

**THE INTEROPERABILITY OF FUTURE OPERATIONAL CONCEPTS
OF NATO FORCES**

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Executive Summary. This study examines the interoperability of the future operational concepts of the United States and NATO. As the United States continues to transform its military as part of a general revolution in military affairs (RMA), the speed and extent of that transformation might create dangerous technological, organizational, doctrinal, and perhaps cultural gaps might develop between U.S. forces and those of other members of the Alliance. Clearly, such gaps would have negative political and strategic implications for NATO. This study furthers our understanding of one of those potential gaps by examining the interoperability of U.S. and NATO future operational concepts.

Evidence suggests that despite the best efforts and intentions of all concerned, some gap in technological capabilities will likely exist between the U.S. military and its NATO partners. If that in fact occurs, the compatibility of the Alliance's future operational concepts will assume greater significance. Military concepts provide the intellectual middle-ground for translating broad visions, such as the U.S. military's *Joint Vision 2020 (JV 2020)*, into the basic foundations of doctrine, as reflected in such doctrinal instruments as *Joint Publication 3.0 (JP 3.0)*. Accordingly, a gap in concepts will ultimately lead to incongruities in doctrine.

A comparison of U.S. future operational concepts with those now under consideration in NATO's Concept Development and Experimentation (CDE) process

reveals that the Alliance has no umbrella or overarching concept. All of its concepts (or projects) amount to enabling concepts. Only the United States currently has an overarching concept in the form of Rapid Decisive Operations (RDO). As enabling concepts, NATO's concepts are not incompatible with RDO, or any of its supporting initiatives.

However, interviews in France, Germany, and the United Kingdom revealed that very few officers were familiar with RDO or the assumptions upon which it is based. Once the RDO concept was explained, NATO officers grasped it quickly. Remarkably, reception of the concept was divided among service, rather than national lines. In other words, officers from the Royal Air Force and the U.S. Air Force saw RDO in a similar light and embraced it much more enthusiastically than did their army, navy, and marine counterparts.

This disparity in perspectives has been brought about, in part, by differences in service traditions and cultures, which in turn have been exasperated by the RMA and what it portends for future warfare. For instance, air force officers tend to believe that the RMA will increase substantially the relative power of their service with respect to the others: they, in short, are what is "new" about twenty-first-century warfare. Consequently, they believe that their service should receive the top priority in terms of transformation and warfighting. The response of the other services typically is that the RMA will not change the fundamental nature of war; therefore, distribution of resources

should remain balanced. Unfortunately, this response tends to come across as intransigent.

In most cases, differences in service perspectives are as sincere as they are inevitable. Under certain circumstances they can prove productive because they create a dialectical tension of sorts that can lead to healthy debate over the merits of change (among other things). However, if taken too far—which is too often the case—they pose obvious challenges for jointness and NATO interoperability. In addition to differences in national culture, therefore, NATO will have to contend with the friction that emerges from any potential realignment of service roles as a result of the RMA. Hence, one of the findings of this study is that service perspectives, perhaps intertwined in national cultures, may pose a significant challenge for achieving interoperability in the Alliance's future operational concepts.

However, the most important finding of this study is that the NATO CDE process, which already has several projects under review, would benefit from an Assumptions-Based Concept Development (ABCD) procedure that examines a concept's underlying assumptions and tests their validity. To embrace a concept—whether old or new—Alliance members must be comfortable with the assumptions upon which it is based. Assumptions form the core of a concept; to get at them one must often strip away a great deal of rhetoric, which is usually designed to seduce. Ensuring the interoperability

of NATO concepts should thus involve some method of analyzing the assumptions of those concepts and exposing them to the scrutiny of Alliance members.

ABCD, or a similar method, could also be applied to certain traditional or contemporary operational concepts—such as the center of gravity. Although NATO forces base their understanding of the center of gravity concept on Clausewitz's description, they have misinterpreted his basic idea. A process for laying bare the assumptions underpinning the center of gravity concept and getting back to the original idea could reduce confusion in NATO operational planning and execution.

Introduction

This study began with the hypothesis that individual national cultures might act as barriers to achieving the effective interoperability of NATO's future operational concepts. Indeed, as the recent international controversy over Operation Iraqi Freedom demonstrates, national cultures, informed by a variety of political perspectives and disparate interests, will at times generate friction for the Alliance. At some point, certain NATO members might even drift apart as the post-Cold War realignment takes new forms. On the other hand, it is also possible that a future crisis of some sort will force the United States and western Europe to work more closely together.¹ Such is the nature of international politics. It is not clear that the individual NATO officer can—or *should*—do much to channel the shifting winds of political change in any particular direction.

Nonetheless, the findings of this study underscore the significance of another potential barrier to interoperability, one that NATO officers can—and should—affect, namely, the lack of congruity in service perspectives. For instance, officers from the Royal Air Force and the U.S. Air Force appear more likely to agree with each other on

¹ Simon Serfaty, *The European Finality Debate and Its National Dimensions* (Washington, D.C.: Center for Strategic and International Studies) discusses Europe's struggle for a post-Cold War identity and how to define its future relationship with the United States.

the merit of certain future operational concepts than they are with their army, navy, or marine counterparts. These differences in service perspectives are due in part to dissimilarities in roles and missions, traditions, and cultures. The Revolution in Military Affairs (RMA) and the changes in roles, missions, and priorities it foreshadows for the future have exacerbated these differences. Some air force officers, for example, believe that the RMA is substantially increasing the relative power of their service with respect to the others.² Accordingly, they maintain that their service should be expanded (even at the expense of the other services) and that it should receive the bulk of available resources for transformation.³ In response, the other services argue that the “friction” of war demands balanced capabilities; the RMA will affect all services in ways that are still unpredictable and it is, therefore, premature to make momentous—and perhaps harmful—decisions about resource priorities. Thus, while the disparity in service perspectives can generate healthy competition, it can also place some significant obstacles in the path of “jointness,” and NATO interoperability.

Until recently, most research concerning the interoperability of NATO forces focused primarily on the issue of technological compatibility. The seminal study, *Mind the Gap: Promoting a Transatlantic Revolution in Military Affairs*, lays out the

² As one analyst reflects, this attitude is widespread within the Pentagon. Loren B. Thompson, “Raptor’s New Design is Long Overdue,” Lexington Issue Brief, September 13, 2002.

³ “Air Force Innovation & National Security Transformation,” presented at the U.S. Army War College in April 2001.

nature of the problem.⁴ It rightly maintained that, as the U.S. military continues to transform as part of the RMA, a dangerous technological gap might develop between its forces and those of other members of the Alliance. Obviously, such a divide could generate serious and potentially negative political and strategic implications for NATO.

As NATO's Concept Development & Experimentation (CDE) process reveals, a great deal of attention is now being focused on addressing technological disparity. Not surprisingly, the greatest barrier to bridging this gap is money. Individually, few NATO countries have defense budgets large enough to effect anything like the military transformation now underway in the United States. In 2001, for example, collectively, NATO Europe spent more than \$126 billion on defense while the United States spent more than twice that amount, over \$284 billion.⁵ What Europe's NATO partners might accomplish by complementing rather than duplicating their efforts, however, is another matter. They could, for example, adopt the strategy of "divide and conquer" by having certain partners focus on developing one or two specific capabilities—such as strategic lift, special operations forces, missile defenses, or secure communications—that would contribute to an overall NATO force. Yet, on the issue of military spending, "political

⁴ David C. Gompert, Richard L. Kugler, and Martin C. Libicki, *Mind the Gap: Promoting a Transatlantic Revolution in Military Affairs* (Washington, D.C.: Institute for National and Strategic Studies, 1999).

⁵ Jean-Paul Béchat and Felix G. Rohatyn, *The Future of the Transatlantic Defense Community*, Final Report of the CSIS Commission on Transatlantic Security and Industrial Cooperation in the Twenty-first Century (Washington, D.C.: Center for Strategic and International Studies, 2003), Appendix B.

will” remains the decisive factor. Can the French count on the Germans to be there when they need them, and vice versa?

The authors of *Mind the Gap* laid the foundation for other researchers and analysts interested in looking at the non-technological aspects of interoperability. For example, a more recent study, “Hanging Together: Interoperability within the Alliance and with Coalition Partners in an Era of Technological Innovation,” has now expanded the question of interoperability from technological issues to those of organization, doctrine, and culture.⁶ As the author points out, an important prerequisite for the technological exchange of services is a common operational framework, one built upon compatible operational concepts.

This observation also constituted one of the findings of a French-German-UK-US working group which stressed that “technical interoperability was neither essential nor sufficient to achieve desirable coalition behaviors.”⁷ Merely exchanging data without the ability to understand and act on that data will not enhance coalition military operations. Conversely, regardless of how interoperable coalition technology is, other variables such as organization, doctrine, and procedures will still influence the outcome of military operations. The group therefore coined the term “cooperability” to reflect the necessity

⁶ Michael Codner, “Hanging Together: Interoperability within the Alliance and with Coalition Partners in an Era of Technological Innovation,” 2000 NATO Fellowship Final Report.

⁷ *Coalition Military Operations: The Way Ahead through Cooperability* (Arlington, Va.: U.S. Center for Research and Education on Strategy and Technology, April 2000), 29.

of bridging the various differences in doctrine, organization, and culture in order to achieve cohesion in military operations.

The term cooperability was recently used by a German-American research team as a basis for further examination of the problem of interoperability. The resultant study, *Shoulder to Shoulder: The Road to U.S.-European Military Cooperability*, recommended, among other things, that NATO put greater effort into exploring and implementing common concepts of operation that stress “rapid-short warning deployability, defeat of anti-access threats, integrated net-worked maneuver-and-strike operations, and...post-war stability operations.”⁸ This report concluded that NATO should take immediate action to resolve non-technological issues—the concepts, doctrine, and organizational challenges—and focus on developing peripheral capabilities while efforts remain ongoing to close the technology gap over the long-term.

As these recent works show, non-technical issues have gained prominence as a critical, if partial, solution to the question of interoperability. Indeed, the popular term now in use in defense circles is the “capabilities gap,” which encompasses the whole gamut of issues from technological interoperability to political will.⁹

⁸ David C. Gompert and Uwe Nerlich, *Shoulder to Shoulder: The Road to U.S.-European Military Cooperability* (Arlington, Va.: RAND, 2002), 68.

⁹ As one analyst explained, “The gap is no longer defined by the availability and quality of military capabilities, but also by the will to use whatever capabilities are available.” Simon Serfaty, “September 11, One Year Later: A Fading Transatlantic Partnership?” *Euro-Focus*, Vol. 8, No. 5, September 11, 2002, p. 3; see also Peter Finn, “Military Gap Grows Between U.S., NATO Allies,”

NATO's definition of interoperability (and the one used here) is "the ability of systems, units or forces to provide services to and accept services from other systems, units or forces and to use these services so exchanged to enable them to operate effectively together."¹⁰ Operational concepts lie at the core of interoperability because they provide the intellectual middle-ground for translating broad visions—such as *Joint Vision 2020*—into the basic instruments of doctrine, such as *Joint Pub 3.0*. Hence, reconciling incompatible future operational concepts helps to ensure that continued doctrinal interoperability is maintained over the long term. Ensuring continuity through periods of transition is especially important, since few military forces can typically afford to take a "time out" from preparing for and conducting crisis response and other urgent missions.

Paradoxically, just such a break in concepts is anticipated—even desired—as part of the ongoing RMA. Some proponents of change suggest that a measure of success for the current transformation of U.S. military forces is the size of the gap between today's and tomorrow's operational concepts. In fact, the U.S. military collectively assumes that a dramatic shift, or revolution, will occur in the way it thinks about future operations.¹¹ For instance, the Chief of Staff of the U.S. Army declared that the U.S.

Washington Post, May 19, 2002.

¹⁰ NATO Standardization Agreement, AAP-6.

¹¹ U.S. Joint Forces Command's Millennium Challenge 2002 Quick Look Report, p. 53.

Army's transformation will entail an intellectual as well as a technological revolution.¹² Similarly, the Chief of Staff of the U.S. Air Force, the U.S. Chief of Naval Operations, and the Commandant of the U.S. Marine Corps expect to change *how* their respective services think about warfare.¹³ Presumably, anything less than an essential break with the past may appear as less than successful.

