

Shock-Based Operations

New Wine in an Old Jar

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I want to thank Col Paul Herbert (USA) and Dr Mark Clodfelter (USAF, ret.), both of the National War College faculty, for their invaluable assistance. They did not always agree with me but nonetheless did a marvelous job keeping me pointed in the right direction.

Introduction

It is only a slight exaggeration to say that hardly a day goes by without the introduction of some remarkable development in the fields of information technology or bioenvironmental science. Such advances have had extraordinary consequences not only for industry, academia, medicine, and the social sciences, but also for warfare. In fact, while it is reasonable to suggest that many previous military-inspired scientific breakthroughs paved the way for a wide variety of spin-off societal improvements, the standard model has been turned on its head in the information age. In the military we now often find ourselves at a comparative disadvantage as we try to grasp how to take advantage of breathtaking changes in other fields. Indeed, at times it is as if we "are surfing the ever-higher waves of information power more than [we] are in any practical sense controlling the heights or frequency of those waves."¹

The rapid pace of technological change demands equally frenetic efforts by our military to find more effective ways to deter and defeat our potential competitors and battlefield opponents. Over the past decade or so, we have been moving at an impressive pace in our attempts to advance military doctrine and improve joint military operations. Nevertheless, for the most part our changes to warfighting doctrine have been largely evolutionary. It is time to cross a new threshold. Apart from gaining a better understanding of technology's effects on our ability to fight and win wars, we need to implement revolutionary changes in both targeting and combat assessment doctrine at the strategic, operational, and tactical levels of war.

We need a warfighting doctrine that places more emphasis on the ability to overwhelm our adversaries both physically *and* mentally. Specifically, the objective must be to induce mental and physical paralysis in our opponents — paralysis that will inject a false orientation, prevent our adversaries from adapting to their ever-changing surroundings, and cripple their ability to react to U.S. or coalition actions. I call this a doctrine of "shock-based operations." Following a more detailed investigation of this doctrine I propose a new method of battlespace assessment, itself one of the most important aspects of shock-based operations.

Shock-based warfare offers a new way of carrying out the Clausewitzian clash of wills, albeit one that relies as much (or more) on the mental and moral aspects of conflict as it does the physical. In addition to helping us take advantage of information-age advances without becoming subservient to new technology, shock-based warfare will improve the risk-reward ratio that is an essential consideration of any political-military strategy. Moreover, it allows for opponents whose behavior as complex adaptive systems negates existing American doctrine that

assumes linear mechanistic opponents.² To reflect more accurately the complex and chaotic world in which we live, shock-based operations require sweeping changes in not only our military mindset, but also in organizational structure; modeling and simulation; intelligence gathering; joint, service, and interagency exercises; targeting; and battlespace assessment.³

Exactly what *are* shock-based operations, and what must we do differently than we are doing already — seemingly quite successfully — in today's military operations?

From Political Objectives to Military Action

Military combat operations begin as politics or diplomacy fails. As described in Joint Publication 1, the military's responsibility then becomes to "employ rapid and decisive military power to achieve U.S. objectives...."⁴ Joint commanders use the principles of war, joint warfare fundamentals, enduring concepts and enablers, and elements of joint operational art to craft a strategic estimate and to prepare analyses of various courses of action. The ultimate objective is to produce a wartime campaign plan that, as stated in typically sterile military terms, will "seek to destroy or neutralize the adversary's capability for organized resistance and to facilitate post-combat termination objectives."⁵ While Joint Publication 1 does not offer much more than broad statements as to the actual methods by which political leaders or military commanders use military forces to achieve political objectives, Joint Publication 3-0 is a little more fruitful.

The latest draft of Joint Publication 3-0 (*Doctrine for Joint Operations*) labels the campaign as "a series of related major operations that arrange tactical, operational, and strategic actions to accomplish strategic and operational objectives."⁶ This publication focuses on the terms "simultaneity" and "depth" in describing how shock-like conditions are created on the battlefield, highlighting both as necessary to "overwhelm and cripple adversary capabilities and adversary will to resist."⁷ Joint Publication 1 is peppered with frequent reminders of the benefits of staying inside an opponent's decision cycle — a critical concept that is explored in more detail below. Nevertheless, despite laudable analyses of military campaigns, operational art, and the joint battlespace targeting process, both Joint Publication 1 and 3-0 lack a more detailed discussion of how it is exactly that U.S. forces can "overwhelm" and "cripple" its opponents.⁸

The OODA Loop and Our Opponent's Orientation

The late strategist Colonel John Boyd (USAF, retired) stressed relentlessly the importance of getting inside an opponent's "decision cycle" through a continuous process he called observe-orient-decide-act or, in abbreviated form, the OODA loop.⁹ Observation precedes orientation in this continuous cycle, but I will postpone examination of the former to focus first on what I consider to be the critical phase — the *orientation* stage of the OODA loop.

The orientation phase of any decision cycle is the linchpin of battlespace decision-making. It involves collecting, integrating, and processing all available information and data to ascertain "ground truth." In establishing our orientation in any life environment the *time* it takes to gather and process information is as important as the *manner* in which that information is gathered. A large part of the challenge is trying to separate fact from fiction, certainties from assumptions. (Assumptions are often as important as facts, if for no other reason that you may not really know

the difference between the two.) We have to process information, determine our orientation, make decisions, and act before our opponents go through the same four-step cycle. Additionally, we cannot be satisfied if we do this one or two times — staying ahead of our opponents requires strenuous, constant effort to achieve faster and more effective OODA loops.

