environment, the mid-1990s saw the systems approach theoretically branch in two divergent streams of thought. The one stream, EBAO, grew out of the airpower context of tactical

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<sup>55</sup> Robert Michael Citino, *Blitzkrieg to Desert Storm: The Evolution of Operational Warfare*, (Lawrence, KS: University Press of Kansas, 2004), 254-260.

<sup>56</sup> Naveh, *In Pursuit of Military Excellence*, 294-295, 330.

<sup>57</sup> *Ibid.*, 304-306.

air targeting and the other, SOD, grew out of the frustrating asymmetric context of the Israeli/Palestinian Middle East conflict and the irrelevance of military might.

## **Experimenting with Design: Adapting Operational Thought to Complexity**

Since 2005 the United States Army has conducted an ongoing intellectual debate regarding Design as an alternative approach to operational thinking. In short, Design is a critical and creative thinking approach that enables the creation of understanding in unique situations and the visualization of how to resolve operational problems emerging therein. The approach aims to describe how to generate change transforming an undesirable situation into a favorable one.<sup>58</sup>

Of particular interest to the Army was the role, if any, the approach should have in the Army's practice of operational art, the form Design should take, and the relationship the approach should have regarding current Army doctrinal planning processes. The origin of the debate was a growing belief that current doctrinal planning processes were insufficient at handling ill-structured security problems composed of complex and adaptive systems. Specific to a unique context, these types of problems continue to predominate in today's globalized environment. Since then some doctrinal changes have impacted the debate to some degree. These include expansions of the doctrine on assessments throughout the operations process, the applicability of the effects-based approach concept to Army operations, and the collaborative relationships among commanders, staffs, and subordinates.<sup>59</sup>

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<sup>58</sup> U.S. Department of the Army, Field Manual Interim 5-2 (FMI 5-2), *Design* (Draft), (Washington, DC: Headquarters, Department of the Army, 20 February 2009), 4-5.

<sup>59</sup> For greater details on the doctrinal refinements and emerging requirements, see U.S. Department of the Army, Field Manual Interim 5-0.1 (FMI 5-0.1), *The Operations Process*, (Washington, DC: Headquarters, Department of the Army, March 2006, with change 1 dated 14 March 2008).

The U.S. Army's 2005 Unified Quest future warfare studies program was the start of an ongoing examination of the Israeli-developed concept of SOD.<sup>60</sup> In the light of operational difficulties in both Iraq and Afghanistan at the time, the Army sought to critically evaluate its application of the experimental effects-based approach and the long-established Clausewitzian and Jominian theoretical paradigms. In practice established conventionally focused theoretical frameworks were not sufficient to meet the operational challenges of a complex, ever-changing, asymmetric security environment. The U.S. experience from 2001 through 2005 followed the conventional paradigm of applying industrial patterns of warfare to counter an unconventional and patternless adversary.<sup>61</sup>

Two changes seemed to result from the apparent conceptual irrelevance. The first was the generation of a climate conducive for intellectual discourse on reconciling two sets of theoretical and practical tensions. One set consisted of the differences between political directives and operational thought and the other the differences between operational patterns and the contextual logic of the operational environment. The second change was the re-instilling of creative adaptive thinking back into the practice of operational art.<sup>62</sup> The need for change led to inviting Israeli Brigadier General (retired) Shimon Naveh, Ph.D. and his team at Operational Theory Research Institute (OTRI)<sup>63</sup> to share their understanding of the new and emerging SOD concept.

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<sup>60</sup> Unified Quest, co-sponsored by the Army and US Joint Forces Command, is an annual Title 10 year-long series of simulations, experiments, and seminars focused on military transformation. The May Unified Quest capstone event is the culmination for the series and the Army's ongoing Future Warfare Studies Program.

<sup>61</sup> Chris Hables Gray, *Postmodern War: The New Politics of Conflict*, (New York, The Guilford Press, 1997), 109-127.

<sup>62</sup> Shimon Naveh, *Asymmetric Conflict: An Operational reflection on Hegemonic Strategies*, (Operational Theory Research Institute, 2002), 31-32. This work does not directly relate to the U.S. wars in Iraq and Afghanistan but describes the tensions that exist in traditional state apparatuses confronted with contextual difference between their own and the adversarial operational logic.

<sup>63</sup> Shimon Naveh founded OTRI in 1995 to develop new conceptual approaches to operational art for the Israeli Defense Forces (IDF). A change of leadership throughout the IDF just prior to the 2006 2nd Lebanon War with Hezbollah led to the replacing of SOD-based operational plans for EBAO inspired

## Theoretical Underpinnings of Operational Design

The most fundamental theoretical treatises forming the foundation of Design lie with General System Theory (GST), Complexity Theory, and Complex Adaptive Systems Theory which contribute ideas relating to systems, causality, complexity, adaptation, self-organization, emergence, and hierarchy. Numerous definitions of a system abound but the one most appropriate for Design states that a system is “a representation of an entity as a complex whole open to feedback from its environment.”<sup>64</sup> Design primarily focuses on open systems and the degree of their complexity, gauged by the scope and intensity of interactivity.<sup>65</sup>

A system's complexity derives from the interdependence of agents and the inability of each agent to determine causation and effect in situations where multi-varied patterns of interactions are taking place among agents. On the other hand, closed systems, which are isolated and capable of sustaining their behavior and structure without interaction from the environment, lend themselves to statistical and predictive analysis through iterative experimentation.<sup>66</sup>

Complex Adaptive Systems (CAS), such as human social systems, are the most complex of open systems. CAS Theory relies heavily on ideas of causality, emergence and hierarchy [drawn from GST], and assemblage theory. CAS's are composed of autonomous agents competing, cooperating, and seeking to adapt within an over-arching context from which each

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concepts. Though approved by the new leadership just prior to the war, the operational doctrine which included SOD and drove the original planning was misunderstood and largely ignored. Naveh acknowledged that the initial version of the doctrine did require refinement as the SOD elements were not fully integrated with the rest. See interview conducted with Shimon Naveh on 1 November 2007 by the Combat Studies Institute, Fort Leavenworth, KS.

<sup>64</sup> Alex Ryan. “What is a Systems Approach?” (Chapter 3 of PhD diss., The University of Adelaide, 2007), 28.

<sup>65</sup> YaneerBar-Yam, *Making Things Work: Solving Complex Problems in a Complex World*, (NECSI: Knowledge Press, 2004), 61-68.

<sup>66</sup> Ervin Laszlo, *The Systems View of the World: A Holistic Vision for Our Time*, (New Jersey: Hampton Press, Inc., 1996), 31-32; Ryan, “What is a Systems Approach?” , 29; Alex Ryan, *Complex Adaptive Systems*, (Microsoft Powerpoint presentation developed for the School of Advanced Military Studies, Fort Leavenworth, KS, 2008).

agents' strategy is acting and changing the context.<sup>67</sup> Interacting agents form what Gilles Deleuze referred to as assemblages, which are defined not by relations among the agents within them but by their relations of exteriority.<sup>68</sup>

These localized relations or interactions follow low-level rules that produce self-organizing behavior. If these interactions trigger macro-behavioral changes within the complex system, the system will begin to demonstrate emergent properties.<sup>69</sup> Incapable of fully anticipating the adaptation of other agents and the consequences of its own adaptation on the system, individual agents are unable to determine causal chains of events, predict outcomes, and therefore select the best courses of action.<sup>70</sup> It is important to keep in mind during the act of observing, the observer interacts with the environment and the relevant system, thereby, making himself an agent within the system, too. Therefore, the observer is likewise unable to accurately predict consequences and outcomes.

## **Development of the SOD Methodology**

Building on his 1997 work, In Pursuit of Military Excellence: The evolution of operational theory, where he applied the systems perspective to his historical survey of operational art,<sup>71</sup> Naveh expanded his theoretical framework beyond the conventional context and into the asymmetric. Undoubtedly, the strategic context of the seemingly endless Middle East violence between Israel and various Palestinian and other Islamic militant entities heavily

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<sup>67</sup> Robert Axelrod and Michael D. Cohen, *Harnessing Complexity: Organizational Implications of a Scientific Frontier*, (New York: Basic Books, 2000), 7-8; Ryan, Complex Adaptive Systems.

<sup>68</sup> Edward P. W. Hayward, *Planning Beyond Tactics: Towards a Military Application of the Philosophy of Design in the Formulation of Strategy*, (Monograph, Command and General Staff College, School of Advanced Military Studies, Fort Leavenworth, KS, 2008), 38.

<sup>69</sup> Steven Johnson, *Emergence: The Connected Lives of Ants, Brains, Cities and Software*, (New York: Scribner, 2001), 17-19; Bar-Yam, 19, 26-27.

<sup>70</sup> Axelrod, 7.

<sup>71</sup> Naveh, *In Pursuit of Military Excellence*, 1-20.

influenced Naveh's subsequent evolution of thought. He and his OTRI team set out to rationalize how military organizations and operational entities should function as learning systems. The asymmetric challenges facing any state military system illuminate the systemic tensions between strategic conceptualization - comprised of systems of thought, learning, and operational approaches - and the ontology of military institutions - comprised of systems of command and organizational functions and forms.<sup>72</sup>

This systemic tension is but one level - the Third - in the logic structure he employed to explain the dynamics of learning. Consisting of three levels or orders, the structure roughly relates to the three doctrinal perspectives relating strategic objectives to tactical tasks - strategy, operational art, and tactics. The Third or highest order of logic refers to the relationship between conceptual or theoretical frameworks [epistemology] and organizational forms and functions [ontology]. The Second order of logic pertains to the structuring of conceptual processes. Finally, the First order of logic relates to the utilization or operationalization of judgments made from those processes.<sup>73</sup>

The implication of Naveh's conceptual efforts was to warn military institutions from falling into the trap of reducing strategic thought down to generic tactics and tactical patterns that are applied to all situational contexts. The lack of a theoretical framework for structuring conceptual processes prevents the essential critical reevaluation of theory and practice through discursive inquiry that would, in turn, produce new knowledge and understanding. It is this new understanding that enables the development of relevant approaches to complex strategic contexts.<sup>74</sup>

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<sup>72</sup> Naveh, "Asymmetric Conflict," 4-5.

<sup>73</sup> Ibid., 5.

<sup>74</sup> Ibid., 29-34.

Operational art serves as the median, enhanced through discursive cognitive space, for synthesizing and rationalizing existing organizational patterns with the strategic directive, in one direction, and with the given strategic context, in the other. As described earlier, the contemporary strategic context describes operational environments possessing a considerable degree of complexity that often exhibit emergent properties. Operational art functions to create new conceptual frames and patterns compatible with the uniqueness of the changing complex environment.<sup>75</sup> Naveh recognized the need for a methodology to aid the operational artist's rationalization and creativity - per se, an "intellectual road map."<sup>76</sup> This road map would ensure relevant orientation on the actual context of the operational environment confronting the operational artist. The Design methodology operationalized in the form of systemic operational Design became the road map.