This expected break, in fact, raises questions about the ability of other NATO partners to keep pace with the United States in concept development. Accordingly, as the emerging technological gap between the United States and other NATO forces grows in importance, so too will the need for a set of compatible operational concepts. *As a step toward development of compatible concepts, this report recommends the NATO participate more extensively in USJFCOM's experimentation efforts.*

Fortunately, unlike technology, operational concepts (whether old or new) need not be completely interchangeable to achieve interoperability; they need only be compatible. The test for compatibility requires a method for analyzing a concept's underlying assumptions. *NATO does not yet have such a method; this report recommends that it adopt an Assumptions-Based Concept Development (ABCD) procedure and incorporate it into the CDE process.*

¹² "Army Transformation Briefing," presented at the U.S. Army War College, April 2001.

¹³ "Air Force Innovation & National Security Transformation"; "A 21st Century Navy: Transformation"; "Marine Corps Evolutionary Transformation," all presented at the U.S. Army War College, April 2001.

Yet, the anticipated break with the past also raises questions about the continued validity of traditional operational concepts such as the center of gravity.¹⁴ NATO's definition of the center of gravity reflects almost verbatim that of USJFCOM. Yet, the concept, which derives from the writings of the nineteenth-century Prussian military thinker, Carl von Clausewitz (1780-1831), is incorrectly understood by both, thereby resulting in a great deal of confusion about the concept's applicability to war planning. Thus, the interoperability of certain current operational concepts must be considered as well.

A Note on Research. Research methodology for this study consisted of a series of interviews with senior officers, analysts, and concept developers in the United Kingdom, France, Germany, and the United States as well as analyses of published documents and unclassified briefings. Research was carried out initially at the United States Army's Strategic Studies Institute in Carlisle, Pennsylvania, and at Joint Forces Command in Suffolk, Virginia. Onsite interviews were also conducted in Europe at the following locations: the Joint Doctrine & Concepts Center (JDCC) in the United Kingdom; Commandement de la Doctrine et de l'Enseignement militaire Supérieur (CDES) in France; and the Heeresamt (Concepts Branch), the Joint Planning and

¹⁴ Antulio J. Echevarria II, "Clausewitz's Center of Gravity: It's *Not* What We Thought." *Naval War College Review* Vol. LVI, No. 1 (Winter 2003): 71-78.

Operations Center (JPOC), the Joint Operations Doctrine Center (JODC), and the Zentrum für Analysen und Studien der Bundeswehr (ZAS) in Germany.

The interviews of officers in each of these locations were very informal, and their responses were very candid. These interviews should not be considered scientific surveys in any sense; they are an indication of a possible trend rather than empirical evidence of it. In order to preserve confidentiality, the identities of individual officers interviewed will not appear in this report.

U.S. Defense “Transformation”

In an effort to capitalize on the emerging RMA over the last decade, the U.S. Department of Defense (DoD) poured a great deal of money and other resources into what is now known as Defense Transformation.¹⁵ Despite the magnitude of its most recent efforts, however, the current vision of Defense Transformation lacks coherence. To be sure, advocates of change despise coherence, at least partially, since it tends to stifle healthy competition and creativity, both powerful dynamics of change. Nonetheless, the history of successful transformations shows that the principal agents of change from Gustavus Adolphus to Adolf Hitler all possessed an underlying logic—a strategic rationale—that guided their efforts. In other words, the transformations of their military establishments, albeit with varying degrees of success, took place with some strategic purpose in mind. For Gustavus Adolphus the aim was to expand the influence of the Swedish state; for Adolf Hitler it was to create a thousand-year Reich.

The United States National Security Strategy states that America’s strategic aim is to “...defend the peace against threats from terrorists and tyrants...preserve the peace by building good relations among great powers...[and] extend the peace by

¹⁵ Ian Roxborough, “From Revolution to Transformation: The State of the Field,” *Joint Force Quarterly* No. 32, (Autumn 2002): 68-75, lays out the course of the transition from RMA to Transformation.

encouraging free and open societies on every continent.”¹⁶ These objectives—the last two especially—require people-intensive resources skilled in building and maintaining relationships with other governments and societies in order to gather intelligence, conduct shaping operations, and perform stability functions.

Yet, DoD’s Transformation documents place more emphasis on moving toward a smaller, high-tech military than on building a force structure large enough to accomplish people-intensive tasks.¹⁷ As a result, the United States military is being transformed into a force that can win any battle or any campaign anywhere on the globe, but that lacks the human resources necessary to secure the peace afterward, and thus to accomplish the strategic goals of the conflict. The recent wars in Afghanistan and Iraq demonstrate this problem all too clearly.¹⁸ While the U.S. military, with help from coalition partners, decisively defeated Taliban, Al Qaeda, and Iraqi forces, they lacked the physical numbers necessary to provide security and conduct stability operations successfully. In other words, Defense Transformation puts America’s strategic objectives at risk for the sake of transforming DoD and the services.¹⁹

¹⁶ The White House, *National Security Strategy of the United States*, September 2002, p. 1.

¹⁷ Recent Testimony by Deputy Secretary of Defense, Paul Wolfowitz, stresses this view. “Testimony on U.S. Military Presence in Iraq: Implications for Global Defense Posture,” presented to the House Armed Services Committee, June 18, 2003.

¹⁸ Ronald O’Rourke, *Iraq War: Defense Program Implications for Congress*, Congressional Research Service, Report for Congress, June 4, 2003, warns that Operation Iraqi Freedom will be exploited by proponents of OSD’s transformation strategy.

¹⁹ Donald H. Rumsfeld, Secretary of Defense, *Annual Report to the President and the*

Ostensibly, the goal of Defense Transformation is a military establishment able to respond better to what is perceived, with some justification, as a rapidly changing strategic environment. Yet, the transformation schemes of the Office of the Secretary of Defense (OSD) are not derived from a rigorous analysis of how the new international environment has changed the strategic problem set—the number and kinds of missions—that U.S. forces will likely have to accomplish over the next few decades.²⁰

In part, the pressure to transform comes from the substantial amount of criticism DoD has received over the years regarding its apparent inability to change. In an effort to prove DoD's critics wrong, OSD has established the rapid (and revolutionary) transformation of all defense institutions as its priority goal. As a result, the overall strategic rationale of "defend, preserve, and extend" articulated in the national security strategy has been overtaken by the desire to transform DoD quickly *and* into something that appears revolutionary.

To be sure, OSD's aggressive approach to transformation deserves some praise. Developing new technologies and concepts is important and DoD needs to be brought into the information age. If OSD can accomplish half that much, it will have done a great deal. Nonetheless, Defense Transformation should not be an end in itself; it

Congress, Washington, D.C.: 2002, pp. 2-3, essentially admits that a comprehensive change of DoD is OSD's primary goal.

²⁰ The missions of the strategic problem set are defined in Huba Wass de Czege and Antulio J. Echevarria II, *Toward a Strategy of Positive Ends*, Carlisle, PA: Strategic Studies Institute, 2001.

should support the national strategy and the vision of America's role in the world. Otherwise, regardless of how successful the transformation is, it runs the risk of compromising U.S. national security in the long run.

Highlighting another weakness in Defense Transformation, OSD's principal model for rapid and revolutionary change—the German blitzkrieg—does not inspire confidence; it simply is not the kind of transformation toward which OSD should strive.²¹ Models are important because the assumptions that underpin them tend to inform policy decisions. Listed below are several of the key assumptions surrounding the blitzkrieg model:

1. The German blitzkrieg—a combination of new technologies and operational concepts—amounted to a revolution in the art of war.

While contemporary military analysts and commentators, such as S.L.A. Marshall, called the German style of fighting a “blitzkrieg” or lightning war and proclaimed it a revolution in warfare, their rhetoric had little substance and was intended primarily to arouse concern in the United States over events in Europe.²² In fact, no official

²¹ Throughout the literature on transformation one frequently encounters statements similar to: “In 1940, the French armed forces had more and better tanks and aircraft than the German army, but no concept for dealing with the Wehrmacht's blitzkrieg strategy.” John Hanley, “Rapid Spiral Transformation,” *Transformation Trends*, February 3, 2003, p. 3.

²² S.L.A. Marshall, *Blitzkrieg: Its History, Strategy, Economics, and the Challenge to America* (New York: William Morrow & Co., 1940).

blitzkrieg concept ever existed in German military doctrine.²³ Instead, the methods employed by the German military were a natural continuation of the concept of a war of movement (*Bewegungskrieg*) as opposed to a war of position (*Stellungskrieg*), a distinction that was hammered out in the 1890s.

After the Second World War, the blitzkrieg idea became loosely associated with the pre-war writings of Liddell Hart, J.F.C. Fuller, and Heinz Guderian, who published theories concerning the value of mobile warfare.²⁴ Guderian's own concept for the use of armored forces, as outlined in his book *Achtung—Panzer!* was organized around accomplishing a rather traditional mission, a breakthrough operation, which he saw as *the* most challenging operation of the First World War.²⁵ Hence, Guderian did little more than attempt to improve existing procedures or, in today's phraseology, re-fight the last war. In any case, the German success on the battlefield depended, more often than not, on such factors as thorough planning, good training, and decentralized leadership.

²³ Robert A. Doughty, "Myth of the Blitzkrieg," in Lloyd J. Matthews (ed.), *Challenging the United States Symmetrically and Asymmetrically: Can America be Defeated?* Carlisle, Pa., Strategic Studies Institute, 1998, pp. 57-80.

²⁴ James S. Corum, *The Roots of Blitzkrieg: Hans von Seeckt and German Military Reform* (Lawrence, Ka.: University Press of Kansas, 1992). Historians do not agree on who had the greater influence on whom. See the debate between Richard Dinardo "German Armour Doctrine: Correcting the Myths," *War in History* Vol. 3, No. 4 (1996): pp. 384-397; and Azar Gat, *Fascist and Liberal Visions of War: Fuller, Liddell Hart, Douhet, and Other Modernists* (Oxford: Clarendon, 1998).

²⁵ Heinz Guderian, *Achtung—Panzer!: The Development of Armoured Forces, Their tactics, and Operational Potential*, Trans. Christopher Duffy (London: Cassell, 1999)

2. The success of the blitzkrieg proves that dramatic results can be achieved by focusing “revolutionary” change on specific areas, since mechanized forces only represented 10-15 percent of the German army.

According to historical accounts and the memoirs of German officers, the lack of mechanization throughout the army caused dangerous gaps to develop between the panzer forces and the foot-mounted infantry and the horse-drawn artillery. These gaps often deprived the panzer forces of the infantry and artillery support they needed to launch combined arms attacks at the tip of the spearhead. They also rendered the supply lines of the tank forces vulnerable to counterattack. This assumption also overlooks the fact that the German navy and air force had to be rebuilt entirely during the interwar years, the cost-outlay of which was enormous.

Furthermore, focused revolutionary change will likely result in limited capabilities. To be sure, the Arab-Israeli Wars (1948, 1956, 1967, and 1973) and the Persian Gulf War (1990-91), demonstrate that blitzkrieg-style maneuver warfare remains effective in conventional conflicts.²⁶ However, it does not fare as well in *unconventional* conflicts, such as those in Vietnam (1946-54 and 1960-75), Cambodia (1970-75), and Afghanistan (1979-1989).²⁷ Projections of the future strategic environment indicate that

²⁶ Martin van Creveld, Steven L. Canby, Kenneth S. Brower, *Air Power and Maneuver Warfare* (Maxwell AFB: Air University Press, 1994); Thomas A. Cardwell III, *Airland Combat: An Organization for Joint Warfare* (Maxwell AFB: Air University Press, 1992).

²⁷ Mao Tse-Tung, *On Guerrilla Warfare*, 2^d Ed., Trans. & intro. by Samuel B. Griffith II,

civil wars, insurgencies, and counter-insurgencies will probably occur more frequently than conventional conflicts. Thus, OSD's use of a model that applies only to a very limited portion of the spectrum of conflict undermines its claim to be transforming *away* from conventional capabilities toward full-spectrum dominance.

(Baltimore: Nautical & Aviation Publishing Co., 1992); and *Basic Tactics*, Trans. & intro. by Stuart R. Schram, (New York: Praeger, 1966). General Vo-Nguyen-Giap, *People's War, People's Army: The Viet Cong Insurrection Manual for Underdeveloped Countries* (New York: Praeger, 1962). Che Guevara, *Guerrilla Warfare*, 3rd Ed., Brian Loveman & Thomas M. Davies Jr., eds., (Wilmington, DE: Scholarly Resources, 1997) contains updated case studies for the 1990s.