Theoretically, if we observe, orient, decide, and act faster than our opponent, he becomes unable to keep up with us. He will find it difficult or, even more desirable from our perspective, impossible to orient himself properly to his mental and physical surroundings and will become bewildered and shattered psychologically. If we get through these four OODA stages faster than our opponent we say we are remaining inside our opponent's decision cycle. On the other hand, if our opponent orients himself and acts faster than us, he can preempt our planned actions, upset our orientation, and decrease even further our ability to make timely and effective decisions.

If we can keep inside our opponent's decision cycle our opponent is overloaded beyond his ability to respond, react, or adapt. As described by Boyd, the goal is to "collapse [the] adversary's system into *confusion* and *disorder* by causing him to over and under react to activity that appears simultaneously *menacing* as well as *ambiguous, chaotic, or misleading* [emphasis in original]."¹⁰ Our opponent will experience "various combinations of uncertainty, doubt, confusion, self-deception, indecision, fear, panic, discouragement, and despair...."¹¹ Ultimately, our opponent will become incapable of fighting effectively.

The OODA loop or decision cycle depends completely upon tactical, operational, and strategic agility. We must not only *think* faster than our opponent; we must also *move* faster than him. Movement by itself can be fruitless or even counterproductive. If Newtonian momentum is defined as mass multiplied by velocity, we best define agility in the information age as movement multiplied by intelligence.¹² To take full advantage of rapid technological change requires mental and physical agility in both the planning room and in battlespace. Shock-based warfare relies heavily upon such agility and must be used to disorient our opponents so thoroughly that they either decide not to fight or, once the fighting has begun, to capitulate with low relative U.S. or coalition losses.

Shock at Home

As a very basic illustration of this effect, consider what happens as I come home from work one day to find my key does not fit in the front door of my house. At first the problem seems simple: I have the wrong key. But as I struggle more and more I find none of my keys work. I knock on the door; surprisingly, the person who meets me is not my wife. While more confused than ever, my initial reaction is to assume I somehow picked the wrong house. But I am on the right street, the number and name on the front door are correct, and the same old welcome mat sits under my feet. Bewilderment and a little panic sets in. As I walk in the house I recognize nothing: the furniture, pictures, carpet are all completely different. My confusion mounts. Just when I think I can find a way to adapt to this ever-increasing shock to my orientation, the person who greeted me pulls out a gun, points it at me, and fires.... Whether the gun has blanks or live bullets is immaterial: what matters is that I am now completely unable to react to the unfolding situation. What started as a mild and maybe even amusing disorientation ended with utter confusion and an inability to comprehend the situation; my world turned upside down in a matter of minutes.¹³

Shock-based operations have the *potential* to produce on a grand scale such shock and disorientation in our opponents.

Implementing a Shock-Based Strategy

Industrial-Age Targeting

In general, we have succeeded in linking military strategy to political objectives by relying upon superior intelligence agencies and military forces to achieve desired battlefield effects through conventional, physical attack against our opponent's military infrastructure, his weapons systems, and his fielded forces (this order has changed through the years and depends somewhat on service doctrine, but these common categories have not really changed much).

In the traditional way of attacking the enemy through air, ground, or sea, typically we have selected those sets of physical targets that our enemy needs to keep fighting. In broad terms, we have gone after our opponent's military forces and his industrial base (comprising in the main telecommunications and transportation networks, war production facilities, command and control nodes, and petroleum-oil-lubrication storage areas). Additionally, starting in World War II and continuing through the present, the Air Force has emphasized destroying an enemy's desire to keep fighting. According to Air Force doctrine, destruction of many of the targets listed above will not only reduce the enemy's physical capacity to fight the war, it also reduces — and some airpower zealots would say can destroy — the enemy's national will to fight. Within the last fifteen years, the enemy's leadership has also gained new acceptance as a lucrative target, under the assumption that removal of our opponent's political-military leadership offers the shortest route to eliminating this will to fight.

The best example of a leadership-centric approach to targeting is Colonel John Warden's (USAF, retired) "Five Rings" theory of aerospace warfare. While innovative and commendable for its bold approach to changing long-standing targeting doctrine, Warden's theory (and most other leadership-centric or counter-army-centric doctrines) fails in that it relies on largely linear mechanisms for success. In his essay *The Enemy as a System*, Warden begins with an equation in which the outcome of a war strategy depends upon the product (Physical x Morale). Since the physical side of the enemy is theoretically "perfectly knowable and predictable," and the human side "beyond the realm of predictability," Warden contends that the war effort should thus be directed "primarily at the [enemy's] physical side."¹⁴ In seeking a best way to attack this facet, Warden develops his five-rings model of an opponent. He compares it to an astronomical or molecular model in which the outer "orbiting subsystems" surround a critical core. In Warden's model the critical core is the enemy leadership; the orbiting subsystems are organic essentials, infrastructure, population, and the opponent's fielded military forces.¹⁵

While the perfect attack would be one in which only the critical core — the enemy's leadership — would have to be defeated to achieve ultimate success, Warden acknowledges the difficulty of getting at this lucrative target and expands his discussion of "parallel attack" to describe how an attack against all five rings at once may be necessary to bring about the desired strategic effect (in effect, attacks against the component rings can collapse the enemy's system or affect the enemy's leaders' will, much in the same manner as Air Force attacks against Germany's

economic and industrial targets in World War II were designed to affect the German national will to fight).¹⁶

My primary objection to Warden's Five Rings theory rests on its neglect of the morale side of his equation of war. While it may be nigh impossible to predict human behavior with high accuracy, that is no reason to neglect it in execution of a grand strategy. Moreover, the use of astronomical or atomic ring and shell models to describe an enemy's system suggests an excessive dependence on linearity and mechanistic systems.¹⁷

Since it has been notoriously difficult to attack leadership targets directly, we have usually focused on the hardware, command and control networks, and people that help keep our opponent's leadership in power. Consequently, the most effective way to defeat our opponents and achieve political objectives has been to drop bombs on things they value, to capture territory and equipment, and to kill people. With Desert Storm we started seeing the concerted introduction of what now typically falls under the rubric of "information warfare." In the war against Iraq, information operations included attacking Iraq's computer, communications, and command and control networks with electrons instead of high explosives.