## **Cognitive Characteristics of the Design Approach**

Intrinsically, the operational commander chooses to integrate Design into his command practice. SOD offers a cognitive system of iterative and exploratory learning enabling the commander to draw upon the collective creative potential of the organization. Its organizing logic aids the commanders in balancing three essential leader concerns: exercising command authority and expressing sufficient explicit guidance, maintaining control by way of a structure that orients the cognitive energy of the organization, and maintaining a climate of open unrestricted communication. Key to forming shared understanding throughout the hierarchy of command, Design's systemizing methodology employs a series of learning discourses that link vertically

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<sup>75</sup> The approach to creating new paradigms out of complexity cannot come about from a reductionist or analytical approach but from a cybernetic or systems approach. Operational art is the military expression of the Systems and Cybernetic Theories.

<sup>76</sup> Shimon Naveh, "Discursive Command – Operators – Systemic Operational Design: A New Framework for Strategic Epistemology," (Paper provided to faculty at the School of Advanced Military Studies, Fort Leavenworth, KS).

upwards with senior / strategic sponsors and downwards with tactical warfighters and horizontally with other operational artisans and operational planners.<sup>77</sup>

Inspired by postmodernist ideas of deconstructivism and discourse, which questions the observed frames of reference and the underlying assumptions that define an artifact, SOD applies a method of skepticism and criticism in order to draw distinctions.<sup>78</sup> Thus, SOD employs disciplined and methodical inquiry as the mode of analysis and then synthesis to construct a cognitive reality of the observed strategic context, environment, or system.<sup>79</sup> Based on the observer's point of view, the constructed reality is an interpretation of the actual reality.<sup>80</sup> Using the heuristic technique of meta-inquiry to learn the 'why' not just simply the 'what' and 'how', SOD seeks to understand the relational qualities of the environment and systems within it from different points of view. Beyond analytical reasoning, SOD relies on cybernetics to validate the known and to build on the interpretation, thus, bridging the observed reality to the actual - as it exists in the environment.<sup>81</sup> Operational learning is not static and not intended to occur in isolation of the relevant environment or system. By virtue of existing as an integral part of the

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<sup>77</sup> Shimon Naveh, "Questions of Operational Art: Depth Structure of SOD and Reflective Spaces of Deliberation" (Microsoft Word presentation given to the School of Advanced Military Studies, Fort Leavenworth, Kansas, December, 2006) Israeli Defense Forces: Operational Theory Research Institute, 12.

<sup>78</sup> Naveh, "Asymmetric Conflict," 3-5, 9-10, 15, 21, 28-29. Postmodernist philosophers, both past and contemporary, that inspired Naveh and his OTRI team include Friedrich Nietzsche, Michel Foucault, Gilles Deleuze, and Felix Guattari.

<sup>79</sup> Walter Truett Anderson, *The Truth About The Truth: De-confusing and Re-constructing the Postmodern World*, (New York: Tarcher, 1995), 110-117.

<sup>80</sup> Zvi Lanir and Gad Sneh, "The New Agenda of Praxis," (monograph, Tel Aviv, Lanir-Decision and Learning Systems, 2000), 20-29, taken from R. Rorty, *Philosophy and the Mirror of Nature*. Princeton, NJ: Princeton University Press, 1979. Praxis is a company dedicated to the research, development and applications of Systemic Re-framing Thinking in individual, organizational and social settings; Extreme postmodernism argues that an actual reality or real truth does not exist. Only the subjective interpretation of what is observed, sensed, or reasoned exists.

<sup>81</sup> Shimon Naveh, "Questions of Operational Art: Depth Structure of SOD," (Microsoft Word presentation given to the School of Advanced Military Studies, Fort Leavenworth, Kansas, December, 2005), Israeli Defense Forces: Operational Theory Research Institute, 22-23; Cybernetic Theory aims to understand and define the functions and processes of systems that have goals, and that participate in circular, causal chains that move from action to sensing to comparison with a desired goal, and again to action, <http://en.wikipedia.org/wiki/Cybernetics> (accessed 13 February 2009).



system, the observer injects energy into the system through his actions. The relevant system's resultant feedback serves as a means of learning by understanding change-created differences.

SOD utilizes dialectic tension in the form of Socratic dialogue to draw out a new creative synthesis from the textual, contextual, and content differences of strategic and operational artifacts. Essential differences include those between existing institutional paradigms and the emergent logic of the observed strategic context, the strategic directive's desired state and the relevant context's trend or propensity, the strategic directive's desired state and the existing organizational forms and functions, and new operational maneuver patterns and the rival's or opposition's logic.<sup>82</sup> By seeking understanding of the tensions, the operational artist continually challenges the relevancy of his knowledge, approach, and form.<sup>83</sup> This holistic understanding enables the conceptual evolution of an approach to transforming the observed strategic context to achieve a desired end-state and to manage the complexity of the operational problem to within established limits of tolerance.

### **Organizing Logic of SOD<sup>84</sup>**

As mentioned earlier the median for discovery, learning, understanding, synthesizing, and creation centers on discourse. The structure-based, process-driven SOD comprises a logical sequence of seven reflective discursive spaces or discourses: system framing, rival as rationale,

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<sup>82</sup> Ibid., 12.

<sup>83</sup> The check on relevancy includes validating ways of thinking, applying heuristic learning processes, comparing conceptual models and paradigms, and assessing the effectiveness of organizational and operational frameworks.

<sup>84</sup> For similar discussion on the structural sequence of SOD, see the following monographs: Christopher J. Bell, "Is Systemic Operation Design Capable of Reducing Significantly Bias in Operational Level Planning Caused by Military Organizational Culture?" (master's thesis, School of Advanced Military Studies, US Army Command and General Staff College, Fort Leavenworth, Kansas, 2006); William T. Sorrells, et al, "Systemic Operational Design: An Introduction," (master's thesis, School of Advanced Military Studies, US Army Command and General Staff College, Fort Leavenworth, Kansas, 2005); Edward P. W. Hayward, "Planning Beyond Tactics: Towards a Military Application of the Philosophy of Design in the Formulation of Strategy," (master's thesis, School of Advanced Military Studies, US Army Command and General Staff College, Fort Leavenworth, Kansas, 2008).

command as rationale, logistics as rationale, operation framing, operational effects, and forms of function.<sup>85</sup> These constitute a system of structuring concepts aimed at breaking the boundaries of existing institutionalized paradigms, deconstructing established conceptual frames, and constructing concepts for the creation of new knowledge. The relationships of these concepts are not hierarchical and linear-sequential, but rather each concept is continually associated with each of the others (see Figure 3). Spiraling along the conceptual system, learning progresses while constantly affording a reframing of any concept as new knowledge emerges.<sup>86</sup>

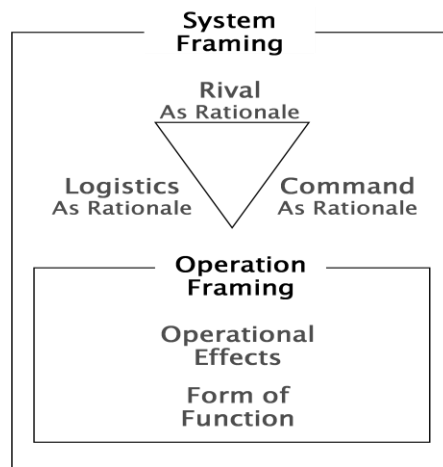


Figure 3. SOD System of Structuring Concepts<sup>87</sup>

## Describing the Structuring Concepts

As the principal structuring concept, System Framing sets the conditions for the cognitive process that enables systemic learning and rationalization through operational inquiry, thinking, and practice. Moreover, it generates a holistic system-of-systems understanding of the strategic

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<sup>85</sup> Ofra Gracier, Gad Sneh, and Shimon Naveh, "Between Strategic Direction and Tactical Action: Systemic Operational Design - the unique practice of operational architects," (Microsoft Powerpoint presentation given to the School of Advanced Military Studies, Fort Leavenworth, Kansas, January, 2005) Israeli Defense Forces: Operational Theory Research Institute.

<sup>86</sup> Naveh, "Discursive Command."

<sup>87</sup> Gracier, Sneh, and Naveh, "Between Strategic Direction and Tactical Action."

context with respect to the strategic directive and, thereby, conditions the operationalization of and the planning for the employment of resources and capabilities to establish the desired strategic state.<sup>88</sup> System framing challenges the suitability of existing institutional paradigms to address the problems arising from the emergent complexity of the relevant strategic context.<sup>89</sup> Moreover, it questions the sufficiency of the Design team's knowledge and understanding of the context and the presumptions, hypotheses, and premises regarding the emergence.

System framing creates an evolving conceptual framework from which to create new paradigms and operational patterns particular to the relevant operational problem. As the textual reference of that framework, the strategic narrative elucidates the logic of the context, traces the source of the problem, and bounds the problem [based on the desired state of the strategic directive] to focus reasoning. It constructs a system model that contextualizes trends, tensions, potential, and propensities of the components, assemblages, and systems within the context. In short, it tells of the evolving 'story', 'plot', and of the relevant 'characters'.<sup>90</sup>

The Rival as Rationale structuring concept complements the traditional intelligence praxis during the Mission Analysis step in both the MDMP and the JOPP and builds on the bounded logic of the system frame. In the former capacity, the rival structuring concept focuses on the subject-matter of enemy analysis, which includes intelligence surveillance, collection, and evaluation. This activity feeds the necessary ontological information to both planners and decision-makers. Understanding the structuring of the rival's physical components reveals his patterns of organization. These patterns when compared to universal and generic paradigmatic

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<sup>88</sup> Naveh, "Questions of Operational Art: Depth Structure of SOD," 22-23.

<sup>89</sup> This is in contrast to traditional operational planning approaches that apply existing templates to resolve pre-defined problems. Planners typically derive the solutions based upon standardized models reflected in institutional paradigms.

<sup>90</sup> Naveh, "Questions of Operational Art: Depth Structure of SOD," 24-27.

models may reveal the logic of his behavior. But can such a reductive and comparative approach expose the logic? Not quite.

Unlike climatic, physical environmental, or other non-humanistic challenges, human-centric adversaries are inherently complex, dynamic, and non-deterministic. The rival as rationale concept treats such entities as complex adaptive systems. The concept recognizes the futility of a reductionist or analytical approach to trying to understanding the properties of the whole from an analysis of its constituent components. Thus, the second capacity of the rival structuring concept is to synthesize a singular system model of the rival in the emerging context and compare it to paradigmatic models of varying contexts.<sup>91</sup> In this capacity, the rival as rationale serves as a median for operational inquiry and learning. By identifying differences between the models, the rival structuring concept enables the deconstruction of the institutional models and patterns in order to create new ones compatible to the emerging context. The working product is a conceptualization of the rival's logic, organizational forms, and operational patterns.