New U.S. Operational Concepts

Network-Centric Warfare. “Network-Centric Warfare” (NCW) represents the beginning of information-age concepts because at its core lies the idea of building an information infrastructure (an infostructure) linking platforms and command structures together in ways that permit rapid information-sharing.²⁸

Its original author, Admiral Arthur Cebrowski, initially resisted defining it because, as he explained, “concepts and definitions are enemies.”²⁹ By this he meant that once a concept is defined, it becomes static and inflexible. The paradox, of course, is that in order to communicate the merits of a concept and to generate support for it, one must define it. In fact, NCW was eventually defined:

[NCW is] an information superiority-enabled concept of operations that generates increased combat power by networking sensors, decision makers, and shooters to achieve shared awareness, increased speed of command, higher tempo of operations, greater lethality, increased survivability, and a degree of self-synchronization.³⁰

²⁸ Arthur K. Cebrowski and John J. Garstka, “Network-Centric Warfare: Its Origins and Future,” *Proceedings* (1998); <http://www.usni.org/Proceedings/Articles98/PROcebwski.htm>.

²⁹ Arthur K. Cebrowski, “Network-centric Warfare: An Emerging Military Response to the Information Age,” Presentation at the 1999 Command and Control Research and Technology Symposium, June 29, 1999.

³⁰ David S. Alberts, John J. Gartska, and Frederick P. Stein, *Network Centric Warfare: Developing and Leveraging Information Superiority* (Washington, DC: C4ISR Cooperative Research Program, 1999), 2.

Presumably, the infostructure, or information network, will enable individual platforms to become greater than the sum of their parts since they will develop the synergy that comes from cohesive action and will do so with greater efficiency. Information-sharing will enable operations to occur with greater speed, flexibility, and precision. Receiving the right information in a timely manner should allow “sensor-shooter-supplier” linkages to become faster and should enable a smaller number of platforms to accomplish a greater number of missions.

To be sure, U.S. military forces stand to benefit from such advances in communications and information networks. While current communications capabilities are improving, for example, platforms from one service still have difficulty exchanging information with those of another. It is rather telling that in recent conflicts, U.S. friendly-fire casualties rival those inflicted by hostile fire. A reliable, robust, and rapid infostructure might reduce friendly-fire incidents. Additionally, some valuable synergy could result from rapid, secure, and accurate info-sharing, not only among the various combat systems of each service, but also between combat and logistics systems and organizations. In short, NCW can provide a more comprehensive operational picture, an improved situational awareness, faster response times, and a more efficient concentration of effects. And, in most cases, these would amount to positive improvements.

However, the networks that form the core of NCW are merely tools, and as such they are essentially neutral. On the one hand, they could facilitate speed of command and decentralized execution—self-organizing and self-synchronizing activities—within the battlespace. On the other hand, they could just as easily enable a more deliberate approach to command and greater centralized control from the highest through the lowest echelons, particularly if increased precision is desired rather than speed.³¹ Political objectives, human personalities, command styles, and doctrine will inevitably influence how such tools are applied in military operations.

Moreover, NCW rests on the problematic assumption that knowledge is power. This assumption is reflected in the way that NCW proponents mistakenly emphasize the value of the info-network over the platforms it connects.³² In fact, knowledge is nothing without the capability to act. Put differently, the network can only be as powerful as the capabilities of the networked platforms allow it to be. The infostructure, no matter how effective, cannot make a B-52 perform the mission of a tactical intercept fighter, at least not efficiently. Therefore, the key to success lies not just in the networking of capabilities, but in networking the right capabilities in the right proportions.

³¹ A point also made by Henry Kamradt and Douglas MacDonald, “The Implications of Network-Centric Warfare for United States and Multinational Military Operations,” Occasional Paper 98-1, U.S. Naval War College, December 1998.

³² Adm Jay L. Johnson, Chief of Naval Operations, address to U.S. Naval Institute, Annapolis, Maryland, 1997.

Furthermore, since they provide the “glue” that enables combat forces to fight cohesively, all networks will likely become principal targets in future conflicts under attack, particularly from various electronic jammers and electromagnetic pulse (EMP) weapons.³³ Although extensive efforts are underway to “harden” communication systems against jamming and EMP attack, it is likely that a co-evolution of electronic warfare measures and countermeasures will take place, making the operation and security of the infostructure less than certain. Future concepts must, therefore, include provisions for “fighting blind.”

One must also consider an additional side to the issue of “fighting blind,” namely, fighting an enemy whom our attacks have made strategically or operationally blind. Taking out an opponent’s critical nodes, as many information-war proponents suggest is the goal of NCW and its supporting concepts, may make effective communication with his strategic leaders more difficult, which will in turn hamper efforts at conflict termination and resolution.³⁴ Thus, the “ways” and “means” of NCW strategy could very well hinder the accomplishment of the “ends” of national security policy.

Therefore, while U.S. military forces should continue to develop greater networking capabilities, they should do so with eyes wide open. Beyond the obvious

³³ Loren Thompson, “The Hidden Dangers of Networked Warfare,” Issue Brief, Lexington Institute, June 17, 2003, highlights the numerous vulnerabilities intrinsic to electronic networks, and how easily they could be exploited.

³⁴ A point brought out by Thomas P.M. Barnett, “The Seven Deadly Sins of Network-Centric

benefits that would derive from linking platforms together, the NCW concept itself lacks any real substance. When one strips away the rhetoric, the concept amounts to little more than a description of organizational capabilities and characteristics desired for conducting information-age warfare. As such, it is hardly a concept in its own right, but a imprecise vision of future conditions that could in turn serve as a start point for other concepts.

NCW thus opened the door for the development of Rapid Decisive Operations (RDO), Effects-Based Operations (EBO), Operational Net Assessment (ONA), and Standing Joint Force Headquarters (SJFHQ) discussed below. Each of these concepts, among others, was recently tested at Millennium Challenge 2002 (MC 02), a large-scale experiment of future operational concepts sponsored by USJFCOM.³⁵

Rapid Decisive Operations. RDO represents an effort to “operationalize” the concepts outlined in *JV 2020* (dominant maneuver, precision engagement, focused logistics, full-dimensional protection). As such, it serves as an umbrella concept under which other ideas, such as Effects-Based Operations, have emerged. RDO reflects the direction of contemporary concept development within U.S. Joint Forces Command

Warfare,” *Proceedings*(1999); accessed online www.nwc.navy.mil/WARDEPT/7deadl~1.htm.

³⁵ MC 02 was conducted in July and August 2002; it included 13,000 personnel from all four U.S. services operating from 18 locations across the United States. Donald Chisholm, “Organizational Change in Uncertain Times: The U.S. Military and *Millennium Challenge 2002*,” *Proceedings*,

(USJFCOM). The Millennium Challenge 2002 Quick Look Report stated that U.S. joint forces could not conduct a RDO today (2003), the capability to do so should exist within this decade.³⁶

In brief, the central idea of RDO is to leverage information and networks to conduct operations that are both quick and decisive.³⁷ According to its White Paper (dated 1 March 2002), RDO was intended to function as an integrating concept oriented on high-end, small-scale contingencies in the 2015 timeframe. RDO is:

*a knowledge-based concept that describes how to achieve rapid victory by attacking the coherence of an enemy's ability to fight. It is the synchronous application of the full range of our national capabilities by a fully networked and coherent joint force in timely and direct effects-based operations against the adversary as a system of systems. RDO employ our asymmetric advantages in the knowledge, precision, and mobility of the joint force against an adversary's critical functions to create maximum shock and disruption, defeating his will and ability to fight.*³⁸

Unfortunately, the definition of RDO is disjointed. By stressing destruction of the enemy's *coherence*, the definition implies that an enemy fighting incoherently is not a concern. In an era in which weapons of mass destruction (WMD) continue to

September 2002.

³⁶ Quick Look, 54.

³⁷ U.S. Joint Forces Command, "Toward a Joint Warfighting Concept: Rapid Decisive Operations," White paper V 2.0, Suffolk, VA: J9 Joint Futures Lab, March 1, 2002.

proliferate, that will not hold true. An incoherent enemy armed with WMD can do great harm. The definition also assumes that attacking an adversary's *critical functions* will create “maximum” shock and disruption and that these effects will in turn defeat his will and ability to fight. Perhaps the concept designers intended to say that attacking an opponent's critical functions amounts to an attack against the coherence of his ability to fight.

The White Paper also compares the underlying principles of RDO to the German blitzkrieg:

the existing mobility and firepower of the tank and the airplane through the communication power of the radio and a shared outlook that *netted* the German leadership in thought and intent to achieve a level of rapidity and shock action that overwhelmed the enemy and defeated his ability to fight.³⁹

However, in addition to the faulty premises noted earlier concerning blitzkrieg theories, this comparison also tends to obscure RDO's obvious links to the “precision-engagement” school of thought and its intellectual forerunner—strategic bombing theory—which maintains that air power has revolutionized warfare. After the First World War, strategic bombing theorists—such as Giulio Douhet in Italy, Hugh Trenchard in Britain, and Billy Mitchell in the United States—argued that air forces

³⁸ RDO, i. Emphasis added.

³⁹ RDO, Section 1.4, p. 3.

could circumvent the tactical and operational carnage associated with surface warfare to strike directly at an opponent's heart and nervous center until he capitulated or until his capability to resist was destroyed.⁴⁰

While evidence suggested that air power possessed enormous potential, in practice the results fell short of expectations.⁴¹ During the Second World War, strikes against major cities and industrial centers proved a necessary but not a sufficient cause for victory. Rather than surrendering en masse, civilian populations became inured to the massive devastation associated with strategic bombing and developed ways to counter its growing precision. Even long-range, precision-guided munitions, which some air-power zealots have hailed as America's asymmetric advantage, fell short of achieving strategic psychological collapse. Moreover, recent campaigns in the Persian Gulf (1990-91, and 2003), Bosnia (1995), Kosovo (1999), Afghanistan (2001-02), and Iraq (2003) were examples of "Joint" rather than single-service victories.⁴²

⁴⁰ Giulio Douhet, *The Command of the Air*, Trans. by Dino Ferrari (Washington, D.C.: Office of Air Force History, new imprint, 1983); William Mitchell, *Winged Defense: The Development and Possibilities of Modern Air Power Economic and Military* (New York: Dover, 1988<1928>); Neville Jones, *The Beginnings of Strategic Air Power: A History of the British Bomber Force 1923-29* (London: Frank Cass, 1987); and Alan Stephens, "The True Believers: Air Power Between the Wars," in *The War in the Air 1914-1994* (Fairbairn, Australia: Air Power Studies Center, 1994).

⁴¹ Conrad C. Crane, *Bombs, Cities and Civilians: Airpower Strategy in World War II* (Lawrence, Ka.: University Press of Kansas, 1993); and Richard Overy, *Why the Allies Won* (New York: W.W. Norton, 1995) present conflicting views on the success of strategic bombing.

⁴² Richard P. Hallion, *Storm over Iraq: Air Power and the Gulf War* (Washington & London: Smithsonian, 1992); Daniel T. Kuehl, "Thunder and Storm: Strategic Air Operations in the Gulf War," in *The Eagle in the Desert: Looking Back on U.S. Involvement in the Persian Gulf War* (Westport, Conn.: Praeger, 1996); Lt. Col. John F. Jones, USAF, "Giulio Douhet Vindicated: Desert Storm 1991," *Naval War College Review* 45 (Autumn 1992): 97-101; Col. Phillip S. Meilinger, USAF,

RDO attempts to combine two properties—speed and decisiveness—into a single operational concept. This is a bold endeavor. Speed and decisiveness are relative properties. A horse can move faster than a man, but not as fast as a missile. Holding a gun to an adversary's head can prove decisive for some foes, but not for others. Historically, the desire to strike an adversary quickly has competed with the need to have the sufficient force to compel him to submit. Yet, for obvious reasons, neither property should be stressed at the expense of the other. While some advances in both maneuver and firepower technologies will likely occur by 2015, the probability remains high that bringing speed and decisiveness together will still create tension.