This method of assailing our enemy, moderately successful in 1991, was even more useful in Operation Allied Force as we employed remarkably wide-ranging information networks to gather reams of data on how the Serb leaders ran their country. Some very smart people in our military and civilian agencies made great headway in finding out what the Serb leadership valued most — in other words, what they could least afford to lose if they hoped to remain in power. Yet we simply did not yet have the capacity to put together the best of both physical and information attacks to shatter the Serb leaders' orientation, induce paralysis, and stay inside the Serb decision cycle.¹⁸ As a result, we could not bring down the Serb power base before the war began or during the first few days of actual combat operations.¹⁹

Most current targeting doctrines neglect the powerful effects of interaction, complexity, and the chaos of warfare.²⁰ It is not that such concepts are not discussed; rather, it is the very difficulty of dealing with such complex effects that cause them to be largely ignored or discarded. Moreover, today's doctrines essentially ignore the existence of opponents who behave as complex adaptive systems. Our opponents are usually much smarter than we assume initially. They learn not only from the experiences of other states or groups who have been on the receiving end of American military might, they adapt remarkably well even while under direct attack from U.S. forces.²¹ After the conflict ends these opponents endure and persist.

If Desert Storm and, to a lesser extent, Allied Force were examples of a mostly direct approach to combined warfare, the recent phenomenal growth of information, bio-, and nano- technologies now provide a way to focus once more on the *indirect* method of attack. We need to perfect an approach that combines physical attack and information operations to get and stay inside our enemy's decision cycle; to confuse, shock, and frighten their leadership and (or) populace to the point they make inappropriate responses or collapse into inaction. The information age has given us the tools to accomplish such attacks. The challenge is to figure out exactly how we use the precepts of shock-based warfare to defeat our enemies.

Where to Begin: The Strategic Level

As always, the first and critical step is to establish a well-defined link between political objectives and military strategy. This process establishes the intensity and breadth of the military campaign and places limits on the amount of power military commanders are allowed to use to achieve political objectives.²² The next — but scarcely less important — task is to analyze completely our potential opponent's ideology and his political, economic, military, and cultural systems — the only way to truly shatter our enemy's orientation is to begin with a complete grasp of what allows him to survive from day to day. This understanding leads naturally to development of the type and sequence of battlespace attacks and the proper placement of mental, moral, and physical pressure that will yield the greatest likelihood of paralysis and capitulation.²³

Shock-based operations thus demand an excruciatingly detailed analysis of an opponent's centers of gravity, nodes, and critical vulnerabilities; only such a holistic method will allow military commanders at *all levels* to understand how the combination of physical attack and information operations will achieve strategic objectives. The "two levels up, two levels down" philosophy associated with industrial-age "commander's intent" will not suffice in shock-based warfare. It is critical that everyone from front-line warriors to the Chairman of the Joint Chiefs of Staff have the same understanding of the campaign's grand strategy and, in particular, a sense of how shock-based operations will be used to achieve campaign objectives.²⁴

This analysis must force together often-distinct worlds for both planning and execution of shock-based operations. At the strategic level we need to forge an unbreakable bond between warriors of the five services and intelligence agencies, and the 'best and the brightest' of the interagency world. During this process the steely-eyed advanced tactics school graduate who can pick the best weapons and tactics for any target in the world is no more or less important than the intelligence specialist who knows exactly what physical targets to hit to reduce the enemy's ability to wage war. He is also no more or less important than the select group of recognized experts culled from both government and the corporate world that are versed in the intricacies of international finance, transportation, power, water, industry, and worldwide crime syndicates. He is no more or less important than the diplomat who served ten years in country and knows the culture, geography, and language better than anyone but a native. Our steely-eyed warrior is no more or less important than the disgruntled defector who, after serving a decade as the enemy leader's right-hand man, knows exactly what keeps that leader in power. Finally, while the steely-eyed warrior may find it hard to swallow, in shock-based operations he is no more or less important than the psychologist, psychiatrist, sociologist, or religious expert.²⁵

The use of strategic-level "nodal analysis" has recently gained more currency as our military staff officers and governmental interagency groups search for new and inventive ways to degrade or destroy portions of an opponent's civil-military system. The intent is to achieve military objectives through a combination of overwhelming precision firepower and information operations against critical nodes of our adversary's leadership, fielded forces, and military and civil infrastructure. The doctrine associated with this well-intentioned concept still relies, however, on a largely linear or reductionist combination of technology and physical destruction to achieve military objectives.

Over the past ten years U.S. military leaders have done reasonably well taking data and advice from most of the above-named groups of specialists to build a campaign that pits American strengths against opponent weaknesses, establishing the necessary links between political objectives and military strategy. Rarely, however, have we put all of the groups together at one time to coordinate such efforts: there has never been a "central clearing house" at one classification level to lay out the targeting plan to military commanders.²⁶ Such efforts have remained largely at the strategic level of war for three principal reasons: above all, they remained at the higher level because they were not particularly relevant to the operational and tactical levels. Also, security concerns have confined the complete targeting plan to the strategic level. Finally, the overarching targeting plan stayed largely at the strategic level due to the fact that rapidly changing events throughout the lower levels of war have made it almost impossible to adapt on the spot. Such adaptation, however, is absolutely central to shock-based warfare.