The next two rationale structuring concepts of Command and Logistics are introspective. The Command as Rationale concept focuses on the domain of one's own operational command. The reason for the operational command's existence is the systemization of heuristic processes. This level of command serves as the hub for operational learning and learning problematization through action. The operational commander and his Design team remain continually vigilant to differences between the emerging context of the environment and the working rival logical frameworks initially generated by the system frame and rival as rationale structuring concepts.<sup>92</sup>

Throughout the praxis of battle command - understanding, visualizing, describing, directing, leading, and assessing - the commander and the Design team conduct discourse through meta-inquiry to understand the tensions between the overall working frame and the evolving

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<sup>91</sup> Ibid., 29-32.

<sup>92</sup> Ibid., 42.

contextual patterns.<sup>93</sup> The contribution of such a reflective learning system is enormously significant during operational execution. While continually deconstructing, analyzing, and reframing, the commander and his Design team maintain an essential adaptive stance enabling the ability to rapidly translate new logical understanding into effective operational activity. The command as rationale concept informs the commander during his application of the Rapid Decision Making and Synchronization Process (RDSP) and facilitates him getting into the rival's decision-cycle.<sup>94</sup>

The Logistics as Rationale structuring concept generates a system model that reconciles the tension between the emerging environment's physical reality and existing logistical structures. The availability of materials and resources, the capability of equipment, and the capacity of infrastructure influence the shaping of an operation's spatial and temporal dimensions. As with the structuring concepts described thus far, the logistics concept seeks to stand outside established paradigms to create a singular organizational pattern compatible with the unique complexity of the relevant operational problem. Its logic centers on potential as it materially bridges the gap between strategic logic and operational form.<sup>95</sup>

Created upon the framework provided by the system frame and the logical references of the three rationale structuring concepts, the Operation Frame is the manifestation of the adaptive transformative resolution to the operational problem. The conceptual frame derived from this structuring concept determines the end-state conditioning for the operation, envisions the form of

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<sup>93</sup> Ibid.

<sup>94</sup> Getting into the enemy's decision-cycle is in reference to USAF COL John Boyd's decision-making construct of the OODA loop, which stands for Observe, Orient, Decide, and Act (see U.S. Department of the Army, Field Manual 6-0 (FM 6-0), *Mission Command: Command and Control of Army Forces*, (Washington, DC: Headquarters, Department of the Army, August 2005), A1-3; Edward A. Smith, "Complexity, Networking, and Effects-Based Operations: Approaching the "how to" of EBO." (The Boeing Company. Arlington, VA, 2005), 20-21. The objective is to process through this cycle more rapidly than the enemy in order to retain the initiative and maintain disruption of the enemy's efforts to effectively operate. This concept has clear parallel to SOD's operational learning problematization and reframing.

<sup>95</sup> Naveh, "Questions of Operational Art: Depth Structure of SOD," 45.

systemic shock to disrupt the rival system, defines the spatial boundaries for action, and establishes the temporal spacing of activity. Furthermore, the operation frame identifies the factors which limit actions, establishes a framework to structure operational functions, rationalizes subsequent coherent operational planning, and produces a logical framework for reflective learning during execution.<sup>96</sup> In short, the operation frame conceptualizes the options for intervention to bring about the realization of the strategic directive's transformative aims. It forms the logical basis from which to derive the structuring concepts of operational effects and of forms of the functions defined by that system.

Serving as the formative concepts reconciling the tension between the emergent strategic context and the desired end-state of the strategic directive, the Operational Effects and Forms of Function structuring concepts exist within the structure of the Operation Frame. The operational effects concept squares the tension between the aims of the operation and the form of achieving them. Operational effects establish logical functions for the maneuver system and guide the validation of existing organizational forms doctrinal operational patterns or the creation of new ones. The forms of function concept ensures these patterns and forms are compatible with the functional logic of the intended effects, the emergent context, and the oppositional components, against which the organizing logic of the effects concept intends to orient them. Operational effects serve as references and define trends from which to orient, assess, and reflect upon the systemic consequences of actions in the emergent context.<sup>97</sup> The cybernetic perspective of learning through action functions as the heuristic mechanism for reframing.

Operationalizing the functional logic of the operational effects, the forms of function structuring concept enables operational effects, shapes the physical configuration of the maneuver

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<sup>96</sup> Ibid., 48-49. The operational functions framework includes the structuring of operational effects and the organizational forms of the maneuver system.

<sup>97</sup> Ibid., 51-52.

system, and serves as an opportunity for institutional learning. The latter may lead to doctrinal and organizational adaptations or creation of new patterns and templates. As the final transitional component in the SOD concept structuring process, forms of function provide concrete direction to the MDMP and JOPP.<sup>98</sup>

## EVALUATING THE ALTERNATIVES

### Assessment of EBAO

Since the release of General Mattis' memorandum, a number of articles appeared in various military journals supporting the decision to remove EBAO concepts from the military lexicon and doctrine. The arguments included points related to the over-emphasis on targeting through the employment of precision air-delivered fires. This particular point argues that EBAO neglects to sufficiently integrate the synergistic capacity of ground maneuver. Another point of contention revolves around the lack of consensus over the language and meaning of many EBAO terms. In particular, the term effect, itself, has led to considerable ineffectiveness and confusion.<sup>99</sup> However, the central theme of the opposition rests on a deeply philosophical matter.

The fundamental flaw that sounded the death knell for the EBAO was its presumption of predictability in conflict, the nature of which is inherently unpredictable. The contemporary operational environment is characteristically complex and contains dynamic systems that, in turn, possess adaptive and emergent qualities that elude predictive analysis. General Mattis stressed the need for developing and incorporating creative thinking into campaign Design and that effect-

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<sup>98</sup> Ibid., 54.

<sup>99</sup> Donald Lowe and Simon Ng, "Effects-based operations: language, meaning and the effects-based approach," 2004 Command and Control Research and Technology Symposium: The Power of Information Age Concepts and Technologies, Defence Science and Technology Organization, Australian Department of Defence, 3, [http://www.au.af.mil/au/awc/awcgate/ccrp/ebo\\_language.pdf](http://www.au.af.mil/au/awc/awcgate/ccrp/ebo_language.pdf) (accessed 28 November 2008).

based thinking cannot serve as a substitute.<sup>100</sup> EBAO falls short of providing the U.S. Military a theoretical framework from which to operationalize a practical thought process suited well for tackling ill-structured problems.

General Mattis clearly comprehends the non-deterministic nature of war and of complex adaptive systems.<sup>101</sup> An important aspect of this nature to keep in mind is that war is a large-scale duel between two [or more] opposing [free] wills.<sup>102</sup> Each side, so to speak, aims at the overthrow of the other's effort to achieve its objective while maintaining the ability to attain its own. In theory these aims may succeed mechanistically but in practice the aims invariably meet frustration in ambiguous environments conditioned by "chance", "friction", and the "fog" of war.<sup>103</sup> In essence, the inter-relatedness and interactivity of the systems existing in the environment along with the natural and physical limitations placed on human cognitive capacities magnifies the ever-present uncertainty in operations.

EBAO's efforts to establish causality within dynamic and rapidly evolving open-systems, such as CAS's, and to predict the future consequences of actions upon those systems, are the approaches critical weaknesses. Through emergence and self-organization of its multitude of components, CAS's, by nature, are continually changing in response to the environment. Consequently, the multiplicative impacts of the innumerable component interactions make analyzing the parts in order to understand, let alone predict, the behavior of the whole impractical.

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<sup>100</sup> Mattis, 108.

<sup>101</sup> The non-deterministic characterization applied here centers on our relative inability to discern a fully accurate causal chain of events to explain the actual.

<sup>102</sup> Carl von Clausewitz, *On War*, trans. and ed. by Michael Howard and Peter Paret, (Princeton, N.J.: Princeton University Press, 1984), 75. Though Clausewitz and his theories served as the mantra of U.S. operational thinking in the 1980s and early 1990s, the maturation of concepts such as EBAO and Design are now overshadowing the nineteenth century military theorist. An interesting contrasting philosophical idea is *Compatibilism*. Espoused by ancient Greek Stoics, 17th and 18th century philosophers Hobbes, Locke, and Hume, and a number of contemporary philosophers, compatibilism is a theory that argues the compatibility of free will and determinism.

<sup>103</sup> *Ibid.*, 85, 119, 140.



Further criticism of EBAO's merits rests on the conceptual additions of System-of-Systems Analysis (SOSA) and Operational Net Assessment (ONA). Although not integral to the original EBAO construct, these concepts promised a method of compiling and mapping an enormous volume of information to predict system behavior. The computing capacity required to account for the unfathomable number of interactions for an operational environment contextually similar to that of OIF is unachievable. These highly algorithmic computer modeling techniques fail to accurately measure non-linearity in human-centric systems.<sup>104</sup>

Traditionalists, espousing Clausewitzian precepts, point to the folly of such a mathematical approach to warfare. Clausewitz's greatest theoretical contribution to our understanding of warfare is his conceptualization of the complexity of war. He writes, "No other human activity is so continuously or universally bound up with chance. And through the element of chance, guesswork and luck come to play a great part in war."<sup>105</sup> Building further on the uncertain nature of war, Clausewitz reasons that deducing an effect from a cause is exceptionally difficult as many factors impact an event. Determining the actual causal link is difficult without absolute disclosure of all possible facts.<sup>106</sup> Again, the ability to achieve such absolute knowledge lies beyond human and automated capacity.

As evidenced by the core principles, the EBAO concept writers acknowledge complexity, uncertainty, and unpredictability.<sup>107</sup> However, the Joint Warfighting Center's Commander's

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<sup>104</sup> A number of opponents of EBAO employ these points to argue for its abandonment. For further details of such arguments see: General James N. Mattis, USMC, "USJFCOM Commander's Guidance for Effects-based Operations," *Joint Force Quarterly* 51 (4th Quarter, 2008): 106; Milan N. Vego, "Systems versus Classical Approach to Warfare," *Joint Force Quarterly* 52 (1st Quarter, 2009): 41-42; LTG Paul K. Riper, USMC (Ret.), "EBO: There Was No Baby in the Bathwater," *Joint Force Quarterly* 52 (1st Quarter, 2009): 83-84. Aspects of non-linearity referred to here include chance, individual will, and countless other moral forces inherent in human-centric systems.

<sup>105</sup> Clausewitz, *On War*, 85.

<sup>106</sup> Clausewitz, *On War*, 156.

<sup>107</sup> Smith, "Complexity, Networking, and Effects-Based Operations," 1-3. Also, see Appendix 2 for a detailed description of EBAO core principles.