At this point, it is important to emphasize that successful execution of RDO is highly conditional, perhaps too much so to function in the real world. A closer inspection of the conditions necessary for RDO reveals that it requires a rather large—perhaps prohibitive—number of prerequisites. To achieve *speed*, for instance, RDO must have:

- information superiority;
- an in-depth operational net assessment of the adversary;
- advanced planning;

“Giulio Douhet and Modern War,” *Comparative Strategy* 12 (July-September 1993): 321-38; Richard P. Hallion, “Airpower and the Changing Nature of Warfare,” *Joint Force Quarterly* (Autumn/Winter 1997-98): 39-46. By contrast, Thomas A. Keaney and Eliot Cohen, *Revolution in Warfare? Air Power in the Persian Gulf* (Annapolis, Md.: Naval Institute Press, 1995); and Admiral Bill Owens, *Lifting the Fog of War* (New York: Farrar, Straus, & Giroux, 2000) raise cautionary notes.

- a standing joint force headquarters;
- forward presence forces;
- aggressive offensive information operations;
- and greater standoff-engagement capabilities.⁴³

Similarly, to achieve *decisiveness*, RDO requires:

- precise identification of key links, nodes, centers of gravity, and critical vulnerabilities;
- an exploitation of the immutable relationship between intelligence, maneuver, and fires;
- relentless application of overwhelming firepower;
- denial or destruction of an adversary's most dangerous warfighting and war-making capabilities;
- and rapid strategic deployment and sustainment.⁴⁴

It is difficult to imagine a situation in which all of these prerequisites would be present. Thus, RDO amounts to a rigid operational concept, evidently applicable only in the rarest of circumstances and arguably not worth the investment of scarce defense

⁴³ RDO, i-ii, 4-5.

⁴⁴ RDO, ii-iii, 5-6. Emphasis original.

dollars that its further development would likely require. Despite the White Paper's assertions to the contrary, RDO applies only to one portion of the spectrum of operations (e.g., operations such as Grenada, Haiti, Panama, and Desert Shield) and merely perfects an approach to war in which the United States is already superior.⁴⁵

The U.S. military would probably benefit more by investing additional resources in developing concepts applicable to the mid- to low-end of the spectrum. Most projections of the future security environment assign a high probability of occurrence to such operations for the next 10-15 years; such scenarios have traditionally posed a challenge for U.S. forces.⁴⁶

Still, advocates of the concept are probably correct—that the real value of RDO lies not in the concept itself, but in the increased knowledge gained by subjecting it to the experimentation process.

Effects-Based Operations. EBO is considered one of the byproducts of experimenting with RDO, and it now is being discussed and analyzed more widely in defense literature. EBO is defined as “actions that change the state of a system to achieve directed policy aims using the integrated application of select instruments of

⁴⁵ For RDO's span of applicability, see p. 2 of the White Paper.

⁴⁶ See *Global Trends 2015: A Dialogue about the Future* <http://www.cia.gov/cia/publications/globaltrends2015>.

power.”⁴⁷ It is an approach to military operations that attempts to focus political and military decision-making on identifying desired effects (defined as a physical or behavioral change) and selecting the tools that can best achieve them. It is an attempt to move away from the traditional method of attacking and neutralizing or destroying an opponent’s “capabilities” and measuring progress by a calculus of attrition or by the movement of lines on a map.⁴⁸

EBO is based on a modified “systems approach” to understanding an adversary. Instead of assuming that adversaries are closed systems, as is often the case in systems theory, EBO proceeds from the assumption that opponents are “complex adaptive systems made up of political, cultural, technological, military, and economic components” each of which possesses key nodes and links that, if targeted appropriately, can produce a desired physical or behavioral change.⁴⁹ In one sense, EBO is the application of the U.S. Air Force’s targeting approach to warfare on a broader scale, though it endeavors to apply all appropriate tools of national power, not just smart bombs. When asked to describe effects-based operations, one senior official

⁴⁷ “Effects-Based Operations (EBO),” Draft Working Paper, 4 Feb 2003, p. 2.

⁴⁸ U.S. Joint Forces Command, “A Concept for Effects-Based Operations,” Suffolk, VA: J9 Concepts Department, 1 March 2003.

⁴⁹ Gene Myers, “Effects-Based Operations: Everything Old is New Again, as Concept Reveals,” *Armed Forces Journal International* (June 2003): 47-49.

replied that they were akin to dissolving “the *glue*” that holds a table together, rather than striking at its individual legs.⁵⁰

The concept’s chief merit, as retired Marine general Anthony Zinni remarked, is that it forces political and military leaders to consider the actual effects they wish to achieve through the application of military (and other) power.⁵¹ History has far too many examples of political leaders who misapplied military force because they failed to understand what it could (and could not) achieve. If EBO can reduce the number of misunderstandings by establishing a common procedure and basis for dialogue, it will amount to a vast improvement in how the United States wages war.

The concept’s primary shortcoming is that it demands “comprehensive” knowledge—not just information—in order to implement it. EBO requires the ability to identify nodes and links, many of which frequently change in a complex adaptive system. Yet, our knowledge of many systems, such as culture and economics, is still very limited.⁵² Anthropologists have not yet reached a firm consensus on a definition of culture, for example, nor do they agree on how to manipulate it. Economists hold different opinions about the cause(s) of the current recession in the United States’

⁵⁰ Christian Lowe, “In Exercise, U.S. Military Practices Unconventional Warfare,” *Defense Week*, May 21, 2001, p. 2.

⁵¹ Lowe, 2. For a more detailed critique of RDO see Antulio J. Echevarria II, *Rapid Decisive Operations: An Assumptions-Based Critique*, Carlisle, PA: Strategic Studies Institute, 2001.

⁵² Culture seems to have as many definitions as books on the subject. For a dated, but still useful summary of different definitions of culture see Edgar H. Schein, *Organizational Culture and*

economy, as well as what should be done about it. Unquestionably, our knowledge of these fields has improved over the last few centuries.

However, greater knowledge generally produces even more questions and, in the process, sometimes creates more uncertainty. At its highest levels, knowledge means the ability to accept a degree of uncertainty when answering particular questions. Understanding and predicting cause and effect in anything but the most general terms, seems to work better in physics and billiards, than it does in culture, economics, politics, or even military action, especially since these fields interact in complex ways. In other words, competent execution of the concept may require more certainty than it is possible to obtain. In the worst case, waiting for “comprehensive” knowledge could induce a form of self-paralysis.⁵³

Another primary shortcoming is that EBO suffers from a definite credibility gap. Its zealots have made a number of inaccurate, unsupportable, and wildly optimistic claims concerning its potential. Perhaps the most vocal of these zealots is Major General David Deptula, director of plans and programs within the U.S. Air Force’s Air Combatant Command, who claims that EBO has changed the nature of war.⁵⁴ And, that it is the “defining event” of the RMA, since EBO coupled with precision and stealth

Leadership, 2nd Ed., (San Francisco: Jossey-Bass, 1992), 8-10.

⁵³ A point made by Colonel Art Corbett, “Why Say No to EBO: A Contribution to the Debate on the Development of Joint Operational Concepts,” unpublished paper, November 3, 2002.

⁵⁴ “Effects-Based Operations,” White Paper published by the U.S. Air Force’s Air Combatant

technologies will enable the execution of parallel or nonlinear (as opposed to series or sequential) operations.⁵⁵ However, such claims merely undermine the credibility of the concept and repel potential supporters.

While EBO clearly has origins in airpower theory, if it is to survive as a twenty-first-century concept it must be left solely to the intellectual descendants of Douhet to develop. The scions of Douhet have and will continue to claim that EBO can bring about “shock and awe” sufficient to paralyze an enemy strategically.⁵⁶ Such was the promise of the so-called Shock and Awe campaign of Operation Iraqi Freedom; that promise was, however, never realized despite a spectacular display of precision bombing in Baghdad. Fortunately, USJFCOM has stripped EBO of some of the rhetoric that the zealots have wrapped around it. Still, accepting all of its claims requires a leap of faith.

In reality, EBO amounts to little more than the application of airpower targeting methodology on a larger scale, one that would ideally involve all elements of national power: diplomatic, military, economic, cultural or informational. In essence, EBO is a method of planning that reduces an adversary to a number of targets that must be “serviced” in ways that, collectively or individually, appear likely to achieve the desired

Command, May 2002.

⁵⁵ “Effects-Based Air Operations – Cause and Effect, *Jane’s Defense Weekly*, June 18, 2003.

⁵⁶ Harlan Ullman and James Wade, Jr., *Shock & Awe: Achieving Rapid Dominance* (Washington, D.C.: Government Printing Office, 1996).

effect. A more correct name for the concept, therefore, is EBP or Effects-Based Planning, and it is sometimes referred to in this manner.⁵⁷ This method of planning has utility not only for each of the services, but also for non-military actors—its chief value being once again that it forces strategic decision-makers to ask themselves what effect(s) they wish to achieve through the application of military (and non military) power. It is regrettable, but historically true, that political and military leaders have not asked themselves this question more frequently.

Operational Net Assessment (ONA). ONA is defined as a “continuous, collaborative process that builds a common, coherent knowledge base. It links together various knowledge sources to develop a common understanding of friendly forces, opposing forces, opponent perceptions, and the operational environment.”⁵⁸ ONA provides the knowledge basis for EBO. It is not intended to be a static product, but a dynamic source of operational understanding that encompasses the enemy’s warfighting system as well as his political, economic, cultural, diplomatic, and informational systems.

⁵⁷ A point made by the author in a briefing to the U.S. Defense Science Board, May 2002.

⁵⁸ U.S. Joint Forces Command’s Millennium Challenge 2002 Quick Look Report, 31. The report also discusses four other concepts: Force Projection, Information Operations, Collaborative Information Environment, and Joint Interagency Coordination Group. However, they are not analyzed in this study because they are either not new or they resemble those already addressed.

ONA is a highly ambitious concept to say the least. Essentially, it amounts to attempting to acquire comprehensive knowledge of another society and maintaining that knowledge even as the society itself is changed by events. Arriving at even a general approximation of such knowledge may require larger headquarters and, at a minimum, extensive participation of U.S. military and non-military agencies in all phases of planning and execution. Such participation should also take place during the development of the concept, especially in terms of identifying supporting technologies. As recent after-action reviews have stated, the faster operations become, the greater the number of planners required to keep pace with changing events.⁵⁹ Speed and accurate knowledge are enemies. At present, it does not appear that technology alone will suffice to maintain an up-to-date knowledge base.

Recent experimentation with the concept has produced the following tentative insights concerning the value of ONA:

- It can become the key enabler of EBO.
- It complements and is complemented by joint intelligence preparation of the battlespace (JIPB).
- It is operationally feasible to examine the enemy as a system of systems.

⁵⁹ G-3, II Marine Expeditionary Force, "Millennium Challenge 02 Consolidated After Action Report," September 24, 2002.

- It can enable greater simultaneity in planning and decision-making.
- It resembles a collaborative process more than a tool.
- The process still requires “refinement” in terms of turning information into operational knowledge.⁶⁰

Standing Joint Force Headquarters (SJFHQ). The SJFHQ is defined as a “staff directorate located in each combatant commander’s headquarters that provides a pre-crisis planning capability for designated focus areas.”⁶¹ In theory, it should function as a joint command and control element that would reduce the current ad-hoc nature of joint task force operations. The Chairman of the Joint Chiefs of Staff has directed Joint Forces Command to develop a prototype that will be fielded in each regional combatant command by 2005. Current plans call for the SJFHQ to number 55 personnel. The SJFHQ represents an enabling concept or capability for RDO.

MC 02 yielded the following insights regarding the SJFHQ:

- It facilitates stand-up of joint task force headquarters.
- It brings commander’s intent, regional expertise, and knowledge of service capabilities together.

⁶⁰ Quick Look Report, 35.

- It enhances situational awareness, particularly in the early stages of a crisis.
- It can reduce the overhead and forward footprint of a JTF headquarters.⁶²

However, the concept also introduces an implicit insight that runs counter to a popular information-age orthodoxy, namely, that the thirst for information that future military operations seem to generate will require more staff personnel, rather than less. Information-age orthodoxies claim that information technology will ultimately reduce the size of staffs. The SJFHQ, which augments the combatant commander's staff, does not support this claim, however. As previously pointed out, if the speed of operations truly increases in the future, commanders might require larger staffs in order to work all of the branches and sequels quickly.

Center of Gravity (CoG). While not a new concept, per se, the idea of a center of gravity has assumed a prominent place in U.S. military doctrine and that of many other NATO countries as well. It could well play a major role in the development of future operational concepts, and the conduct of future operations. It, therefore, warrants close analysis for issues of compatibility.