What Next? The Operational and Tactical Levels

Operational- and tactical-level commanders will not have the luxury of time granted strategic-level planners who conceive and build a holistic shock-based campaign plan. The fog and friction of the battlespace, adaptive opponents, and ever-changing political exigencies will dilute almost immediately the value resident in the original strategic plan. To stay inside the opponent's decision cycle and avoid being placed into a reactive mode of operations, our commanders who fight the day-to-day war must rely upon innovation to adapt to continuous change. These commanders must have an ever-present link (physical if able, virtual otherwise; on-site if possible, in-theater without fail) to the same organizations and individuals who helped plan the original campaign to ensure that the opponent's orientation is attacked properly and shattered. At the same time, commanders will rely upon the same links to ensure the orientation of U.S. and coalition forces remains intact during events in battlespace that will change almost by the minute, often in ways never anticipated.

The key to shock-based warfare is to unleash the gamut of physical and information tools of warfare to attack our opponent's critical nodes, overwhelm his ability to adapt to change, and make him think he is under constant attack from every conceivable direction. Nothing can appear safe from attack. Every time our enemy attempts to reorient himself to the new environment, the U.S. shifts its weight of effort to attack something else equally important to the opponent's survival — our opponent's orientation is distorted and shattered before he knows what hit him. The process continues until paralysis sets in. If the Patton-esque adage of industrial-age maneuver warfare was to "hold 'em by the nose and kick 'em in the ass," in shock-based warfare the idea is to hold the enemy by the nose and kick him in the ass, the shins, the spine, and the chest — all while assaulting his brain, heart, and central nervous and immunity systems. The enemy's "body" collapses and implodes.²⁷

As an example, our Joint Force Air Component Commander (JFACC) may find that the typical 72-hour Air Tasking Order process that was so useful in the original strategic plan becomes at best unwieldy when trying to keep up with a rapidly changing battlespace. Faced with limited resources and competing objectives, our JFACC will have to make tough on-the-spot decisions about resource reallocation. The value of shock-based targeting, however, is that our JFACC can

modify significantly his original resource allocation plan but still achieve the desired military objectives.

Such resource reallocation might mean, for instance, sacrificing direct and seemingly lucrative attacks against a dozen MiG aircraft in the open on an enemy airfield to hit a time-critical target somewhere else in theater (a target which, according to his group of on-site or virtual experts, would play a more important part in warping the opponent's orientation than an attack against the MiGs). The sacrifice would be permissible thanks to our JFACC's coordination with his group of experts who, through shock-based operations analysis, were able to find other means of assuring those same MiG aircraft would never leave the ground (for example, by contaminating the airfield fuel supply, information attacks against the base command and control system or the aircraft's avionics and weapons systems, or use of special operations forces to take out the enemy's pilots and mechanics).

While I use the JFACC example to illustrate the idea of rapidly changing operational-level conditions, the argument applies throughout the battlespace. This ability to forgo one or more lucrative targets in favor of a time-critical one will itself require something of a revolution in organizational thinking: not many air, land, sea, or space component commanders will give up "hard kills" against lucrative targets with mere promises that those targets will be neutralized through other means. It is clear the proof will have to be in the pudding before battlespace commanders consistently adopt such thinking.

The demands of a fluid battlespace environment and presence of adaptive opponents make flexibility, agility, and innovation central features of shock-based warfare at the operational and tactical levels. The only way for U.S. and coalition commanders to destroy the opponent's orientation is to remain inside our enemy's decision cycle. To stay inside our opponent's decision cycle means changing the weight of effort as the tactical and operational battlespace changes; it also means relying on the advice of shock-based warfare experts to remain a step ahead of our adversary.

As important as flexibility, agility, and innovation in shock-based warfare is the ability to receive timely and accurate information from a constantly shifting battlespace, since this helps establish our correct orientation within each decision cycle. How do we get such timely and accurate information? How do our political leaders and tactical-, operational-, and strategic-level military commanders assess progress in meeting campaign objectives and thus continue with a plan that preserves our own orientation while destroying our opponent's ability to adapt?

Combat Assessment, or Back to the OODA Loop

If the initial strategic plan focuses almost exclusively on the orientation phase of the OODA loop, subsequent iterations of the decision cycle are contingent upon the observation stage (which for the purposes of this discussion may be called by the more familiar term, the combat or battle damage assessment phase). Observation is an integral part of the decision cycle. In our OODA loop, the output of the observation stage feeds directly into the orientation phase, where our leaders and commanders then form the decisions that lead to actions both in the battlespace and at the bargaining table. Not surprisingly, the observation phase has been only as complex as

our existing collection systems and cognitive factors have allowed. In industrial-era combat, combat assessment consisted — and consists — mainly of direct battle damage assessment (‘eyes on target’ and weapon system video tape), intelligence analysis of military capability (collection assets and human intelligence), and commanders’ personal observations as to remaining enemy capability (Figure 1).