Effects-Based Operations Handbook exposes a contradiction. The handbook describes a notional exchange between a combatant commander and some staff primaries. The discussion centers on a failure to anticipate unintentional effects. The tone suggests the failure was due to an incorrect assessment system. The shared belief by the notional individuals is that by simply redefining the MOEs and MOPs, and determining better metrics to map the links between them one can identify causality and unanticipated effects.<sup>108</sup> The example discourse provided in the handbook reveals the deterministic mindset of the concept writers and the greater emphasis they give to predictive analysis rather than systemic understanding in a continually emergent context.

Given varying scopes an observer's viewpoint could possess, the textual space needed to describe absolute knowledge about an event would be infinite. Adding to the challenge of isolating causality, the textualization of the observer's perspective is itself a subjective creation of reality? The difficulty of knowing the facts about something limits the ability to identify every potential causal factor, and, thus, hinder the capacity to predict outcomes. Again, Clausewitz understood well the unpredictability in war. As to the uncertain responses of components in a complex environment, Clausewitz states that, "The very nature of interactions is bound to make it unpredictable."<sup>109</sup>

While appreciating the ambiguity of war, General Mattis seeks "to develop a joint force that acts under conditions of uncertainty and thrives in chaos through common understanding of the essence and nature of the problem and the purpose of the operation."<sup>110</sup> He states that the use of a program focused on training and the application of technology-enabled problem solving techniques would enhance the initiative, decentralization, and recognition primed decision-

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<sup>108</sup> *Commander's Handbook*, IV-17.

<sup>109</sup> Clausewitz, *On War*, 139.

<sup>110</sup> Mattis, 108.

making of a joint force's battle command.<sup>111</sup> However, General Mattis stresses caution when developing innovative operational concepts to ensure they promote clear language, a shared understanding, and enable decentralized decision-making, initiative, and independent action by subordinates in accordance with the commander's intent. Computer-based analysis and modeling, similar to the McNamara-era operations research techniques during the Vietnam War, are poor substitutes for experience-driven intuition.<sup>112</sup> These identified shortcomings, however, do not entirely invalidate the EBAO concept.

The value of EBAO rests with its bedrock concept of balancing and synchronizing actions among all instruments of national power through a common shared understanding of the desired effects throughout the entire campaign in order to affect behavior.<sup>113</sup> These effects extend beyond the tactical material impact considered in the strict sense of targeting with fires. In a larger sense, they are the desired conditions and behavioral states of a system that result from an

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<sup>111</sup> Ibid; Gary A. Klein, *Sources of Power: How People Make Decisions*, (Cambridge, Mass, MIT Press, 1998), 1-30. Recognition Primed Decision-making (RPD) models rapid, effective decision-making in complex situations. The experience of the decision-maker plays a considerable role in the ability to generate possible courses of action [using mental simulation], filter each subsequent course of action through the constraints imposed by the situation, and select the first unconstrained course of action. Greater experience enables the decision-maker to match a situation to the cues and patterns of a previous situation, thereby, elevating the most recognized course of action to the top of the sequence. A drawback to this approach is that it is prone to serious failure in unique or misidentified situations. Moreover, deception, subjectivity and bias, and poor intelligence can "paint" and inaccurate picture of the situation, thus, leading to incorrectly matching the pattern or cue. See Clausewitz, *On War*, 117.

<sup>112</sup> Clausewitz, 136, 140, 146, 164, 585-586. Clausewitz warns against becoming too dependent on algebraic calculations, fixed theories, and quantifiable measures. Rather he emphasizes critical thinking and creativity (or rather coup d'oeil) to address the constantly changing situation given the continuous "interaction of opposites." Arguably, intuition alone has limited value in a dynamic constantly evolving environment. The most effective leader is one employing intuition reinforced with the artful skills of critical thinking and creativity; EBO advocates such as Edward Smith, though recognizing the complexity in human social systems, believes that some processes in such systems are not complex. Smith emphasizes the prospects of separating out which processes are complex and which are not and then applying linear analysis and modeling to bound estimates and judgments. See Smith, "Complexity, Networking, and Effects-Based Operations," 2.

<sup>113</sup> Smith, "Complexity, Networking, and Effects-Based Operations," 1.

action(s) or another condition.<sup>114</sup> Joint doctrine reflects the integration of this foundational idea in EBAO thinking through tasks executed to create an effect or condition that enable the achievement of objectives to accomplish the end state.<sup>115</sup> These effects play an essential role in assessing the attainment of an operation's mission accomplishment through the executed tasks.

The problem with effects lies in semantics. Language is an essential enabler to doctrine, as the latter must clearly communicate a codified body of principles or knowledge that ensures shared and common understanding. Confusion arises when looking closely at the doctrinal definitions for commander's intent, effect, end state, and condition. Each of these contains sufficient overlap in meaning making them redundant and somewhat interchangeable, thus, generating confusion as to the context of their use.

For instance, JP 3-0 defines *commander's intent* as "a clear and concise expression of the purpose of the operation and the military *end state*."<sup>116</sup> Similar but more descriptive, FM 3-0 defines *commander's intent* as "a clear, concise statement of what the force must do and the *conditions* the force must establish with respect to the enemy, terrain, and civil considerations that represent the desired *end state*."<sup>117</sup> JP 3-0 defines *end state* as "the set of required *conditions* that defines achievement of all military objectives."<sup>118</sup> Conversely, a *condition* is a *state* of being. Finally, JP 5-0 defines *effect* as "a physical and/or behavioral *state* of a system that results from an action, a set of actions, or another effect. A desired effect can also be thought of as a *condition* that can support achieving an associated objective."<sup>119</sup>

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<sup>114</sup> JP 5-0, III-12; JP 3-0, IV-9. Also included are consequential undesired conditions and physical states.

<sup>115</sup> JP 3-0, iv.

<sup>116</sup> U.S. Department of Defense, Joint Publication 5-0 (JP 5-0), *Joint Operation Planning*, (Washington, DC: Department of Defense, 26 December 2006), III-24.

<sup>117</sup> FM 3-0, 5-10.

<sup>118</sup> JP 3-0, III-8.

<sup>119</sup> JP 5-0, III-12.

If end states and effects are defined as conditions, then effects are, in essences, end states. Therefore, the commander's intent expresses the desired effect(s), albeit in terms of conditions and end state. Taking this argument to its logical conclusion, given that the commander's intent is closely associated to the overall mission through the purpose, effects should define mission achievement not objectives. Joint doctrine's placement of effects as a separate element of ends guidance is puzzling. In JP 3-0's and JP 5-0's depiction of the tactical task to strategic end state linkage construct, the guidance elements for the theater strategic and operational levels appear in the ascending order: tasks - effects - objectives - mission (see Figure 4).



Figure 4: Effects and Command Echelons<sup>120</sup>

Confusion arises when considering the sample scenario in JP 5-0 exemplifying the use and linkage of the terms in Figure 4. The effects subordinated under the objectives are structured as desired behavioral conditions regards to the other than own entities, that when attained achieve the objective. This adds an extra unnecessary layer. When correctly selected and executed, the tasks achieve the objective. The differences in the entries are more wordplay - word

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<sup>120</sup> JP 5-0, III-13.

rearrangement, passive/active voice alternation, word tense changes, and a change regarding to whom the entries imply.

Instead these subordinate entries are far clearer when structured by the overall mission's intent as tasks. For example:<sup>121</sup>

- Objective 3: Regional security and stability are restored

- Effect 3-4: Regional countries welcome US intervention

(Instead, Effect 3-4 would be Task 3-4: Gain support from regional countries for US intervention)

The stated effects in this scenario would instead appear in the commander's intent as conditions set to achieve overall mission success. This intent would contain the expressed end state and the desired effects to define mission accomplishment and determine the objective sets. Correctly identified, executed and assessed tasks achieve the objectives. This modified construct would be: tasks, objectives, and mission (and associated intent).

Aside from its many shortcomings, EBAO offers valuable contributions. As a holistic approach, it aims at thinking of warfare from a systems perspective. Such an approach is useful in understanding the complex interconnected contemporary operational environment. The nodal-link and network analyses and mapping are helpful tools in maintaining a systemic understanding of the essential relationships, interactions, or links among relevant nodes. Arguably, even human-centric complex adaptive systems possess a nodal-link rationale, albeit one that adapts and evolves.

EBAO enables the commander to visualize this environment beyond the traditional military paradigms of operational areas. Concerned with coordinating a commonly defined set of conditions throughout an operation or campaign, EBAO seeks to facilitate collaboration among various military and non-military agencies, and vertically up and down the chain of command.

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<sup>121</sup> JP 5-0, III-14.

More important is EBAO's appreciation of the need to establish the effects that lead to success prior to assigning tasks.

## **Assessment of SOD**

The shortcomings of SOD are few but significant. Two of its greatest weaknesses are the language with which the creators expressed the theoretical construct and the difficulty in operationalizing the approach to facilitate the interface with elements of the operations process. For the commander the former possess a formidable challenge to establishing a collaborative command climate promoting open communications throughout all levels of the command. The latter threatens the headquarters' efforts to ensure the battle command system enables shared understanding among staff functions and the different levels of command.

Couched in a multitudinous array of terms and concepts drawn from a variety of disciplines, SOD's theoretical textualization is in some ways a semantic patchwork of redundant terms and ideas. Due to a lack of a multi-disciplined military education system, the highly urbane and pedantic expression of SOD lies beyond the intellectual reach of most current military practitioners. The result is confusion and misunderstanding as to the meaning of terms. Until operational Design advocates simplify the language without losing the conceptual essence, operational artists schooled in Design will struggle sharing understanding with others familiar only with traditional doctrinal patterns of language.<sup>122</sup>

The strengths of the Design approach far outweigh the shortcomings. Like EBAO, SOD maintains a full appreciation of the complex strategic context and the dynamically evolving operational environment. SOD also views the environment from both a systemic and a systems

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<sup>122</sup> Fortunately, the effort to clarify the language and operationalize the approach is moving apace as leaders in TRADOC push for continued Design experimentation and professional discourse. In so doing, there is a risk of losing the essence associated with specific Design terms when removed for the sake of simplicity or doctrinal conformity.

perspective. Whereas EBAO focuses on relating operational and strategic objectives to component missions, tasks, and actions by creating desired effects, SOD takes a much broader cognitive approach. Design recognizes the incredible difficulty in accurately determining the appropriate effects that would shape complex adaptive system behavior. With or without an action upon them, the system's components self-organize and exhibit emergent behavior.

A deterministic approach seeking to implement a finite and teleological solution to a complex operational problem will fall into frustration. Each attempt to move the observed system towards a final solution only acts to deflect the system into an uncertain direction. Design's approach is to manage the ever-changing problem and bring it to within a range of tolerance. The metaphor of a control rod in a nuclear reactor controlling reactivity serves to illustrate the nuanced meaning. The subsequent section examines the important issue of how to approach complex dynamic problems.