⁶¹ Quick Look Report, 23.

⁶² Quick Look Report, 27.

For several decades, the U.S. military has struggled both to understand the center of gravity concept as developed by the Prussian military theorist Carl von Clausewitz (1780-1831), and to find practical ways to apply it. In the process, it drifted away from Clausewitz's original idea, creating several competing definitions for a CoG. Each of the U.S. services—shaped as they are by different roles, histories, and traditions—brought individual perspectives to the idea and redefined it in their respective images. The U.S. Marine Corps, a relatively small force designed more for winning battles than fighting campaigns or wars, initially equated enemy CoGs with key vulnerabilities. It now defines CoGs much like the U.S. Navy, as “any important sources of strength.”⁶³ By comparison, the U.S. Air Force, which takes a “targeting” approach to warfare, saw CoGs as multiple strategic and operational critical points that it could attack from the air. Some contemporary airpower theorists, such as John Warden, with his notion of concentric rings, identified so many CoGs that the concept became absurd.⁶⁴ In contrast, the U.S. Army, which has the role of fighting campaigns and winning wars,

⁶³ Department of the Navy, *Warfighting*: Marine Corps Doctrinal Publication 1 (Washington, D.C.: U.S. Department of the Navy, 20 June 1997), 45-47.

⁶⁴ Department of the Air Force, *Air Force Doctrine Document 1* (Washington, D.C.: U.S. Department of the Air Force, September, 1997), 79, now uses the Joint definition of CoGs explained elsewhere in this paper. John A. Warden III, *The Air Campaign: Planning for Combat* (Washington, D.C.: NDU Press, 1988), 910; and John A. Warden III, “The Enemy as a System,” *Airpower Journal* 9, no. 1 (Spring 1995): 40-55. Another prominent air power theorist wrote: “In essence, Air Power is targeting,” in Phillip Meilinger, *10 Propositions Regarding Air Power* (Washington, D.C.: Air Force History and Museums Program, 1995), Chapter 4.

saw CoGs as “sources of strength” and tended to look for a single CoG, normally in the principal capability that stands in the way of mission accomplishment.⁶⁵

Recently, *Joint Publication 3-0* (Doctrine for Joint Operations) attempted—with only limited success—to pull these various perspectives together into a single definition, asserting that the essence of the operational art rests in being able to mass effects against the enemy’s sources of power, or CoGs, to gain a decisive advantage. Joint doctrine defines CoGs as those “characteristics, capabilities, or locations from which a military force derives its freedom of action, physical strength, or will to fight.”⁶⁶ Each of the services, as we have seen, settled on defining the CoG as a source of strength.

JP 3-0 states that, at the strategic level, CoGs can include a military force, an alliance, national will or public support, a set of critical capabilities or functions, or national strategy itself. At the operational level, they are generally the principal *source*

⁶⁵ Department of the Army, *Operations*: FM 100-5 (Washington, D.C.: U.S. Department of the Army, 1993), 613; compare to FM-3 (2001), 57, which now uses the Joint definition. The CoG appealed to maneuver theorists, who saw it as something for maneuver to aim at in the hope of arriving at a quick decision, *à la* blitzkrieg. Unfortunately, although the Army’s 1986 version of FM 100-5 placed great emphasis on CoGs, identifying them as the “key to all operational design,” it also caused a great deal of confusion by equating CoGs to key geographic features, boundaries between army groups, and lines of communication (LOCs), in other words—to decisive points in the Jominian sense. Schneider and Izzo, “Elusive Center of Gravity,” 52 and 56; and William Lind, “The Operational Art,” *Marine Corps Gazette* 72, no. 4 (April 1988): 45, pointed out that “FM 100-5 arrives at a meaning of center of gravity that can be applied to anything worthy of being attacked.” Jomini defined a decisive point as anything “whose attack or capture would imperil or seriously weaken the enemy.” John Shy, “Jomini,” in *The Makers of Modern Strategy: From Machiavelli to the Nuclear Age*, ed. Peter Paret (Princeton: Princeton University Press, 1986), 152-54. The 1993 version of FM 100-5 partially corrected this error, but retained the idea that CoGs could be LOCs.

⁶⁶ Department of Defense, *Doctrine for Joint Operations*: Joint Pub 3-0 (Washington, D.C.: U.S. Department of Defense, 1 February 1995), GL-4.

of combat power—such as combat forces that are modern, mobile, or armored reserves—that can assure, or prevent, accomplishment of the mission. At its core, this definition is capabilities-based, despite the presence of other terms such as national will or public support. All elements—whether leadership, national will, or public opinion—tend to trace back to an opponent’s capability to resist.

Each of the services in the U.S. military believes its CoG derives from Clausewitz’s, namely, that it represents the “*hub* of all power and movement.”⁶⁷ However, their capabilities-based definition differs substantially from his effects-based concept. Clausewitz’s use of the CoG in *On War* remains essentially consistent with the concept’s representation in the mechanical sciences. This analogy has somehow gotten lost in the many translations of his work. The translations that follow come closer to Clausewitz’s original sense:

⁶⁷ As derived from, Carl von Clausewitz, *On War*, Indexed ed., Ed. and trans. by Michael Howard and Peter Paret (Princeton: Princeton University Press, 1989).

... it is against that part of the enemy's forces where they are most concentrated that, if a blow were to occur, the effect would emanate the furthest; furthermore, the greater the mass our own forces possess when they deliver the blow, the more certain we can be of the blow's success. This simple logic brings us to an analogy that enables us to grasp the idea more clearly, namely, the nature and effect of a CoG in the mechanical sciences.⁶⁸

In the mechanical sciences, a CoG represents the point where the forces of gravity can be said to converge within an object and, hence, represent the spot where its weight is balanced in all directions. Striking at, or otherwise upsetting, the CoG can therefore cause the object to lose its balance or equilibrium and fall to the ground. A physical object can be thought of in two ways: as a composite of many smaller particles, each of which is acted upon by gravity; or as a single object, which is acted upon by gravity only at a single point.⁶⁹ Understandably, physicists prefer the latter, since it makes other calculations concerning the interaction of force and matter much easier. However, physicists also acknowledge that a CoG amounts to little more than a mathematical approximation, since gravity acts upon all the points in an object simultaneously.

⁶⁸ Carl von Clausewitz, *Vom Kriege*, 19th Ed., Introduced by Werner Hahlweg, (Regensburg: Pustet, 1991), 810. Hereafter, *Vom Kriege*.

⁶⁹ Geoff Jones, Mary Jones, and Phillip Marchington, *Cambridge Coordinated Science: Physics* (Cambridge: Cambridge University Press, 1993), 52-55. In an environment where gravity does not exist, a CoG is replaced by a center of mass (CoM), meaning where an object's mass is

Calculating a CoG for a simple, symmetrical object—a ruler, a rock, a boomerang—is not difficult. The CoG for a ruler is in the middle of it. The CoG for a sphere lies at its geometric center. Interestingly, the CoG for a boomerang, though not difficult to calculate, does not lie on the object itself, but in the space between the “V”.⁷⁰ On the other hand, calculating the CoG for complex objects—such as a bolos or a human being with multiple moving parts—is more difficult. Such objects must be artificially “frozen” in time and space. When a complex object changes the distribution of its weight, its body position, or if external weight is added, the CoG requires recalculation. For example, a soldier standing at port arms will normally have a CoG in the middle of the pelvis, at a spot roughly behind the navel. If the soldier raises his arms, he raises his CoG to a point somewhere behind and above his navel.

Strictly speaking, therefore, the soldier’s CoG is *not* a source of strength. Rather, it represents the point of confluence where gravitational (centripetal) forces come together. A soldier’s strength (or power) might derive from his muscles, his brains, or his weapons, or any combination of them. They relate to his CoG only so far as he needs *balance* to use them. Nor, strictly speaking, is a CoG a weakness. A soldier might be physically weak, intellectually challenged, or in need of weapons. While these conditions constitute weaknesses, they have little to do with the soldier’s CoG, per se.

most heavily concentrated. Figures 1 and 2 came from this source.

⁷⁰ Jones, et. al., 53.

Although a CoG is neither a weakness nor a vulnerability, it can still lie open to attack and, therefore, be vulnerable.

Clausewitz continues:

The armed forces of every combatant, whether an individual state or an alliance of states, have a certain unity and thus a certain *interdependence* or *connectivity* (*Zusammenhang*); and just where such interdependence exists, one can apply the center of gravity concept. Accordingly, there exist *within* these armed forces certain centers of gravity which, by their movement and direction, exert a decisive influence over all other points; and these centers of gravity exist *where* the forces are most concentrated. However, just as in the world of inanimate bodies where the effect on a center of gravity has its proportions and limits determined by the interdependence of the parts, the same is true in war [Emphasis added].⁷¹

This passage reveals that the CoG concept only applies where a certain “unity” (*Einheit*) and “connectivity” or “interdependence” (*Zusammenhang*) exist between the enemy’s forces and the space they occupy. The type and number of CoGs the enemy possesses will thus depend upon the degree of connectivity, or overall unity, that his forces possess.⁷² It is also worth pointing out that Clausewitz’s statement that the CoG

⁷¹ *Vom Kriege*, 810-11.

⁷² *Vom Kriege*, 453. Antulio J. Echevarria II, “Clausewitz: Toward A Theory of Applied Strategy,” *Defense Analysis* 11, no. 3 (1995): 229-240.

lies “where the forces are most concentrated” refers less to the forces, than to the thing that *causes* them to be concentrated. As in the mechanical sciences, Clausewitz’s military CoG is a *focal point*. Hence, combat forces tend to concentrate there and, at times, emanate from there.

In other words, to return to the physics analogy, military CoGs possess a certain centripetal (as opposed to centrifugal) force. Accordingly, they represented much more in Clausewitz’s mind than a mere concentration of forces. Indeed, his concept in general reflects an intrinsic dynamism—not easy to capture on paper.⁷³

What theory can admit to thus far is the following: Everything depends upon keeping the dominant conditions of both states in mind. From these emerge a certain center of gravity, a focal point of force and movement, upon which the larger whole depends; and, it is against the enemy’s center of gravity that the collective blow of all power must be directed.⁷⁴

⁷³ Alan D. Beyerchen, “Clausewitz, Nonlinearity and the Unpredictability of War,” *International Security* 17, no. 3 (Winter 1992): 59-90.

⁷⁴ *Vom Kriege*, 976.

Alexander the Great, Gustavus Adolphus, Charles XII, and Frederick the Great each had their centers of gravity in their respective armies. Had their armies been destroyed, these men would have been remembered as failures. In states with many factions vying for power, the center of gravity lies mainly in the capital; in small states supported by a more powerful one, it lies in the army of the stronger state; in alliances it lies in the unity formed by common interests; in popular uprisings it lies in the persons of the principal leaders and in public opinion. The blow must be directed against these things. If the enemy loses his balance because of such a blow, he must not be given time to regain it; blow after blow must follow in the same manner. In other words, the victor must always direct all of his blows in such a way that they will strike at the whole of the enemy, not just a part of him.⁷⁵

Reducing the enemy's force to one CoG depends: "first, upon the [enemy's] political connectivity or unity itself" and "second, upon the situation in the theater of war itself, and which of the various enemy armies appear there."⁷⁶ The criterion once again is the extent to which the enemy's (or enemies') forces can operate as a single entity. In World War I, Germany, fighting on two fronts, had to look for two CoGs, one Anglo-French and one Russian. Hence, the unity (or lack thereof) formed (or not) by military

⁷⁵ *Vom Kriege*, 976-7.

⁷⁶ *Vom Kriege*, 1009-10.

forces and the geographical spaces in which they have to fight can, in fact, create *more than one CoG*.⁷⁷ Clausewitz, of course, advocates tracing these back to a single one whenever possible. Yet, he allows for the eventuality that one specific CoG might not exist. The key question one must ask, then, is whether the enemy is “connected” sufficiently so that actions against him in one area will still have a decisive effect on him in other areas.⁷⁸

In other words, Clausewitz’s CoG is a “focal point,” not a strength nor weakness, per se, nor even a source of strength. Second, CoGs are found only where sufficient connectivity exists among the various parts of the enemy to form an overarching system (or structure) that acts with a certain unity, like a physical body. Third, they possess a certain centripetal force that acts to hold an entire system or structure together. A blow at the enemy’s CoG would throw him off balance or, put differently, cause his entire system (or structure) to collapse. Fourth, the concept necessitates viewing the enemy holistically.