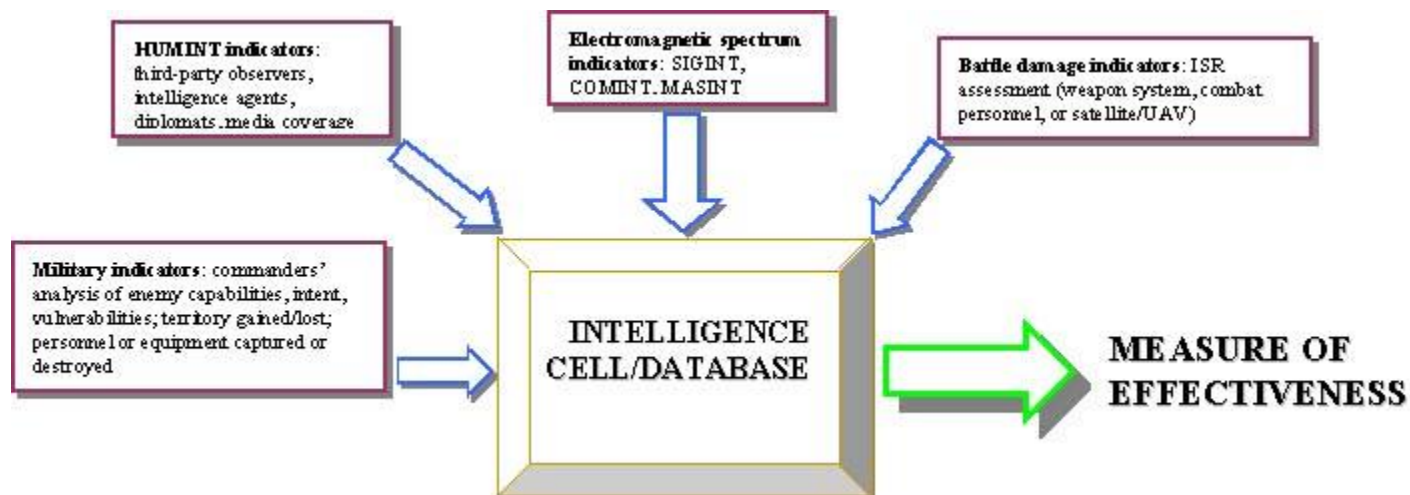


Figure 1. Industrial-Age Battle-Damage Assessment

As we move to shock-based operations, the complexity of information-age warfare demands more than so-called ‘conventional’ indicators of battlefield success.²⁸ Information-age conflict requires an increasingly sophisticated means of assessing progress. If we accept that our opponents behave as complex adaptive systems, we need a combat assessment system to match. In essence, what we need is a "complex adaptive intelligence system" (Figure 2). Put in simpler terms, we need a combat assessment capability that is capable of self-learning. As farfetched as it might sound at first, there have been remarkable advances in information systems that suggest such a self-learning system is possible, if not highly likely, within the next several years.²⁹ Such a system will accept continuous battlespace inputs as shown in Figure 2, apply them against a cultural-military-economic model produced by shock-based warfare experts and against what it has already ‘learned’ by comparing the opponent’s expected and actual actions to date, and provide a constantly updated measure of effectiveness for commanders.³⁰

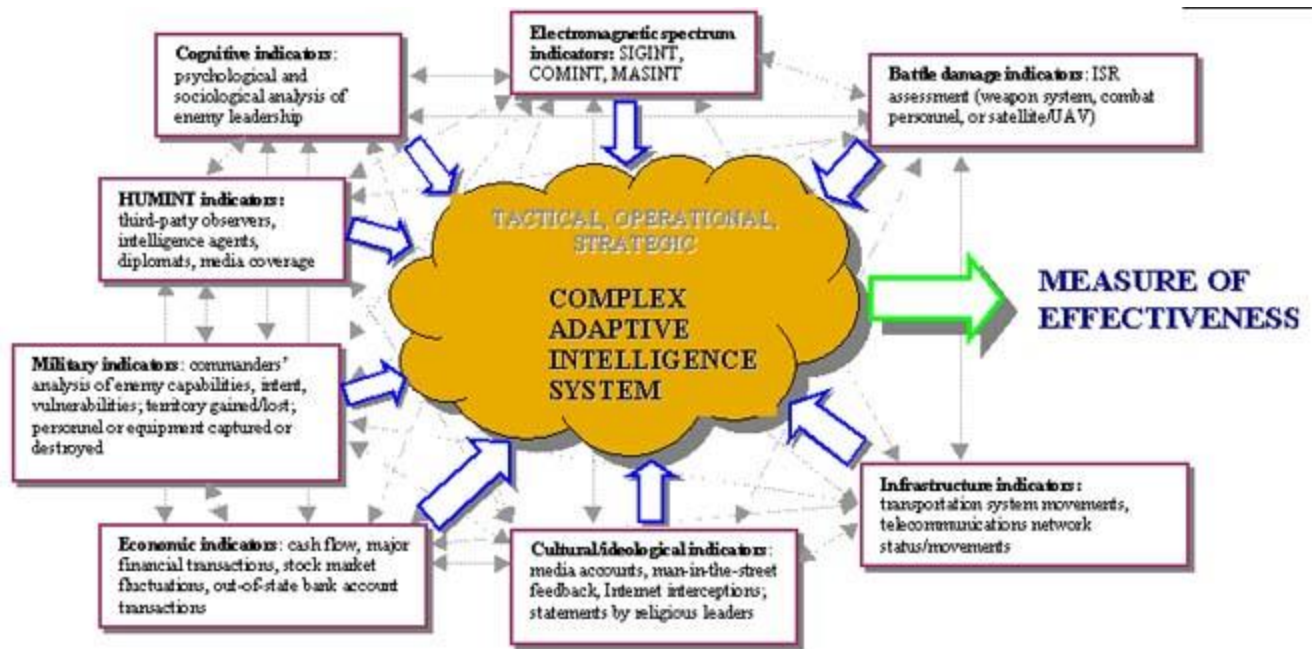


Figure 2. Information-Age Combat Assessment

The output of such a system is not linear. There can never be a numerical grade cutoff, above which our commander can tell the politicians that success is assured; below which, our commander assumes he is losing the war (introducing frightening comparisons with the worst of Vietnam-era "systems analysis," to say the least). Moreover, the output will only be as good as the inputs — that aphorism remains immutable, if somewhat unfortunate. We need to think of the product more in terms of "green, yellow, and red light" indicators.³¹ Given these clear limitations, it may seem that building these highly sophisticated databases for each theater of war is more effort than it is worth. What is important, however, is not only that a new observation method is needed to handle the exploding demands of information-age conflict. What also matters is that our ability to shatter our opponent's orientation — the central feature of shock-based operations — depends to a large extent on how well we can monitor our progress towards that goal. We need a complex adaptive intelligence system to give us the most timely and highest fidelity combat assessment possible, even if such a system has to take second place to the most effective centuries-old complex adaptive system, the commander and his *coup d'oeil*.