Design's heuristic system of learning stands as the most important contribution to operational art. SOD aims at achieving operational adaptivity and relevance through a disciplined cognitive process of deliberate, iterative and reflective learning. Employing discourse and meta-questioning to identify and exploit differences in varying references, Design achieves a shared systemic understanding of the entire relevant environment. This understanding provides a number of opportunities. It enables the validation of existing theoretical frames, the creation of new hypotheses, and the rationalization of templates specific to the emerging context.

The understanding of the systemic logic gained facilitates the discovery of the systems' propensities together with trends and assemblages within the environment. All of these may present opportunities for exploitation. They orient the designer in the general direction toward which to apply energy and action that would lead to transforming the observed system into the desired system. Unlike EBAO, which aims to change a system's behavior to a specific desired state, SOD endeavors to transform the system to an acceptable state while remaining aligned with



the system's natural tendency. The analogy of the judo fighter comes to mind, as this martial artist uses and exploits the weight, inertia, and momentum of his opponent against him. Informed by the systemic logic gained through meta-questioning, the designer generates operational functions and forms compatible with the relevant context to manifest action. Recognizing the uncertainty of the environment, the designer leverages the understanding of trends, system propensities and potentials to apply a probabilistic, rather than a deterministic, approach to initiating action.

Herein lies SOD's greatest strength - its system of learning and problem setting. Design offers a way to think and gain understanding of unique situations through iterative meta-cognition throughout the operations process: planning, preparing and executing. The continuous reflectivity in learning prevents falling into cognitive stasis, theoretical stagnation, and operational irrelevancy.

## **SOLVING OR MANAGING COMPLEX ADAPTIVE PROBLEMS**

Any attempt to develop an integrative concept that combines EBAO and SOD must first reconcile a fundamental philosophical / theoretical argument. Are complex adaptive problems or, as Horst Rittel called them, 'wicked problems' solvable or only manageable?<sup>123</sup> The recent semantic disagreement over the language of the mission statement for the School of Advance Military Studies (SAMS) may offer insight. The current SAMS mission states:

“The School of Advanced Military Studies educates the future commanders and leaders of our Armed Forces, our Allies, and the Inter-agency at the graduate level to think strategically and operationally to *solve* complex adaptive problems across the security environment.”

On the one side of the debate are those who argue that by attaining a sufficient systemic understanding of the environment from which a problem arises, regardless of its complexity, a planning group can arrive at a solution [a premise of EBAO]. On the other side, the argument

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<sup>123</sup> Horst W. J. Rittel and Melvin M. Webber, "Dilemmas in a General Theory of Planning," *Policy Sciences* 4, 1973: 160-167.

centers on the very nature of a changing and dynamic CAS. A Design team is unable to precisely anticipate the multiple order impacts of intervening actions on such a system. At best the transformative efforts will achieve equilibrium within a range of tolerance. These efforts are only able to manage the problem(s) associated with a CAS, thus, potentially defying the predictive and teleological supposition of a solution [a premise of SOD]. Perhaps, there is a middle ground between the two claims.

Equally arguable is the point that future commanders and leaders must be capable of performing both as problem solvers and problem managers when dealing with CAS's. The key to settling the debate lies with the semantic nuances of the term solve. To illustrate the logic of this claim the following is a description of an ideal, yet quite conceivable, battle command approach which exemplifies how problem solvers can simultaneously be problem managers.

Given adequate time and augmented by credible experts, an experienced and intellectually competent commander and planning staff can apply Design and potentially achieve a sufficient systemic understanding of the complex adaptive system from which an operational problem arose.<sup>124</sup> This understanding may reduce the knowledge gap separating the actual reality and the observed reality. The differential between the two realities exists due to the qualitative interpretation of knowledge, and the exclusionary result of placing an artificial frame over the environment to focus future energies.

This focus of future energy becomes the commander's theory of action that informs subsequent planning processes linking actions and capabilities to desired outcomes and end-states. At the moment of energy injection into the environment, the complex adaptive system may change in unanticipated ways, thus, to some degree nullifying the expectations of the initial

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<sup>124</sup> Judging adequacy of time is a subjective balance between theorizing and acting.

actions.<sup>125</sup> At this point a solution's narrowly conceived predictive and teleological supposition will fail. Commanders and their planning staffs must maintain an adaptive stance which understands that the resolution to a problem lies within a range of tolerance.<sup>126</sup> Organizations adopting the range of 'good enough' when handling complex dynamic problems will increase the likelihood of eventual success.

Success hinges on the ability to conduct continual assessments of actions and the consequences of those actions on the complex adaptive system. Reflecting upon and iteratively learning about the ever-changing complexity of the system are keys to detecting any emergent properties in the system along with any adaptive behavior in its components.<sup>127</sup> Reflective feedback looping is an "azimuth check" to ensure the systemic understanding remains relevant. The reflection also validates the approach used to align the observed reality with the desired reality.

Informed by assessments conducted during execution, the commander may need to discourse with the senior authority regarding the suitability of the desired state's acceptable range of tolerance. The emerging situation may require a reformulation of the approach and/or a rescaling of the tolerable range. A pattern of learning fed by continual assessments and recursive discovery of new information increases the knowledge and the systemic understanding of the actual reality, thus enabling reframing of the complex adaptive system, the operational problem and the approach to system intervention.<sup>128</sup>

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<sup>125</sup> Wesley C. Salmon, *Causality and Explanation*. ( New York: Oxford University Press, 1998), 261, 280; Understanding propensities within the system may enable a degree of anticipation of when and how such changes may occur. Malcolm Gladwell's concept of 'tipping points' describes such changes in the internal processes of the system that alter the direction in which it moves. See Malcolm Gladwell, *The Tipping Point: How Little Things Can Make a Big Difference*, (Boston: Back Bay, 2002), 12.

<sup>126</sup> Hayward, 21-22.

<sup>127</sup> Bar-Yam, 19, 27.

<sup>128</sup> Robert Axelrod and Michael D. Cohen, *Harnessing Complexity: Organizational Implications of a Scientific Frontier*, (New York: Basic Books, 2000),121-123.

As long as the commander and his staff avoid fixating on set paradigms and accept that predictions are difficult in complex settings exhibiting emergence, the battle command system employed is capable of maintaining an adaptive stance. Buttressed with a measure of patience, while informed by a continually evolving systemic understanding, the commander's staff systematizes the continuum of incremental action, assessment, learning and adaptation.<sup>129</sup> Over time this iterative praxis transforms the problem to a sufficiently amenable outcome within the accepted range of tolerance. Perseverance, creativity and adaptivity are essential characteristics when operating in ambiguous operational environments.

Evinced by the tension between a strategic sponsor's vision of the desired end-state conditions and the emerging context, complex adaptive systems will invariably generate complex operational problems. Such problems will elude exclusively reductionist and deterministic approaches to developing causal understanding and precise solutions. Problem solving viewed in a teleological and finite way is futile. When faced with complex human-centric systems and their associated dynamic operational problems, operational headquarters apply Design's broader approach to create a systemic understanding capable of managing a problem within an acceptable range of equilibrium. This implies the underlying factors of complex problems never cease to exist. Thus, Design views solutions to complex problems as enduring and requiring continuous adaptive management to preserve equilibrium. Understood in a broader nuanced sense, complex adaptive problems are solvable but through recursively evolving management.

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<sup>129</sup> Bar-Yam, 15; Dietrich Dorner, *The Logic of Failure: Recognizing and Avoiding Error in Complex Situations*, trans. Rita and Robert Kimber, (New York: Basic Books, 1996), 42; David W. Robson, "Cognitive Rigidity: methods to overcome it," (Paper presented at the 2005 International Conference on Intelligence Analysis, sponsored by the Office of the Assistant Director of Central Intelligence for Analysis and Production, McLean, VA, 2-4 May, 2005), 1-3; Salmon, 33-42.

## CONCLUSION

### Recommendation: Integrating New Concepts to Enhance the Operations

#### Process

In the last fifteen years, coupled with the complexity of the operational environment, the character of conflict indicates a continuing trend towards the irregular.<sup>130</sup> Given this trend, operational artists have a need for methodologies to assist in developing a deeper understanding of such complex situations. Unfortunately, there exists a void in operational thinking while applying the U.S. Army's operations process. An overemphasis on action and execution leaves the process anemic with respect to the vital activity of generating the understanding from which to, first, correctly set the problem (see Figure 5).

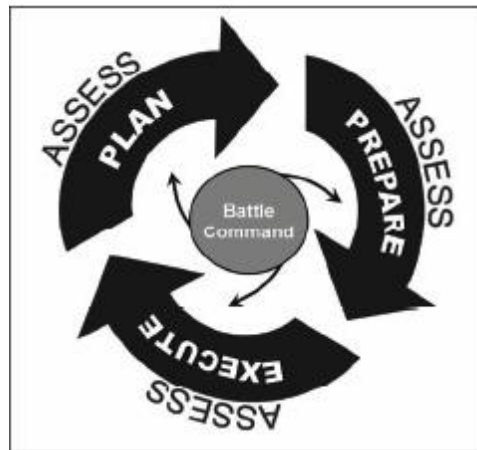


Figure 5: Current Operations Process Model<sup>131</sup>

Overall, EBAO and, particularly, Design offer useful tools for enhancing the operational artist's efforts throughout the operations process in developing and conducting comprehensive operations and campaigns that address relevant problems. EBAO, however, intrinsically maintains an action-oriented focus that seeks to generate a set of actions producing a range of

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<sup>130</sup> See Appendix 1 for an exposition on the complex array of threats the United States faces in the 21st century.

<sup>131</sup> FM 3-0, 5-16.

effects in order to achieve established objectives. On the other hand, Design employs an inquiry-oriented focus that seeks to generate a deep systemic understanding of the environment and the relevant systems within. Such an understanding ensures energy and resources are committed to resolving the correct problem set.

Though some aspects of the original EBAO concept are useful for the operational artist, Design offers a broader approach that already integrates the best aspects of EBAO, such as employing a systems perspective, understanding networks, linking strategic ends and tactical actions, and adapting via a system of assessment. Well suited for complex, globalized challenges, Design provides a powerful methodology for bringing about a deep systemic understanding of the operational environment, a more accurate identification of the operational problem set, and a comprehensive transformative solution to managing those problems in an ambiguous and politically volatile strategic context. Incorporating the Design methodology into the operations process will strengthen the operational artist's ability to generate understanding through critical thinking and to develop creative approaches to achieving aims.

In the ongoing effort to operationalize the Design concept, the U.S. Army's SAMS introduced a simplified conceptual construct from SOD's system of seven structuring concepts. Three cognitive spaces compose the construct - environmental space, problem space, and solution space.<sup>132</sup> These spaces roughly correspond to SOD's structuring concepts - environmental to the systems frame, problem to the three rationales, and solution to the operations frame, within which are also the operational effects and forms of function concepts. Substituting spaces for frames acknowledges the existence of numerous relevant frames within the operational environment depending, for example, on the perspective of the observer.