Since Clausewitz’s CoG focuses on achieving a specific effect, the collapse of the enemy, it is an effects-based approach, rather than a capabilities-based one. In this

⁷⁷ *Vom Kriege*, 1009.

⁷⁸ Clausewitz’s CoG has been called a linear concept because his description employs a relationship—CoG against CoG—seemingly based on directly proportional effects. Yet, in some respects, it connotes a nonlinear concept as well, because the CoG is not always a physical mass. Destruction of something intangible—such as an alliance’s community of interests—or something relatively small—such as a political or military leader—can bring down the enemy’s entire edifice. Beyerchen, 87, identifies the CoG as a linear concept.

sense, it resembles EBO more than the U.S. military's capabilities-based concept of CoG, with the exception that only one particular effect is sought—total collapse of the enemy.⁷⁹ Like EBO, Clausewitz's CoG requires the ability to predict, with some reasonable probability, how to achieve at least first and second-order effects, and possibly more. That said, it is important to point out that Clausewitz eschewed prescriptive formulae and considered the calculation of a CoG a matter of "strategic judgment" (*strategische Urteil*) at the highest levels.⁸⁰ The chief difference between the two concepts is that while Clausewitz's CoG assumes the enemy is a system, EBO goes a step further and assumes he is a *mappable* system.

Furthermore, Clausewitz's CoGs were only "operative" (*wirksame*) in campaigns or wars designed to defeat the enemy completely.⁸¹ In such wars, military and political objectives are essentially complementary. In limited wars, on the other hand, CoGs (because they tend to focus on the total collapse of the enemy) tend to compete with political objective(s). By contrast, Joint doctrine asserts that CoGs exist for all kinds and at all levels of war. Presumably, defeating tactical CoGs facilitates the

⁷⁹ Joint Forces Command, J9 Joint Futures Lab, *Rapid Decisive Operations White Paper*, DRAFT dated February 16, 2001 (Norfolk, VA: U.S. Joint Forces Command, 2001). Hereafter, RDO. It defines Effects-Based Operations as "a process for obtaining a desired strategic outcome or 'effect' on the enemy through the synergistic, multiplicative, and cumulative application of the full range of military and other national capabilities at the tactical, operational, and strategic levels." An effect is defined as the "physical, functional, or psychological outcome, event, or consequence that results from specific military and non-military actions." RDO, p. 20.

⁸⁰ *Vom Kriege*, 324. Compare: *On War*, 163.

⁸¹ *Vom Kriege*, 813.

accomplishment of tactical objectives, which, in turn, contribute to the defeat of operational CoGs, the destruction of which then assists in the accomplishment of operational objectives, and so on, until national security objectives are achieved.

Yet, inserting a CoG into the strategic planning process is contrived and unnecessary. In the Gulf War (1990-91), for example, a limited conflict in which, according to Clausewitz, the CoG concept should not have been applied, the Combatant Commander's notion of the enemy's CoG did not accord with those of his Joint Air Force Component Commander (JFACC). The former saw three distinct CoGs: Saddam Hussein; the Republican Guard; and Iraqi chemical, biological, and nuclear capabilities. The JFACC identified twelve "target sets"—ranging from national leadership and command and control to railroads, airfields, and ports—each of which corresponded to a CoG. As Lieutenant Colonel Joe Purvis, who headed a team of Leavenworth SAMS' graduates that assisted in ground component planning, later admitted, "the CENTCOM staff became more focused on what [the CoG] was as opposed to what do we do with it."⁸² However, simply translating the war's strategic objectives—expulsion of Iraqi forces from Kuwait and reduction of Iraqi offensive

⁸² Cited from Seow Hiang Lee, "Center of Gravity or Center of Confusion: Understanding the Mystique," Wright Flyer Paper No. 10 (Maxwell Air Force Base, AL: Air Command and Staff College, 1999), 18-19.

capability—into operational and tactical objectives would still have resulted in identifying those critical capabilities that Coalition forces had to defeat in order to be successful.⁸³

The CoG and NATO Doctrine. NATO's definition of CoG follows that of U.S.

Joint doctrine almost verbatim:

Characteristics, capabilities or localities from which a nation, an alliance, a military force or other grouping derives its freedom of action, physical strength or will to fight.⁸⁴

While this definition is obviously compatible with that of U.S. doctrine, it is nonetheless undesirable for the reasons explained above. The definition should be changed to reflect the idea that CoGs are focal points where forces come together.

Moreover, NATO, too, should refrain from overusing the idea. It does not apply in all cases and it does have the disadvantage of reflecting industrial-age thinking in terms of massing combat forces against a single point, which, to be sure, is still a valid approach for many types of conflicts. Yet, as NATO moves further into the twenty-first century, it might find itself up against more adversaries that are globally distributed, as in the case of Al Qaeda, or who do not possess a CoG susceptible to military power.

⁸³ These strategic objectives are condensed. The objectives for the Gulf War as outlined by President Bush were: 1) withdrawal of Iraqi forces from Kuwait; 2) restoration of legitimate government in Kuwait; 3) assuring security and stability of the Persian Gulf region; and 4) protecting American lives. Eliot Cohen, et. al., *Gulf War Air Power Survey*, 5 Vols, Vol. I: *Planning and Command and Control* (Washington, D.C.: Govt. Printing Office, 1993), 83-4.

⁸⁴ *NATO-Russia Glossary*, 15-Part II 7 June 01, p. 37.

Such opponents may require a different conceptual approach, one that is more akin to unraveling a ball of yarn, as in cases where the interrogation of one or two terrorists leads to information on a few others, and so on. This approach would hardly yield the sort of strategic collapse that should occur with striking the CoG, particularly as terrorist organizations learn better ways to keep individual cells ignorant of one another.

That notwithstanding, if the recent war in Iraq is any indication, one can say that the concentration of combat forces continues to occur and therefore remains a valid principle of war. But, now the scale on which it occurs is more often than not global in nature. (The notion of “massing effects,” which has come to replace concentration of force in current military doctrine, is quite another idea.) Information-age complexities do not necessarily nullify industrial-age concepts. However, one needs to recognize when the CoG concept applies and when it does not.

NATO Future Operational Concepts

NATO Concept Development and Experimentation. The NATO Concept Development and Experimentation (CDE) process itself is a sound, if lengthy, one involving three tiers. At Tier 1, the CDE Cell identifies a concept, which can come from any number of sources, and reviews it to ensure that it advances NATO's future capabilities. If it does, the CDE Cell then posts the concept on the web where other member nations can review and comment on it. Once the authors of the concept have addressed any comments, they must rework the concept into a White Paper that explains the details necessary for evaluation and all resourcing requirements. The CDE Cell then submits the White Paper to the Bi-Strategic Command Working Group which evaluates the concept in more detail, considers concept development priorities, and provides recommendations if appropriate. The Bi-SC Working Group then forwards the concept to the NATO Military Committee via the National Advisory Group (NAG) and to the Strategic Commanders, who also provide comment and/or endorsement. The Military Committee then makes decisions regarding resourcing priorities and the concept enters Tier 3, where a team assigned by the Committee develops a plan to address its feasibility and its experimentation schedule.⁸⁵

Although lengthy, the CDE process does allow multinational participation and

involvement of all appropriate levels of command. It helps reduce redundancy and ensures prioritization of concept development based on available resources. The CDE Cell will apparently undergo expansion in the near future and begin to experiment with and develop more concepts.⁸⁶

NATO Concepts/Projects. At present, the CDE process has nine ongoing projects.⁸⁷ (Concepts become projects once the NATO Military Committee approves them for development):

- **Detection of Chemical and Biological Agents** – development of an automated, mobile, standoff, early detection and warning system.
- **Reception, Staging and Onward Movement** – revision of current RSOM procedures.
- **Content Based Information Security** – creation of a single, integrative infrastructure for information-sharing at all levels.
- **Common Operating Decision System (CODS)** – improvement of situational awareness through development of a common operating picture.

⁸⁵ <http://www.saclant.nato.int/cde/process.htm>

⁸⁶ “NATO’s New CDE Projects,” *NATO CDE Newsletter*, January 2003.

⁸⁷ “NATO’s New CDE Projects,” *NATO CDE Newsletter*, January 2003.

- **Low Cost Precision Kill (LCPK) Weapon** – upgrading existing rockets to turn them into low-cost, precision munitions.
- **Leader and Team Adaptability in Multinational Coalitions** – efforts to improve adaptive performance.
- **Future Joint Fires Concept** – development of an operational architecture that integrates fire and maneuver planning, management, and execution.
- **Pathfinder** – development of an overarching training, exercise, and evaluation doctrine.
- **Artillery Systems Cooperation Activities (ASCA)** – development of fire-control interoperability.

Of these nine concepts, all but three—RSOM, Leader and Team Adaptability in Multinational Coalitions, and Pathfinder—focus on the issue of technological interoperability.⁸⁸ A certain amount of redundancy also exists among the concepts, but one would expect this situation to persist until the concepts pass into Tier 3.

⁸⁸ This list should be considered tentative, since the status or name of a concept is subject to change.

Interoperability

Technological	Conceptual/Behavioral	Doctrinal
Detection of Chem/Bio Agents	Leader & Team Adaptability	RSOM
Content Based Info Security		Pathfinder
CODS		
LCPK		
Future Joint Fires		
ASCA		

No overarching or umbrella concept, such as RDO, or major concept for planning, like EBO, is currently under review in the CDE process. The NATO concepts, in fact, represent only individual components of an overall approach to information-age warfare that resembles NCW. These are essentially enabling concepts. As such, they do not appear to conflict with U.S. concepts, though the NATO CDE process will clearly have to ensure that, as they develop, the technological concepts will permit other NATO forces to “plug into” each other as well as U.S. forces, and vice versa.

Notably, NATO CDE does not currently have any organizational concepts similar to USJFCOM’s SJFHQ. Nor does it have a concept that focuses on dynamic intelligence collection and assessment similar to Operational Net Assessment (ONA).

These are serious oversights, as U.S. forces are already putting these concepts into practice. The NATO CDE cell should be more proactive in gathering concepts for evaluation. USJFCOM's RDO and EBO White Papers, which also discuss SJFHQ and ONA, are unclassified and readily available.

NATO CDE can consolidate its current enabling concepts with those of USJFCOM as follows:

Concept Interoperability (Consolidated)

Technological	Organizational	Doctrinal
<u>Info Sharing/Security:</u> - COPS - Content Based Info Security	SJFHQ	<u>Training:</u> - Pathfinder - Leader/Tm Adaptability - RSOM
<u>Joint, Precision Fires:</u> - Future Joint Fires - ASCA - LCPK		ONA
Detection of Chem/Bio Agents		

The interoperability of operational concepts does not, however, speak to whether other NATO forces would embrace the operational assumptions of U.S. forces.

Unfortunately, the CDE process does not take such assumptions into account either. NATO can enhance the CDE process by adding a step for analyzing assumptions, an Assumptions-Based Concept Development methodology (explained in more detail in the Recommendations). A useful place to insert this procedure would be in the CDE Bi-SC Working Group. The Working Group currently uses the following evaluation criteria:

A. OPERATIONAL VALUE

- (1) Priority: importance of the capability that the concept relates to
- (2) Impact: anticipated level of improvement in capability
- (3) Visionary: contribution to “leap-ahead” technologies/capabilities

B. COLLABORATIVE POTENTIAL

- (1) Benefit: number of nations/commands that could benefit operationally
- (2) Offer: number of nations/commands/agencies that might participate
- (3) R&T: number of nations/commands/agencies with ongoing R&T in area

C. LEVEL OF RISK

- (1) Technical Risk: whether technical challenges of concept would impede or halt process
- (2) Operational Risk: operational issues or internal/external opposition would render concept impractical

(3) Experimentation Risk: experimentation processes and methodologies exist to validate concept.⁸⁹

NATO could add a fourth criterion to LEVEL OF RISK—(4) *Assumptions: assumptions are not sound enough to warrant exploration of the concept.*

If the Working Groups judges the assumptions as too risky, it could return the concept to the author(s) for further refinement. Alternatively, to avoid falling into the trap of approving only conservative ideas, it could send the concept forward with strong caveats regarding the soundness of its underlying assumptions. As a creative and innovative process, concept development should involve some risks. NATO CDE should endeavor to foster creative thinking, but not fantasies.