A New Definition for Joint Doctrine

Much as implementation of a shock-based warfare doctrine will improve the capacity to link U.S. political objectives to a military strategy, inclusion of a definition and expanded discussion of shock-based operations will enhance joint doctrine. Joint publications — and Joint Publications 1 and 3-0 in particular — need a definition and description of shock-based operations. I propose the following, to be included in joint doctrine glossaries and within discussions of how military operations will accomplish NCA-directed political objectives:

Shock-based operations. A holistic way of attacking an adversary's centers of gravity, nodes, and critical vulnerabilities, designed to collapse the adversary's system into mental and physical paralysis. Shock-based operations isolate opponents physically, mentally, and morally from their external environment by destroying their view of the world, or their **orientation**. The intent is to push the enemy beyond his ability to endure, respond, or adapt to a rapidly changing tactical, operational, or strategic environment. Shock-based operations rely upon all instruments of national power to link NCA objectives and military strategy. The goal of military commanders at all levels of war will be to assure U.S. and coalition forces remain inside the opponent's **decision cycle**. As such, shock-based operations require both mental and physical agility throughout the battlespace.

The "Law of Unintended Consequences"

One of the risks in shock-based operations has to do with the likelihood of "unintended consequences," or in precipitating reactions that have not been anticipated. For example, extensive attacks against a nation's infrastructure, electrical grid, or economic system can create such extreme hardship that the resulting backlash bolsters rather than weakens our opponent's national will to fight. A holistic shock-based targeting doctrine must consider carefully the possible repercussions of an intense combination of physical destruction and information warfare.³² Strategic and operational commanders must rely upon assessment mechanisms as described above to gauge our opponent's will to fight and to ensure military and political objectives remain closely linked.

In terms of generating unexpected reactions to our operations, we have to expect our opponents to exhibit characteristics of complex adaptive systems. Given that even the most reprehensible and seemingly single-minded opponent is likely to adapt rapidly, this reversion to unexpected or unanticipated behavior should hardly be surprising. Slobodan Milosevic was expected to cave in after three days of bombing. That he did not may be evidence of well-intentioned political and military expectations gone awry, but more important it is a clear demonstration of ineffectual shock-based targeting.

Driving desperate dictators into dark corners can cause them to lash out in ways never anticipated. While the ultimate goal of shock-based operations is to prevent our enemy from recognizing the impending disorientation before it is too late, it is always *possible* that our adaptive opponent will see his world coming apart. There is little question that a tyrant like Saddam Hussein would, if faced with no other option, resort to actions such as use of biological or nuclear weapons against our homeland. Yet even if a dictator were to make such a decision, shock-based operations could provide a variety of acceptable options. For example, in this situation we might be able to make sure the execute order never reached its intended audience or ensure the weapon of choice could not be prepared or fired properly. In a more pessimistic scenario in which the weapon was subsequently launched toward or transported to its intended target, we could attack the launch process, transportation chain, or flight profile so that the weapon would be defused or explode harmlessly away from its target. In this case, however, good old-fashioned asymmetric

deterrence and hard-nosed diplomacy are likely to yield more effective results than untested concepts of shock-based warfare.

Summary

A doctrine of shock-based operations will never be like death or taxes. It does not come with guarantees. It will be foolish to expect quick, easy, or bloodless victories. The promises of techno- and infophiles aside, those concepts are as chimerical as ever. Shock-based operations are designed to take advantage of information-age technologies, not idolize them. Moreover, there may well be times when, as was the case with the U.S. attempt to isolate and capture Mohammed Farah Aideed in Somalia, the paucity of effective military strategies steers us away from fighting in the first place. The very nature of complex adaptive or nonlinear systems implies U.S. political and military leaders will experience considerable, frequent frustration when trying to build an effective link between political objectives and military strategy.

On the other hand, the maturation of the information age demands nothing less than a substantial investment in the concept of shock-based operations. Ongoing strategic-level work on nodal analysis must be matched by equal efforts at the operational and tactical levels.³³ It will be difficult to build a continuous, rapid, and accurate feedback loop during conflict, but such an information-age assessment system is critical to keeping us on track in producing the desired level of disorientation and paralysis in our opponents. Again, our task is not only to shatter the enemy's orientation, it is also to keep our own orientation intact. The friction and fog of war will never disappear, but in the great game of wartime interaction what counts is the *relative* level of this fog and friction. Our paramount objective is to have decision cycles that are shorter and more effective than those of our opponents.

In a less than astonishing irony, the wonders of the information age come with a heavy price: commanders now have less time than ever to interpret tremendous amounts of potentially valuable information. Consequently, personal judgment must reign supreme. In the ever-present tension between technology and mental agility, there is no question what must prevail: no high-technology information-age system, however fanciful, will ever replace military genius or plain old battlespace common sense, intuition, and innovation.