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<sup>132</sup> Stephan J. Banach and Alex Ryan, "The Art of Design: A Design Methodology," *Military Review*, March-April 2008: 109.

Integrating Design into the operations process should not be problematic. Intending never as an indictment of or a replacement to doctrinal planning processes, Design compliments planning by developing a deeper understanding of complex situations. The differences between Design and planning are, primarily, cognitive. However, each approach serves a particular function. Design sets and frames a problem through iterative learning to attain systemic and shared understanding, while planning focuses on action and applies recognized paradigms and mental models in order to solve problems.<sup>133</sup> Design seeks to add a modicum of structure to ill-structured problems so as to enable planning processes in creating the plan linking actions and capabilities to desired goals.

Design does not end with the interface between designers and planners via the campaign directive. Instead, Design continues throughout the operations process constantly framing or reframing understanding depending on new information received. Complimenting all four major command and control activities of plan, prepare, execute, and assess, Design performs a critical role ensuring the operational headquarters maintains an adaptive posture. Departing from the current doctrinal representation of the operations process, Figure 6 below illustrates the recommended modification reflecting this complimentary relationship.<sup>134</sup>

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<sup>133</sup> Alex Ryan. "Systemic Operational Design." Microsoft Powerpoint presentation developed for the School of Advanced Military Studies, Fort Leavenworth, KS, 2008.

<sup>134</sup> See FM 3-0, 5-16, for the current model illustrating the operations process.

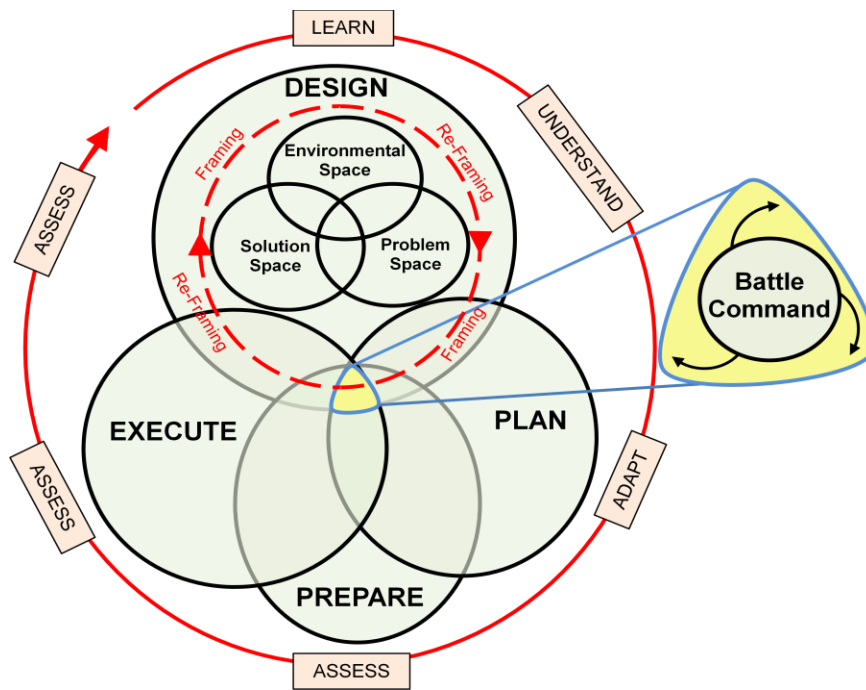


Figure 6: Modified operations process model

Adding Design to the model and depicting all activities as overlapping circles recognizes the reality that in any operation all these activities are taking place simultaneously. At the center of the ongoing activities is the commander applying the elements of battle command. Design is particularly informative to the commander regards the first three elements - understanding the environment, visualizing the desired conditions and a broad concept of how to transform the current situation to the desired, and describing the vision through various means including commander's intent and planning guidance.

Effective commanders and their headquarters create operational learning systems, depicted in the figure by the outer red circle, that constantly monitor and evaluate operations against measures of effectiveness and performance. Information garnered through assessment and fed back to the Design team permits the commander to continually validate his understanding of the environment for relevancy and sufficiency. Where there are gaps in understanding, new information spurs further learning. As new learning generates further understanding, the Design



team determines whether any differences in the environment or the behavior of systems developed. Understanding these differences facilitates adaptation to the changing situation. Operational learning systems structured with the Design concept for an operation or campaign prevents an organization from becoming operationally irrelevant.

## **Summary**

With the end of the Cold War and the collapse of the Soviet Union in 1991, the tense bipolar competition of the two superpowers' influence on maintaining a global balance of power and temperance on conflicts throughout the world also ended. As the grip of superpower strictures loosened, few will deny the resultant increase in complexity and dynamism that marks today's security environment. The rapidly changing and uncertain environmental and strategic realities of the past fifteen years have compelled U.S. operational and strategic leaders to review their understanding of operational art, find extant operational voids, and fill them with new or renewed conceptual approaches.

Within this environment, given its nature of complexity, uncertainty, and rapid change, the U.S. Military confronts the difficult challenge of evaluating the relevance of its institutional theoretical framework, epistemology, and cognitive paradigms. Relevant theoretical constructs enable critical examinations of conceptual patterns of operational thought and prevent a descent into conceptual irrelevancy and obsolescence. The significance of such examinations lies with their potential systemic and ontological impact on military institutions and their associated doctrine. Of particular importance is their impact on command practices, organizational functions and structures, organizational learning systems, and operational thinking.

This research finds the two alternative conceptual approaches to operational thought - EBAO and Design - as having considerable irreconcilable differences. Where EBAO applies a systems perspective to develop solutions through center of gravity and nodal link analyses,

Design focuses on deriving a deeper systemic understanding through heuristic thinking and learning. The risk of solving the wrong problem is far greater employing the former approach. The latter approach combines meta-questioning and action to advance iterative learning. The system of inquiry seeks to critically examine tensions between existing paradigms and the relevant emerging situation. In practice, overly reductive and algorithmic additions to the original EBAO concept, such as SOSA and ONA, discredited EBAO in the eyes of numerous U.S. Military senior leaders. Having fallen short on meeting its promise of predictivity, EBAO must return to its original principles to retain any relevancy in today's complex operational environment.

The similarities between EBAO and Design lie in the referential theories, particularly with respect to systems and the complexity of the environment. Those elements of EBAO are already resident in the Design approach. Other aspects of EBAO related to linking actions with aims reinforce Design's efforts in determining the functions for the transformative intervention and in establishing the forms those functions will take. EBAO is capable of augmenting Design in all three of its current construct of cognitive spaces.

Complimented by select EBAO elements and offering a broader holistic thinking and learning methodology, Design significantly enhances the commander-driven activities of the operations process. Possessing a system of continual inquiry the commander challenges the existing understanding of the problem, the relevancy of the functions employed to bring about transformation, and the effectiveness of the forms structured to carry out transformative actions. Given the non-linear and non-deterministic nature of the complex operational environment, the commander, informed by Design's meta-cognitive learning system, guides the iterative adaptation to maintain operational relevance and effectiveness in an ever-evolving situation. The net result is a vast improvement in the operational praxis of the organization and the practice of the operational art.

## APPENDIX 1: THE ARRAY OF THREATS

Known well in history, the extraordinary events of 1989-1991 leading to the collapse of the Soviet Union also marked the end of the Cold War. Undeniably, the outcome of the collapse was enormously positive. However, with the end of the global bi-polarity in the dynamics of international relations came the release of long-contained latent pressure of numerous nascent conflicts throughout the world. For nearly half a century the exigencies of maintaining a balance of power during the Cold War drove the two blocs to keep in check post-World War II and postcolonial intra- and interstate confrontations.<sup>135</sup> Seemingly the 'Pandora's Box' of conflict opened bringing with it a surge of wars for secession, independence, and unification in the 1990s. The political map of the globe changed dramatically by 2000.

The dawn of the 21st century promised a complex array of threats to U.S. security interests. Both the current National Military Strategy of the United States and the National Defense Strategy acknowledge the wide array of active adversaries and potential opponents to our national interests ranging from states to non-state organizations to individuals. Since the notable one-sided U.S. victory in the first Gulf War, the pendulum along the spectrum of conflict appears to have shifted away from major combat operations and toward the operational themes of irregular warfare, limited interventions, peace operations and peacetime military engagements.<sup>136</sup> As adversarial actors seek to avoid confronting the conventional superiority of technologically advanced militaries, the character of conflict will trend towards the irregular and "war among the people."<sup>137</sup> This is not to say that conventional force is no longer among a state's options.

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<sup>135</sup> Smith, *The Utility of Force*, 269.

<sup>136</sup> To find a detailed description of each operational theme, see FM 3-0, 2-3 to 2-13.

<sup>137</sup> Smith, *The Utility of Force*, 278.

## Conventional Challenges: Emerging Powers and Rogue States

In fact, some more powerful states, such as Brazil, Russia, India, and China, widely referred to as the BRIC alliance, are seeking regional dominance in some form whether political, military or economic, and are fast becoming global near-peer conventional force competitors to the United States. These emerging potential 'superpowers'<sup>138</sup> are racing to strengthen their military capabilities through vigorous modernization programs.<sup>139</sup> The vivid images of Russian armor penetrating deep into Georgian territory in August 2008 gives pause to the often heard notion that conventional conflict is an activity of the past.

Still others are 'rogues', such as Syria, Iran, and North Korea, whose behavior promotes instability in regions throughout the world. What makes these states exceptionally dangerous is their desire to enhance their traditional military capability with advanced ordnance delivery systems, including cruise and ballistic missiles, crude nuclear and radiological weapons, and sophisticated latest-generation niche conventional armaments. An equally alarming reason for concern over such 'rogues' is their support, albeit tacit in some cases, for shadowy terrorist and extremist organizations, both regional and transnational.<sup>140</sup>

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<sup>138</sup> Lyman Miller, *China an Emerging Superpower?*, *Stanford Journal of International Relations*, [http://www.stanford.edu/group/sjir/6.1.03\\_miller.html](http://www.stanford.edu/group/sjir/6.1.03_miller.html) (accessed 22 January 2009). Miller defines 'superpower' as a state "that has the capacity to project dominating power and influence anywhere in the world, and sometimes, in more than one region of the globe at a time, and so may plausibly attain the status of global hegemon." Additional interesting opinions are held by Kim Richard Nossal of McMaster University at <http://post.queensu.ca/~nossalk/papers/hyperpower.htm> and the Former Indian National Security Advisor Jyotindra Nath Dixit at <http://www.tribuneindia.com/2003/20030126/spectrum/main10.htm>.

<sup>139</sup> Mark R. Brawley, "Building Blocks or a BRIC Wall? Fitting U.S. Foreign Policy to the Shifting Distribution of Power," *Asian Perspective*, Vol. 31, No. 4, 2007: 152-155.

<sup>140</sup> National Military Strategy, 4; National Defense Strategy, 2-5.