⁸⁹ Criteria extracted from CDE Report #3 to the Military Committee, dated October 31, 2002.

Compatibility of U.S. and NATO Future Concepts

NATO officers outside the United States were generally familiar with such documents as *JV 2010* and *JV 2020* and the capabilities (dominant maneuver, precision engagement, focused logistics, and full-spectrum dominance) they described. They were also fairly acquainted with Network-Centric Warfare, but not the shortcomings identified by its critics. Familiarity with concepts other than NCW was less widespread. Many NATO officers, with the exception of those in the United Kingdom, required explications of RDO and EBO before they could render opinions on the concepts' potential military value. Consequently, most NATO officers also possessed little or no knowledge of the enabling concepts, such as Operational Net Assessment and Standing Joint Force Headquarters. That condition has probably changed since MC 02, which involved a substantial number of non-U.S. officers. Also, the experimentation branch (J9) of USJFCOM has increased its efforts to involve non-U.S. officers in its experiments and wargames.

Unlike their French and German counterparts, officers in the Joint Doctrine and Concept Center (JDCC) in the United Kingdom were very familiar with the two newest concepts—EBO and RDO—under development within U.S. Joint Forces Command. In fact, officers in the JDCC could recite the fundamental precepts of each of these

concepts almost verbatim. This familiarity probably reflects the British military's desire to remain closely linked to the U.S. military and to capitalize on American RMA efforts.

The militaries of France, Germany, and Britain have essentially internalized the broad scheme of transformation laid out in *JV 2020*. This document appeared to enjoy more popularity and more influence than any NATO publication regarding the future of warfare. It is, therefore, possible to say that, collectively, U.S. visions and doctrine (and money) are, for better or worse, leading the way in terms of developing future operational concepts and capabilities. As the United States military, so NATO.

Service Perspectives. The major challenges for the interoperability of NATO future operational concepts appears to exist primarily along service lines, rather than national ones. In other words, arguments for and against new concepts, such as EBO and RDO, are rooted in service perspectives, which are a product of service-related traditions, training, and culture. An officer in the Royal Air Force is likely to share the same views of RDO and EBO as an officer in the U.S. Air Force. The concept developers in the JDCC, for example, repeated the same “pro” and “con” service-related views of RDO as one would see in the U.S. military.⁹⁰ Moreover, the German Army's concept for modernizing itself—by developing more medium-weight,

⁹⁰ Interviews conducted in January 2002.

transportable capabilities—looks very much like the U.S. Army’s scheme, reflecting similar concerns and objectives.⁹¹

Criticality of Assumptions. The most critical element in determining whether operational concepts are compatible is identifying the assumptions that underpin them. Concepts that appear different on the surface may share the same or similar underlying assumptions. Hence, apparent differences may not necessarily impede operational execution, particularly if they do not generate friction capable of stalling the planning processes or causing confusion.

Also, while the transformation paths may differ among NATO’s militaries, shared assumptions can provide enough middle-ground to reconcile any major differences. For example, although officers in the German Joint Operations Doctrine Center (JODC) and the Zentrum für Analysen und Studien der Bundeswehr (ZAS) have at present almost no familiarity with *JV 2020*, or its derivative publications, the Bundeswehr’s literature on the future security environment and its stated goals for military transformation nonetheless reflect the same fundamental outlook and assumptions as *JV 2020*.⁹² Hence, the probability is high that the Bundeswehr and the U.S. military will find enough middle-ground to reconcile any major differences in operational concepts.

⁹¹ “Transformation of the German Army,” Briefing presented to the author, July 2002.

⁹² Dr. Peter Struck, Verteidigungsminister, *Verteidigungspolitische Richtlinie*, Berlin, May 21, 2003.

In any case, concept developers within individual NATO nations would do well to include a method for explicitly identifying assumptions (see Recommendations). This method would help the host nation and other NATO members find ways to make their concepts compatible. While one can easily correct definitional contradictions and inconsistencies, the same is not true of critical assumptions. Correcting faulty assumptions may require reworking the fundamental concept entirely. As an example, RDO is based on a number of faulty assumptions.

The first and most egregious assumption that RDO makes is that U.S. political leaders and their coalition partners will understand the need for, or even desire, operations that are rapid and decisive in all scenarios. The White Paper continually stresses speed in the application of force. However, political leaders may consider a graduated response more appropriate for any number of reasons, such as the desire to avoid escalation to nuclear weapons or to keep allies or coalition partners in the fight. Thus, while RDO purports to offer additional options to political leaders, it actually diminishes them, compelling decision makers to embark upon a major commitment of forces in a small-scale contingency. This inflexible, one-sided approach to military strategy plunged Western Europe into a devastating conflict in 1914 when all-or-nothing war plans deprived political leaders of the flexibility of pursuing limited aims. Therefore, while calling for an *integrated* application of all national capabilities for the

accomplishment of political objectives, RDO actually treats military operations in a vacuum, disassociating them from political aims.

The second faulty assumption in RDO relates to knowledge—defined as the product of information superiority. Unlike air superiority, however, it is difficult to know when one actually has information superiority. One could well have a great deal of misinformation, which might not become apparent until soldiers are already committed to their objectives. RDO asserts that U.S. forces will possess perfect or near-perfect knowledge of the enemy through an Operational Net Assessment (ONA)—defined as a continuously updated, system-of-systems analysis of the adversary’s total war-making capabilities.⁹³ The ONA, combined with *sophisticated* future technologies, will supposedly provide *unprecedented* knowledge and understanding of the enemy.

Yet, as previously noted, it is unclear how such continuous ONA updates will occur without greater resources, such as larger staffs, at each level of command. Artificial intelligence and similar systems have so far not lived up to expectations in this regard. Furthermore, while information systems have shown themselves capable of amassing vast amounts of data, data itself is not necessarily information and information is not necessarily knowledge. For the most part, those who study epistemology agree

⁹³ RDO, 6, 13, A-9.

that knowledge is hierarchical.⁹⁴ Indeed, the RDO White Paper provides a simple cognitive hierarchy in the shape of a pyramid: data, information, knowledge, understanding, and decision superiority.⁹⁵

However, such representations can be misleading since they portray the more complex tasks as smaller than those that are less complex. In other words, the primary task associated with data is collection. Information requires selection and interpretation of data. Knowledge implies analysis. Understanding suggests synthesis. Rather than reflecting a level of cognition, decision superiority merely represents a condition, one that is a function of the difficulty of the decisions that have to be made as well as the data available. An experienced commander can make superior decisions by trusting his intuition, rather than passing through each level of the hierarchy. Except for the last, each level in the hierarchy involves tasks that are more complex and thus require more resources, such as time and experience, than those below it. Paradoxically, the highest level of knowledge in this paradigm—understanding—requires an acknowledgement that uncertainty is a part of every calculation. Understanding is not static, but fluid, changing according to circumstances, and a function of one's experience and perspective. This cognitive hierarchy requires more thorough analysis.

⁹⁴ Benjamin S. Bloom, *Taxonomy of Educational Objectives* (New York: McKay, 1969).

⁹⁵ RDO, 11.

As a corollary, RDO assumes that the links and nodes within an adversary's systems can be identified and attacked. RDO also presumes that attacking those nodes will produce predictable *first, second, third, and fourth-order effects* that can collapse an adversary's will and/or destroy his capability to resist.⁹⁶ The White Paper defines such Effects-Based Operations as "a process for obtaining a desired strategic outcome or 'effect' on the enemy through the synergistic, multiplicative, and cumulative application of the full range of military and other national capabilities at the tactical, operational, and strategic levels." An effect is defined as the "physical, functional, or psychological outcome, event, or consequence that results from specific military and non-military actions."⁹⁷ Efforts to explore effects-based operations are, first of all, to be applauded for moving away from the old force-on-force Lanchester war-gaming models, which reduced warfare to a simple calculus of attrition.⁹⁸

However, the White Paper treats the effects as ends in themselves, rather than connecting them to political and strategic objectives. Once again, this assumption

⁹⁶ Timothy J. Sakulich, Lt Col, USAF, "Precision Engagement at the Strategic Level of War: Guiding Promise or Wishful Thinking?" Air University, Maxwell AFB, April 2001, uses complexity theory to refute the notion that precision engagement can produce desired effects with any degree of certainty.

⁹⁷ RDO, 21.

⁹⁸ C.J. Anker, Jr., and A.V. Gafarian, *The Validity of Assumptions Underlying Current Uses of Lanchester Attrition Rates* (White Sands, NM: TRADOC, 1988). As previously noted, this approach also has the benefit, as retired Marine General Anthony Zinni remarked, of forcing political and military leaders to focus on the specific effects they want military (and non-military) action to achieve. Christian Lowe, "In Exercise, U.S. Military Practices Unconventional Warfare," *Defense Week*, May 21, 2001, p. 2. The exercise was Unified Vision, conducted from 3-24 May 2001.

presupposes that an opponent is nothing more than a “mappable” system. Worse still, this system is assumed to be reactive rather than proactive, and static rather than dynamic. When asked to describe effects-based operations, for example, a senior official involved in the experimentation process said that they amounted to an approach that “dissolves the glue” that holds a table together, rather than striking at its individual legs.⁹⁹ Unfortunately, this metaphor reflects a tendency to view adversaries as inert objects—as tables—waiting to be hit, rather than as thinking beings capable of acting first, or indeed of preempting one’s attack. In other words, RDO presupposes an enemy that does not attempt to anticipate or preempt hostile actions or seek to change his decision-making apparatus before we can map it.

The third flawed assumption underpinning RDO is that an adversary is a system of systems. This phrase, which derives from a combination of RMA-speak and language concerning complex adaptive systems employed by complexity theorists, is merely a trendy and ultimately ineffective way to describe the total sum of an adversary’s political, strategic, operational, and tactical decision-making activities.¹⁰⁰ The phrase

⁹⁹ Lowe, “Unconventional Warfare,” p. 2.

¹⁰⁰ This new paradigm assumes that continuous change and dynamic interaction, rather than equilibrium, represent the universe’s normal state. It employs an interdisciplinary rather than a segregated approach to science, borrowing from disciplines as disparate as biology, economics, physics, and chemistry to help explain the dynamic nature of physical phenomena. The fundamental principles of this new paradigm maintain that: 1) every component within a system, no matter how small or seemingly insignificant, plays a part in final outcome determination; therefore, we must treat systems holistically rather than focusing only on key players; 2) predictable and non-predictable phenomena coexist and interact in the physical world producing complex networks

first originated among those RMA proponents who sought to tie sensor-shooter-assessor linkages together into a single, holistic, information-sharing system that could perform all critical combat functions.¹⁰¹ While the term complex adaptive system may well convey the sense that opponents can adapt to their environment in complex (and successful) ways, it does not impart sufficient *proactive* agency to them. In other words, it assumes that they are primarily reactive—innovating within the constraints of their environment—rather than attempting to step beyond those boundaries. Hence, the RDO White Paper’s use of the term tends to limit the choices that an adversary might select.

Furthermore, the assumption presupposes that an adversary can be paralyzed by a few well-placed strikes against its critical nodes. Although a worthy goal, history shows that such paralyzes rarely occur. Adversaries tend to recover rather quickly from an initial shock. Often, the severed pieces of an opponent’s armed forces tend to fight on,

containing too many variables or relationships to consistently calculate outcomes; 3) a small change in the input to a system can result in disproportionate effects; 4) systems, whether individuals, armies, or bureaucracies, tend to evolve toward greater complexity; and 5) these complex adaptive systems (CAS’s) “spontaneously reorganize” themselves when confronted with crises; in these moments of challenge we generally find the system at its most innovative and creative. The following are helpful for understanding the basics of complexity theory: James Gleick, *Chaos: Making a New Science* (New York: Viking, 1987); M. Mitchell Waldrop, *Complexity: The Emerging Science at the Edge of Chaos* (New York: Simon and Schuster, 1992); John H. Holland, “Complex Adaptive Systems,” *Daedalus*, CXXI (Winter 1992): 17-30; Alan D. Beyerchen, “Clausewitz, Nonlinearity, and the Unpredictability of War,” *International Security* XVII (Winter 1992/3): 82-90; and Jack Snyder and Robert Jervis, eds., *Coping with Complexity in the International System* (Boulder: Westview Press, 1993).