The goal in war has always been to shock the enemy into surrender. Until now, however, we have not had the right combination of tools to effect revolutionary change. Information-age results may often fall short of rosy promises, but the time is ripe to leap from industrial- to information-age targeting and assessment. We have moved from single-component operations on the dusty fields of Cannae, to sequential attacks on the beaches of Normandy, to parallel warfare in Kuwait and over Kosovo. The advent of a shock-based operations doctrine allows us to jump to a new level, that of "simultaneous warfare."³⁴

The period of relative peace since the end of the Cold War gives us a unique opportunity to adjust to our changing environment before it is changed for us. While the taste of war has not become any more palatable over the centuries, we now have new wine to put in the old jar. The vintage of shock-based operations, if bottled correctly, has the potential to be the most successful addition ever to our wine cellar of war.

Notes

1. Colin S. Gray and John B. Sheldon, *Space Power and the Revolution in Military Affairs: A Glass Half Full?* *Airpower Journal* 13:3 (Fall 1999): 12.

2. The simplest definition of a complex adaptive system is a system that learns from experience. Murray Gell-Mann's more expansive description is that a complex adaptive system "acquires information about its environment and its own interaction with that environment, identifying regularities in that information, condensing those regularities into a kind of 'schema' or model, and acting in the real world on the basis of that schema. In each case, there are various competing schemata, and the results of the action in the real world feed back to influence the competition among those schemata." Murray Gell-Mann, *The Quark and the Jaguar: Adventures in the Simple and the Complex* (New York: W.H. Freeman and Company, 1994), 17. While the most obvious example of a complex adaptive system is a human being (and, by association, any group, organization, or nation-state), all animals are complex adaptive systems (there is little question that my border collie exhibits all the traits of such a system). Recent advances in computer sciences have shown that even machines can, in certain instances, behave as complex adaptive systems (so-called "self-learning systems"). This theme is taken up again in the section of the paper dealing with combat assessment. See also Linda P. Beckerman, *The Non-Linear Dynamics of War* [on-line], Science Applications International Corporation ASSET group, 20 April 1999; available from http://www.belisarius.com/modern_business_strategy/beckerman/non_linear.htm; Internet; accessed 6 March 2001; and Steven M. Rinaldi, *Complexity Theory and Airpower: A New Paradigm for Airpower in the 21st Century* [on-line], in *Complexity, Global Politics, and National Security*, ed. David S. Albert and Thomas J. Czerwinski (Washington, D.C.: National Defense University Press, 1997); available from <http://www.ndu.edu/ndu/inss/books/complexity/ch10a.html>; Internet; accessed 9 March 2001.

In linear systems, the output is directly proportional to the input. For example, if a thousand pounds of explosives are found to have a certain effect on a building, two thousand pounds of the same explosive will double the effect. As described by Thomas Czerwinski, "linear reductionist analysis consists of taking large, complex problems and reducing them to manageable chunks. This form of reductionism works in environments that are effectively linear, where the test of wills, the conflict of interests, and the collision of agendas are largely absent." In the non-linear world, inputs and outputs are not proportional, "phenomena are unpredictable," and "unpredictability frustrates conventional planning." Thomas Czerwinski, *Coping with the Bounds: Speculations on Nonlinearity in Military Affairs* [on-line] (Washington D.C.: National Defense University

Press, 1998), 2; available from <http://www.dodccrp.org/copfor.htm>; Internet; accessed 2 April 2001.

3. I admit up front that for purposes of brevity I focus only on doctrine and battle assessment in this paper.

4. United States Joint Chiefs of Staff, Joint Publication 1, *Joint Warfare of the Armed Forces of the United States*, (Washington, D.C.: Government Printing Office, 14 November 2000), vi.

5. *Ibid.*, III-2.

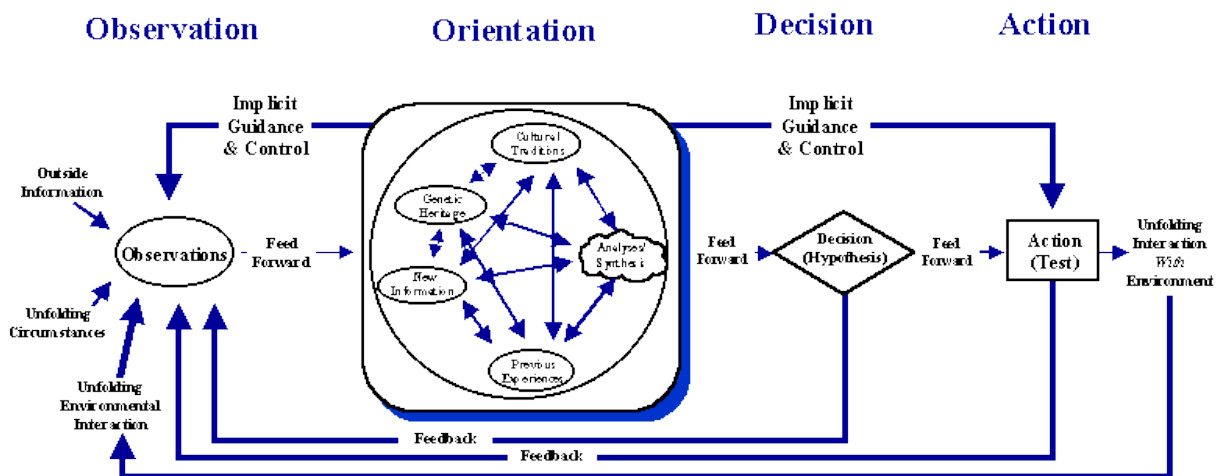
6. United States Joint Chiefs of Staff, Joint Publication 3-0, *Doctrine for Joint Operations* (draft), (Washington, D.C.: Government Printing Office, 5 February 2001), III-4.

7. *Ibid.*, III-11.