## Unconventional Challenges: Non-State Actors

Other non-state actors include international criminal organizations that traffic in all sorts of illegitimate activities, and politically unconstrained illegal armed groups threatening stability and security inside states unable to effectively police the space within their borders.<sup>141</sup> Yet other non-state organizations such as Hezbollah, Hamas, the Iraqi Sadrist Shiite resistance movement known as the Jaysh al-Mahdi or Mahdi Army are uniquely organized into an armed wing and a political wing.<sup>142</sup> The latter of each is an integral part of the established political structure of the state within which they exist and enjoy the support of a sizable segment of the population, thereby making them semi-legitimate.

Still other non-state armed groups, though not fully integrated in the state political structure, have established de facto control over portions of a state. Examples of these groups include the Hezbollah, Hamas (Gaza Strip, only) the Communists Party of Nepal (Maoist) and the Liberation Tigers of Tamil Eelam (LTTE) in Sri Lanka.<sup>143</sup> In essence, the area controlled by such a group constitutes a state within a state, governed by parallel political, judicial and civil service structures. The disquieting concern regarding a few non-state armed groups lies in their increasingly sophisticated military capabilities.

## Hybridization of the Adversary

Secretary of Defense Robert Gates illuminated the increasing military formidability of certain non-state groups such as Hezbollah and the LTTE. Enabled by the interconnectedness of

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<sup>141</sup> National Military Strategy, 4-5.

<sup>142</sup> Keith A. Petty, "Veiled impunity: Iran's use of non-state armed groups," *Denver Journal of International Law and Policy*, 22 March 2008, [http://www.accessmylibrary.com/coms2/summary\\_0286-34837503\\_ITM](http://www.accessmylibrary.com/coms2/summary_0286-34837503_ITM) (accessed 22 January 2009).

<sup>143</sup> Transnational and Non-State Armed Groups: Legal and Policy Responses, Program of Humanitarian Policy and Conflict Research at Harvard University, [http://www.armed-groups.org/home/about\\_database.aspx](http://www.armed-groups.org/home/about_database.aspx) (accessed 22 January 2009).

global communications and externally supported with state-of-the-art military hardware, technology, and technical assistance, such groups are developing operational concepts that blend multiple forms of warfare. Subsequently these groups formed sophisticated organizational patterns capable of operating across the seams of warfare's various forms. He argues:

“... the categories of warfare are blurring and do not fit into neat, tidy boxes. We can expect to see more tools and tactics of destruction - from the sophisticated to the simple - being employed simultaneously in hybrid and more complex forms of warfare.”<sup>144</sup>

These hybrid threats merge the shadowy techniques of irregular warfare with more traditional conventional operations, both enhanced by select high-tech niche weaponry, and choose to fight 'among the people'.<sup>145</sup> The net result is hybrid asymmetric threats presenting challenges comparable to more traditional military scenarios while engaging in the shadowy operations of irregular warfare.

The current security and operational environment composed of a range of threats presents a multifaceted array of challenges to operational thinking. The interwoven nexus among such transnational / regional and state / non-state actors presents a complex threat arrangement taxing the ability to generate a thorough systemic understanding of the global security environment. As long as adversaries continue to perceive U.S. superiority in conventional operations, future operations will predominately occur in complex urban terrain. This urban environment invites the adversary to negate conventional advantages by sheltering in cities and hiding among the population and legally protected structures. Adversaries will force U.S. forces to fight in city streets and alleys, thereby, increasing the likelihood of collateral damage to property and civilian populations. The primary future fields of battle will occur in the hearts and minds of people, the

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<sup>144</sup> Secretary of Defense Robert Gates, speech to the National Defense University, 29 Sep 08. <http://www.defenselink.mil/speeches/speech.aspx?speechid=1279> (accessed 22 January 2009).

<sup>145</sup> Smith, *The Utility of Force*, 17-18.

global mass media, and cyberspace, all of which are intertwined in the globalized environment. In short, irregular warfare is becoming ever more regular.

Since OPERATION JOINT ENDEAVOR in Bosnia, the United States has become increasingly aware that success in handling contemporary foreign policy challenges depends on employing a comprehensive and collaborative multinational approach. Enhanced by a deep cultural awareness and understanding, this approach must use a mix of soft and hard power.<sup>146</sup> With respect to the military instrument, simply applying prescriptive problem-solving techniques and traditional combat solutions to countering threats may be neither appropriate nor sufficient. The demands that the complex operational environment place on the United States defy such approaches. Though serving well in structured well-defined situations, current U.S. military planning and problem-solving doctrine requires imaginative new methods and cognition. Though in the midst of theoretical transformation, the current paradigms still fall short of addressing situations involving ill-structured and ill-defined problems rooted in complex adaptive systems.

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<sup>146</sup> Soft power refers to various forms of persuasion involving the diplomatic, informational, economic, financial, intelligence, and law enforcement instruments of national power, while hard power refers to the military instrument.

## APPENDIX 2: CORE PRINCIPLES OF EBAO

The following summarized points are some of the core principles that underpin EBAO.<sup>147</sup>

*"An effects-based approach is a comprehensive way of thinking about operations."* It does not prescribe a specific strategy but helps to formulate the appropriate one for the situation. EBA can apply anywhere along the spectrum of conflict and for any operational theme.

*"Effects-based operations recognize that comprehensive knowledge of all actors and the operational environment are important to success, but come at a price."* The understanding EBA requires is holistic and systems-based. However, there exists a high cost in times, resources, and effort to attain an ever-deeper understanding of the adversary and the operational environment within which it operates. As military organizations are inherently action-oriented, the time will come to act and the generated understanding as it stands will have to do.

*"EBO should focus upon the objectives and the end state."* It seeks to focus all efforts toward the nested objectives across all levels of war while minimizing unintended consequences.

*"Effects-based operations are about creating effects, not about platforms, weapons, or methods."* Though enabling new effects through technological advances, the resources employed to achieve desired outcomes are subordinate to the desired effects.

*"Effects-based operations should seek to achieve objectives most effectively, then to the degree possible, most efficiently."* Though the effectiveness of the method used is of prime importance, the cost in lives, resources, time and opportunities employing that method may preclude its use. Undeniably, it is necessary to consider the results of a cost-benefit analysis given these factors.

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<sup>147</sup> For greater explanatory depth see U.S. Department of the Air Force, Air Force Doctrine Document 2, *Operations and Organization*, (Washington DC: Headquarters, Department of the Air Force, 3 April 2007), 13-20.



*"Effects-based operations cut across all dimensions, disciplines, and levels of war."* Each instrument of national power - diplomatic, informational, military, law enforcement, and economic offers unique capabilities and options not found in others that can contribute best in achieving desired objectives. EBA understands the enormous advantages of a totality-of or all-of-government approach to achieving objectives nested across all levels of war.

*"Effects-based operations recognize that war is a clash of complex adaptive systems."* EBA understands the complexity and non-linearity of warfare. As war is a human activity, the systems involved are living and, thus, adapt to any changes or interventions in the operational environment. Linkages or interactions within such systems are often intangible and center on human relational behavior. Tracing causality and predicting effects are difficult, if not impossible the more complex the system. However, through an accumulation of effects brought on by actions determined by observation or induction, EBA can achieve objectives, albeit patiently and with continual adjustments.

*"Effects-based operations focus on behavior, not just physical changes."* Ultimately, the aim is to force the adversary's will to conform to ours. Indeed, the impacts against moral factors may far outweigh those against physical factors in manifesting conformity. At times the synergy of effects against both moral and physical characteristics of the adversary is the most effective and efficient method.

*"Effects-based operations should always consider the 'law of unintended consequences'."* EBA recognizes that there is a degree of unpredictability when intervening in a complex system. Thus, indiscernible or emergent behavior as the system adapts to change may result in unintended effects.

## BIBLIOGRAPHY

### Books

- Anderson, Walter Truett. *The Truth About The Truth: De-confusing and Re-constructing the Postmodern World*. New York: Tarcher, 1995.
- Axelrod, Robert and Michael D. Cohen. *Harnessing Complexity: Organizational Implications of a Scientific Frontier*. New York: Basic Books, 2000.
- Bar-Yam, Yaneer. *Making Things Work: Solving Complex Problems in a Complex World*. Cambridge, MA: New England Complex Systems Institute, Knowledge Press, 2004.
- Bertalanffy, Ludwig von. *General Systems Theory: Foundations, Development, Applications*. New York: George Braziller, 1968.
- Brown, Sheryl J. and Kimber M. Schraub. *Resolving Third World Conflict: Challenges for a New Era*. Washington DC: United States Institute of Peace Press Books, 1992.
- Buckley, John. *Air Power in the Age of Total War*. Bloomington, IN: Indiana University Press, 1999.
- Chalybaus, Heinrich Moritz. *Historical Development of Speculative Philosophy: From Kant to Hegel*. Translated by Alfred Edersheim. London: Adams & Company, 1854.
- Citino, Robert Michael. *Blitzkrieg to Desert Storm: The Evolution of Operational Warfare*. Lawrence, KS: University Press of Kansas, 2004.
- Clancy, Tom and Chuck Horner. *Every Man a Tiger*. New York: Putnam, 1999.
- Clausewitz, Carl von. *On War*. Translated and edited by Michael Howard and Peter Paret. Princeton, N.J.: Princeton University Press, 1984.
- Deptula, David A. *Effect Based Operations: Change in the Nature of Warfare*. Arlington, VA: Aerospace Education Foundation, 2001.
- Dorner, Dietrich. *The Logic of Failure: Recognizing and Avoiding Error in Complex Situations*. Translated by Rita and Robert Kimber. New York: Basic Books, 1996.
- Douhet, Giulio. *The Command of the Air*. Translated by Dino Ferrari. Washington, DC: Office of Air Force History, 1983.
- Gladwell, Malcolm. *The Tipping Point: How Little Things Can Make a Big Difference*. Boston: Back Bay, 2002.
- Gray, Chris Hables. *Postmodern War: The New Politics of Conflict*. New York: The Guilford Press, 1997.
- Huntington, Samuel P. *The Clash of Civilizations and the Remaking of World Order*. New York: Simon & Schuster Paperbacks, 1996.
- Johnson, Steven. *Emergence: The Connected Lives of Ants, Brains, Cities and Software*. New York: Scribner, 2001.
- Kiel, Douglas L. and Euel Elliott. *Chaos Theory in the Social Science: Foundations and Applications*. Ann Arbor, MI: University of Michigan Press, 1997.
- Klein, Gary T. *Sources of Power: How People Make Decisions*. Cambridge, Mass: MIT Press, 1998.