¹⁰¹ For an example, see Adm William A. Owens, “The Emerging U.S. System of Systems,” in *Dominant Battlespace Knowledge: The Winning Edge*, Martin Libicki and Stuart Johnson (eds.) (Washington, DC: NDU, 1996), 3.

carrying out the last orders they received (e.g., the Red Army in 1941-42) or taking actions independent of orders (e.g., the U.S. Army in the Battle of the Bulge, 1944).

In an age of proliferating Chemical, Biological, Radiological, Nuclear, High-explosive/High-yield (CBRNE) weapons, moreover, the actions of such severed elements cannot be considered irrelevant. An adversary's military forces, carrying out the last orders they received, can still launch devastating CBRNE attacks—overtly and covertly—against the United States, or one of its strategic partners. Thus, the value of attacking the enemy's coherence is lost. Moreover, RDO will presumably continue to evolve as a concept—reflecting the results of further experimentation, exploration, and critical analysis—but the sterility of war-gaming environments will make it difficult, if not impossible, to discover what factors, if any, would actually lead to an opponent's psychological collapse.

A fourth faulty assumption underpinning RDO is that the United States or its coalition partners can identify, attack, and destroy whatever an adversary values most, and in so doing break his will to fight.¹⁰² This assumption presupposes that the United States' adversaries would conform to the same rational-actor model that characterizes its own behavior. However, models that describe the behaviors of ideologues can differ markedly from our own. For example, during the missile crisis of 1962, Fidel Castro

¹⁰² RDO, ii.

and Che Guevara considered it perfectly reasonable to sacrifice Cuba in a nuclear exchange with the United States in order to further the cause of socialism. Fortunately, the Soviets did not agree, believing that the United States would also launch missiles at the USSR.¹⁰³ Even in the simplest scenarios—where what an adversary values most is power rather than ideology—domestic or coalition concerns may not permit the United States to employ the capabilities necessary to get at the basic source of an opponent's power, his military forces. Thus, asserting that RDO will deprive an enemy of what he values most is too facile a solution for some situations and completely unrealistic for others.

The fifth faulty assumption underlying RDO is that all elements of national power can be brought together in a single operation that is rapid and decisive.¹⁰⁴ Yet, the paper includes no discussion of just how RDO—and military power in general—would operate in combination with the other elements of national power. For example, some of the most potent tools of economic power—blockades and sanctions—generally require a great deal of time to work and often entail a significant amount of collateral damage. It is not clear, therefore, that RDO and economic sanctions—or other tools—could work together to produce results that are both rapid and decisive, at least not

¹⁰³ During the 1962 missile crisis Guevara wrote of the need to “walk by the path of liberation even when it may cost millions of atomic victims.” Castro was less fanatical, but also refused to retreat from the possibility of nuclear holocaust. See James G. Blight, Bruce J. Allyn, and David Welch, *Cuba on the Brink* (New York: Pantheon, 1993), 319-20.

without substantial modification. Such integration, if possible at all, could produce a powerful synergy. However, mere assertions to that effect will not suffice.

¹⁰⁴ RDO, 8-9.

Recommendations

1. Increase Multinational Participation in U.S. Joint Experimentation.

Multinational participation in JFCOM's experimentation efforts is critical. The best way to ensure that the future operational concepts of NATO's forces remain interoperable is to enable NATO members to participate in a joint experimentation process. Fortunately, a vehicle for conducting joint, multinational experimentation does exist. The Multinational Concept Development and Experimentation (CDE) center was established in 2000 at SACLANT Headquarters in Norfolk, Virginia.¹⁰⁵ As described earlier, NATO CDE is a process for identifying and developing concepts, for designing experiments to test those concepts, and for preparing recommendations regarding NATO doctrine, organization, training, and equipment. Although it has several projects under development, neither RDO nor EBO are among them. NATO CDE will be expanded to accommodate more concepts, and it should take RDO and EBO under consideration.

Force experimentation is not likely to close the military gap between the United States and its NATO allies unless some method is developed for identifying and addressing the critical (and sometimes faulty) assumptions that underpin U.S. operational concepts, such as RDO. Even if issues surrounding technological

interoperability are resolved, other NATO countries may find themselves unwilling or unable to buy into the dubious expectations and political inflexibility that RDO entails. With good reason, defense planners in most modern militaries explicitly identify the critical assumptions that have gone into the development of war plans. While this process of identification is neither scientific nor foolproof, it is valuable because it makes war planners and decision makers more cognizant of at least some of the risks inherent in a particular plan. Likewise, such an awareness would prove valuable in force experimentation because it would help concept developers address the risks inherent a particular concept. To date, however, force experimentation and concept development include no method for identifying and addressing faulty assumptions.

2. Develop a Method of Assumption-Based Concept Development (ABCD).

One method for examining a concept's critical assumptions might be to modify the Assumption-Based Planning (ABP) tool, an instrument for long-range planning developed by the RAND Corporation, that has gained currency within the United States in recent years.¹⁰⁵ ABP involves five steps:

- 1) identifying the explicit and implicit assumptions expected to remain true over a reasonable time horizon;

¹⁰⁵ <http://www.saclant.nato.int/cde/whatis.htm>.

¹⁰⁶ James Dewar, Carl Builder, William Hix, & Morlie Levin, *Assumption-Based Planning: A*

- 2) identifying assumption vulnerabilities;
- 3) defining signposts that will indicate when one or more assumption has become vulnerable;
- 4) defining appropriate shaping actions that avoid assumption vulnerabilities;
- 5) defining hedging actions that minimize the impact of an assumption failure.

Although it does not claim to be a panacea, ABP does offer a much improved alternative to trends-based forms of planning which posit only a single, most likely future.¹⁰⁷ Most important, ABP helps expose organizational assumptions that might prove invalid, and therefore dangerous, to a long-range plan in a given period of time. Its success depends on the ability of decision-makers to link their implicit and explicit assumptions to events in the physical world. With some adjustment, the methodology presented in ABP could apply to the crafting of *vision* documents, the design of experimentation programs, and the development of future operational concepts. In other words, with little adjustment, ABP could become an Assumption-Based Experimentation or Concept Development (ABCD) tool.

ABCD could help identify and address the critical assumptions underpinning RDO, for example. With regards to RDO's first assumption—that it is an appropriate, indeed

Planning Tool for Very Uncertain Times (Santa Monica, Ca.: Rand, 1993).

¹⁰⁷ Appendix B of *Assumption-Based Planning* discusses the differences between ABP and other forms of long-term planning.

necessary, response in any situation involving a smaller scale contingency—ABCD would guide concept developers to begin with identifying the assumption's vulnerabilities. An example of such a vulnerability is that history shows that U.S. political leaders have tended to hedge their bets in crises by opting for a graduated response so as to avoid escalation or over-commitment. Thus, RDO might have little appeal to them. Second, ABCD would guide concept developers to define signposts for indicating just how vulnerable this assumption is, and validate those vulnerabilities through rigorous war games. Third, once assumption vulnerabilities are validated, concept developers would then seek shaping adjustments to the concept that might make RDO more flexible, and thus more practicable and appealing to the political leadership. Finally, ABCD would guide concept developers to build in hedging adjustments to the concept, admitting, for example, that it has very limited applicability across the spectrum of operations.

However, using a method like ABCD would also require a basic understanding of the tool's limitations. The first of these involves the sensitivity of human perceptions. Like ABP, ABCD would require the identification of genuine and unambiguous signposts.¹⁰⁸ Yet, in fluid environments, signposts are myriad, conflicting, and at times almost invisible. For example, as the United States entered the twentieth century, all signs indicated that the steam-powered vehicle would dominate the automobile market,

since it ran more cleanly and quietly and proved more powerful than either the gasoline or electric engines.¹⁰⁹ Nonetheless, due to factors that remain something of a mystery, the gasoline engine became the industry standard.¹¹⁰

As the example of inventor James Joule (1818-1889) illustrates, the proper appreciation of signposts often eludes even those who have spent their lives working on a particular project or invention. Although he had invented one of the first electromagnetic engines, Joule never recognized that electricity had the potential to revolutionize all forms of industry.¹¹¹ Compounding the complex problems associated with basic perceptions is the misinformation—inadvertent or otherwise—that often surrounds the potential benefits of a new technology. During the nineteenth century, Richard Gatling (1818-1903) naively marketed his famous gun as *a great economy* that would save the U.S. Army both men and money. He boasted that two Gatling guns—at \$1,500 each—could replace an entire infantry regiment that typically cost

¹⁰⁸ *Assumption-Based Planning*, 25-6.

¹⁰⁹ John B. Rae, “The Internal-Combustion Engine on Wheels,” and Lynwood Bryant, “The Internal-Combustion Engine,” in Melvin Kranzberg and Carroll W. Pursell, Jr., Eds., *Technology in Western Civilization: Technology in the Twentieth Century*, Vol. II, (New York: Oxford University Press, 1967), 123.

¹¹⁰ One explanation suggests that gasoline achieved “lock-in” due to the disappearance of public horse troughs—the steam car’s primary source of water—after an outbreak of hoof-and-mouth disease. M. Mitchell Waldrop, *Complexity: The Emerging Science at the Edge of Order and Chaos* (New York: Simon & Schuster, 1992), 40-41. W. Brian Aurthur, “Competing Technologies, Increasing Returns, and Lock-In by Historical Events,” *The Economic Journal* XCIX (March 1989): 116-31.

¹¹¹ Donald Cardwell, *The Norton History of Technology* (New York & London: W.W. Norton, 1995), 352.

more than \$150,000 per year to maintain.¹¹² However, Gatling's simple cost equation obscured the fact that a regiment of disciplined troops also performed other useful functions beyond just delivering firepower on target. Put differently, identifying "genuine and unambiguous" signposts that indicate when one's assumptions have become vulnerable is more art than science.

In addition to the very real problem of signpost detection, one should understand that the identification of explicit and implicit assumptions is not easy. An organization's ability to identify its assumptions depends upon its willingness to perform rigorous self-critical analyses. In other words, the identification of explicit and implicit assumptions might not proceed much beyond a superficial analysis, unless an organization makes a conscious effort to do so.

Third, one should remember that shaping and hedging actions will compete for finite resources, possibly leading to a situation in which preparing for one precludes achieving success in another. For example, shaping actions in all armies at the turn of the century propelled improvements in firepower technologies, especially cannon, munitions, and powder, so that by 1914, artillery had increased dramatically in number and caliber. However, resources demanded by this and other shaping actions far exceeded those invested in appropriate hedging actions such as the development of

¹¹² P. Wahl and D.R. Toppel, *The Gatling Gun* (London: Herbert Jenkins, 1966), 12.

armored fighting vehicles. In a world of limited budgets, therefore, armies must balance resources among shaping and hedging actions, activities that could complicate—if not compromise—experimentation and the development of operational concepts over the long term.¹¹³ If the processes for achieving technological integration are not flexible and responsive, the accurate identification of signposts and assumptions might not matter.

Fourth, in a dynamic global environment such as today's in which technological change could well occur within institutional decision or adjustment cycles, hedging actions—while appearing to remedy vulnerable assumptions—might have the unintended effect of reducing the overall pace of technological integration. In other words, ABCD will not necessarily eliminate the risks that decision makers face as they attempt to determine the right pace of modernization for the U.S. military. Changing too quickly could result in acquiring *immature or* inappropriate capabilities or might even undermine the doctrinal organization or cohesion essential to a military force. Modernizing too slowly, on the other hand, runs the risk of fielding a force with outclassed and, therefore, restricted capabilities.

The point of airing these concerns is to emphasize that ABCD is merely a tool. It is only one of any number of possible ways to examine the assumptions that underpin

¹¹³ This was clearly the case with turn-of-the-century armies, which had insufficient resources for modernization given the rate and scope of technological innovation they experienced. See Antulio J. Echevarria II, *After Clausewitz: German Military Thinkers before the Great War* (Lawrence, KS: Kansas University Press, 2000).

operational concepts. Other weaknesses in the process—especially in an environment in which change is rapid, pervasive, and nonlinear—could well compromise the overall effort. The value of a tool like ABCD depends upon how well it compensates for human limitations within a particular environment. It certainly offers no silver bullets. In any case, JFCOM would do well to maintain a push-pull approach for incorporating technological innovations into operational concepts. Operational concepts drive technology toward desired end-states, while technology offers new capabilities—actual and potential—that might enlarge, cancel, or otherwise alter operational concepts.

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