- Laszlo, Ervin. *The Systems View of the World: A Holistic Vision for Our Time*. New Jersey: Hampton Press, Inc., 1996.
- Naveh, Shimon. *In Pursuit of Military Excellence: The evolution of operational theory*. London: Frank Cass, 1997.
- Pape, Robert A. *Bombing to Win: Air Power and Coercion in War*. Ithaca, New York: Cornell University Press, 1996.
- Salmon, Wesley C. *Causality and Explanation*. New York: Oxford University Press, 1998.
- Smith, Rupert. *The Utility of Force: The Art of War in the Modern World*. London: Penguin Books Ltd, 2005.
- Tzu, Sun. *The Art of War*. Translated by Samuel B. Griffith. New York: Oxford University Press, 1971.

### Articles

- Banach, Stephan J. and Alex Ryan. "The Art of Design: A Design Methodology." *Military Review* (March-April 2008): 105-115.
- Brawley, Mark R. "Building Blocks or a BRIC Wall? Fitting U.S. Foreign Policy to the Shifting Distribution of Power." *Asian Perspective*, Vol. 31, No. 4 ( 2007): 152-155.
- Mattis, General James N. "USJFCOM Commander's Guidance for Effects-based Operations." *Joint Force Quarterly 51* (4th Quarter, 2008): 105-108.
- Peters, Ralph. "The Culture of Future Conflict." *Parameters* (Winter, 1995-96): 18-27.
- Riper, Paul K. "EBO: There Was No Baby in the Bathwater." *Joint Force Quarterly 52* (1st Quarter, 2009): 82-85.
- Rittel, Horst W. J. and Melvin M. Webber. "Dilemmas in a General Theory of Planning." *Policy Sciences 4* (1973): 155-169.
- Vego, Milan N. "Systems versus Classical Approach to Warfare." *Joint Force Quarterly 52* (1st Quarter, 2009): 40-48.

### Theses

- Beagle, T.W. "Effects-Based Targeting: Another Empty Promise?" Master's thesis, Air University, Maxwell Air Force Base: School of Advanced Airpower Studies, June 2000.
- Bell, Christopher J. "Is Systemic Operation Design Capable of Reducing Significantly Bias in Operational Level Planning Caused by Military Organizational Culture?" Master's thesis, School of Advanced Military Studies, US Army Command and General Staff College, Fort Leavenworth, KS, 2006.
- Hayward, Edward P. W. "Planning Beyond Tactics: Towards a Military Application of the Philosophy of Design in the Formulation of Strategy." Master's thesis, School of Advanced Military Studies, US Army Command and General Staff College, Fort Leavenworth, KS, 2008.
- Lanir, Zvi and Gad Sneh, "The New Agenda of Praxis." Monograph. Tel Aviv: Lanir-Decision and Learning Systems, 2000. Taken from R. Rorty, *Philosophy and the Mirror of Nature*. Princeton, NJ: Princeton University Press, 1979.
- Ryan, Alex. "What is a Systems Approach?" Chapter 3 of PhD diss., The University of Adelaide, 2007.

Sorrells, William T., et al, "Systemic Operational Design: An Introduction." Master's thesis, School of Advanced Military Studies, US Army Command and General Staff College, Fort Leavenworth, KS, 2005.

### **Internet Sources**

Donald Lowe and Simon Ng, "Effects-based operations: language, meaning and the effects-based approach," 2004 Command and Control Research and Technology Symposium: The Power of Information Age Concepts and Technologies, Defence Science and Technology Organization, Australian Department of Defence, 3.  
[http://www.au.af.mil/au/awc/awcgate/ccrp/ebo\\_language.pdf](http://www.au.af.mil/au/awc/awcgate/ccrp/ebo_language.pdf) (accessed November 28, 2008).

George W. Casey, Chief of Staff, United States Army, "Persistent Conflict: The New Strategic Environment," an address given to the Los Angeles World Affairs Council on September 27, 2007. <http://www.lawac.org/speech/2007-08/CASEY,Gen.George2007.pdf> (accessed January 19, 2009).

Richard P. Hallion, "Precision Guided Munitions and the New Era of Warfare," APSC Paper Number 53, Air Power Studies Center, Royal Australian Air Force, 1995.  
<http://www.fas.org/man/dod-101/sys/smart/docs/paper53.htm> (accessed January 25, 2009).

"Joint Doctrine Development: Joint Doctrine Process." Joint Electronic Library.  
[http://www.dtic.mil/doctrine/joint\\_doctrine\\_development.htm](http://www.dtic.mil/doctrine/joint_doctrine_development.htm) (accessed January 16, 2009).

### **U. S. Government Publications**

Joint Chiefs of Staff. The National Military Strategy of the United States of America 2004. Washington, DC, 2004.

U.S. Army Command and General Staff College. *Carl von Clausewitz: Two Letters on Strategy*. Edited and translated by Peter Paret and Daniel Moran, Fort Leavenworth, KS: Combat Studies Institute Reprint, 1984.

U.S. Department of the Air Force, Air Force Doctrine Document 2. *Operations and Organization*. Washington DC: Headquarters, Department of the Air Force, 3 April 2007.

U.S. Department of the Army. Field Manual 3-0 (FM 3-0). *Operations*. Washington, DC: Headquarters, Department of the Army, February 2008.

\_\_\_\_\_. Field Manual 3-07 (FM 3-07). *Stability Operations and Support Operations*. Washington, DC: Headquarters, Department of the Army, February 2003.

\_\_\_\_\_. Field Manual 3-24 (FM 3-24). *Counterinsurgency*. Washington, DC: Headquarters, Department of the Army, December 2006.

\_\_\_\_\_. Field Manual 5-0 (FM 5-0). *Army Planning and Orders Production*. Washington, DC: Headquarters, Department of the Army, January 2005.

\_\_\_\_\_. Field Manual 6-0 (FM 6-0). *Mission Command: Command and Control of Army Forces*. Washington, DC: Headquarters, Department of the Army, August 2005.

\_\_\_\_\_. Field Manual 100-5 (FM 100-5). *Operations*. Washington, DC: Headquarters, Department of the Army, 1 July 1976.

- \_\_\_\_\_. Field Manual Interim 5-0.1 (FMI 5-0.1). *The Operations Process*. Washington, DC: Headquarters, Department of the Army, March 2006, with change 1 dated 14 March 2008.
- \_\_\_\_\_. Field Manual Interim 5-2 (FMI 5-2). *Design* (Draft-unpublished and unapproved). Washington, DC: Headquarters, Department of the Army, 20 February 2009.
- \_\_\_\_\_. TRADOC Pamphlet 525-5-500. *Commander's Appreciation and Campaign Design, Version 1.0*. Fort Monroe, Virginia: Training and Doctrine Command, January 2008.
- U.S. Department of Defense. Joint Publication 1-02 (JP 1-02). *Department of Defense Dictionary of Military and Associated Terms*. Washington, DC: Department of Defense, 12 April 2001, as amended through 17 October 2008.
- \_\_\_\_\_. Joint Publication 3-0 (JP 3-0). *Joint Operations Incorporating Change 1*. Washington, DC: Department of Defense, 17 September 2006 and 13 February 2008.
- \_\_\_\_\_. Joint Publication 5-0 (JP 5-0). *Joint Operation Planning*. Washington, DC: Department of Defense, 26 December 2006.
- \_\_\_\_\_. *The Implementation of Network-Centric Warfare*. Command and Control Research Program, Washington, DC, 2005.
- \_\_\_\_\_. *National Defense Strategy*. Washington, DC, June 2008.
- \_\_\_\_\_. *Network Centric Warfare: Developing and Leveraging Information Superiority*. Command and Control Research Program. Washington, DC, 1999.
- \_\_\_\_\_. *Quadrennial Defense Review Report*. Washington, DC, 6 February 2006.
- U.S. General Accounting Office. "Operation Desert Storm: Evaluation of the Air Campaign." GAO/NSIAD-97-134. Washington, DC: June 1997.
- U.S. Joint Forces Command. *Commander's Handbook for an Effects-Based Approach to Joint Operations*. Suffolk, VA: Joint Warfighting Center. Joint Concept Development and Experimentation Directorate. 24 February 2006.
- \_\_\_\_\_. *Commander's Handbook for an Effects-Based Approach to Joint Operations, Supplement 1*. Suffolk, VA: Joint Warfighting Center. Joint Concept Development and Experimentation Directorate. 24 February 2006.
- \_\_\_\_\_. *Commander's Handbook for an Effects-Based Approach to Joint Operations, Supplement 2*. Suffolk, VA: Joint Warfighting Center. Joint Concept Development and Experimentation Directorate. 24 February 2006.

### **Other Sources**

- Alberts, David S. and Richard E. Hayes. *Power to the Edge: Command...Control...in the Information Age*. Command and Control Research Program, Department of Defense Center for Advanced Concepts and Technology, June 2003.
- Gracier, Ofra, Gad Sneh, and Shimon Naveh. "Between Strategic Direction and Tactical Action: Systemic Operational Design - the unique practice of operational architects." (Microsoft Powerpoint presentation given to the School of Advanced Military Studies, Fort

- Leavenworth, Kansas, January, 2005). Israeli Defense Forces: Operational Theory Research Institute.
- Murray, Williamson and Kevin Woods. *Thoughts on Effects-Based Operations, Strategy, and the Conduct of War*. Alexandria, VA: Institute for Defense Analyses - Joint Advanced Warfighting Program, 2004.
- Naveh, Shimon. "Asymmetric Conflict: An Operational reflection on Hegemonic Strategies." Operational Theory Research Institute, 2002.
- \_\_\_\_\_. "Discursive Command – Operators – Systemic Operational Design: A New Framework for Strategic Epistemology." (Paper provided to faculty at the School of Advanced Military Studies, Fort Leavenworth, KS).
- \_\_\_\_\_. "Questions of Operational Art: Depth Structure of SOD" (Microsoft Word presentation given to the School of Advanced Military Studies, Fort Leavenworth, Kansas, December, 2005) Israeli Defense Forces: Operational Theory Research Institute.
- \_\_\_\_\_. "Questions of Operational Art: Depth Structure of SOD and Reflective Spaces of Deliberation" (Microsoft Word presentation given to the School of Advanced Military Studies, Fort Leavenworth, Kansas, December, 2006). Israeli Defense Forces: Operational Theory Research Institute.
- Robson, David W. "Cognitive Rigidity: methods to overcome it." (Paper presented at the 2005 International Conference on Intelligence Analysis. Sponsored by the Office of the Assistant Director of Central Intelligence for Analysis and Production. McLean, VA, 2-4 May, 2005.
- Ryan, Alex. "Complex Adaptive Systems." Microsoft Powerpoint presentation developed for the School of Advanced Military Studies, Fort Leavenworth, KS, 2008.
- \_\_\_\_\_. "Systemic Operational Design." Microsoft Powerpoint presentation developed for the School of Advanced Military Studies, Fort Leavenworth, KS, 2008.
- Smith, Edward A. "Complexity, Networking, and Effects-Based Operations: Approaching the "how to" of EBO." The Boeing Company. Arlington, VA, 2005.