8. The Air Force and U.S Joint Forces Command have seized upon this shortcoming to propose a new doctrinal term — Effects Based Operations, or EBO — that tries to capture the essence of how the joint commander can link combat success to desired political conditions. In a draft version of AFDD 2-1.2, the Air Force defines ‘effects-based’ as "military actions, such as operations, targeting, or strategy, [that] are designed to produce distinctive and desired results." In other words, the goal is to tell commanders at all levels what objectives to achieve, not how to achieve them. The National Command Authorities (NCA) and the joint force commander will determine the nation’s overarching political and military objectives, while operational- and tactical-level military experts will best determine how to employ the means at their disposal to obtain those objectives. EBO links strategic and operational objectives to desired results, rather than to the "enabling physical actions." A United States Joint Forces Command (JFCOM) J9 Concept Paper defines EBO as "a process for obtaining a desired strategic outcome on the enemy, through the synergistic, multiplicative, and cumulative application of the full range of military and national capabilities at the tactical, operational, and strategic levels." My primary objection to these two EBO definitions is that they do not get to the heart of the matter, which is the manner in which we use the instruments of power at our disposal to create physical and mental paralysis in our opponents. The JFCOM definition does a better job getting the point across than the Air Force definition of EBO, but still does not address sufficiently how the desired effects are achieved. See Air Force Doctrine Document 2-1.2 (draft), *Strategic Attack* [on-line], (Maxwell AFB Alabama: Headquarters United States Air Force, 1 January 2000): 1; available from <http://www.doctrine.af.mil/Library/Doctrine/afdd2-1-2draft.pdf#DW13>; Internet; accessed 6 March 2001. See also Headquarters Air Force Doctrine Center, *Doctrine Watch #13: Effects-Based Operations* [on-line], (Maxwell AFB Alabama: Headquarters Air Force Doctrine Center, 30 November 2000): 1; Internet; available from <http://www.doctrine.af.mil/DoctrineWatch/DoctrineWatch.asp?Article=13>; accessed 6 March 2001. According to this article, an example of a proper EBO objective is, "render 50% of the enemy’s mechanized brigade combat ineffective." An example of a poor

objective in the same combat scenario would be, "destroy 50% of the enemy's tanks." For an expanded discussion of EBO in a wargaming scenario (that is not official Air Force doctrine), see http://ndunet.ndu.edu/wgsc/intranet/WAB_Ebo.htm; accessed 15 March 2001. See also United States Joint Forces Command J9 Joint Futures Lab, *Rapid Decisive Operations: A Concept for Joint Experimentation* (draft), 16 February 2001.

9. The use of "decision cycle" to describe the OODA loop process is finding more and more currency in joint publications. Boyd may not have been the first to use the specific term decision cycle (the Marines used the term during the Korean War, if not earlier, in describing a see-decide-act cycle), but his description of and emphasis on the *orientation phase* of the OODA loop is certainly unique. I do not begin to tackle the full grand strategic implications of Boyd's OODA loop, admitting readily that I use the OODA loop concept in a relatively narrow context — that of combat operations against one or more opponents. For a thorough multi-level analysis of Boyd's works see for example two Internet sites: <http://www.d-n-i.net>, and <http://www.belisarius.com>. Two biographies of Boyd are scheduled for publication in 2001. The following is a depiction of Boyd's grand strategic OODA loop:



10. John Boyd, *A Discourse on Winning and Losing: Patterns of Conflict*, Unpublished briefing, December 1986, 7. This series of unique and fascinating briefings includes *Organic Design for Command and Control*, *The Strategic Game of ? and ?*, *Destruction and Creation*, and *Revelation*. Boyd never had these works published, but he presented them to a truly eclectic mix of audiences in briefings throughout the 1980s.

11. Franklin C. Spinney, *Ghengis John*, *Proceedings* (July 1997): 46.

12. The Joint Publication 1 definition of agility is on the mark and has a distinct Boydian flavor: "Agility is not primarily concerned with speed itself, but about timeliness: thinking, planning, communicating, and acting faster than the enemy can effectively

react. Operating faster than and within the opponent's decision cycle can expand options while denying options the opponent deems important. Agility has different perspectives based on the level of war (strategic, operational, or tactical)." Joint Publication 1, *Joint Warfare*, III-10. Likewise, Joint Pub 1's definition of operational agility is the "ability to integrate and exploit the various capabilities of a joint force [to] disorient an enemy who is weak in one or more of the dimensions of warfare, helping to create a mismatch between what the foe anticipates and what actually occurs. This mismatch can lead to shock, panic, and demoralization, especially in the minds of the enemy leadership." Both definitions are highly encouraging for their emphasis on shock and on the mental aspects of warfare, but stop short of explaining in more detail how agility helps achieve the desired shock, panic, or demoralization. Joint Publication 1, *Joint Warfare*, III-11.

13. Another useful, basic example is the Hollywood movie *The Game*, in which the lead actor becomes the centerpiece of a series of highly surreal life-threatening situations. By the end of the movie the actor is so utterly disoriented by events he is effectively paralyzed mentally and reaches the edge of a complete nervous breakdown. The disorientation is only heightened by the protagonist's inability to differentiate between what is part of "The Game" and what is part of the "real world."

14. John A. Warden III, *The Enemy as a System* [on-line], *Airpower Journal* 9:1 (Spring 1995): 2-3; available from airchronicles/apj/warden.html; Internet; accessed 20 March 2001.

15. *Ibid.*, 3-12.

16. Warden's claim that the enemy's leadership should be the focus of attack is valid but ignores somewhat the political limitations inherent in warfare. If the sole objective of Operation Desert Storm was to remove Iraqi forces from Kuwait, it is reasonable to claim a high level of success in application of Warden's theory in 1991. Yet a leadership-centric targeting doctrine that after more than a decade leaves the leader with almost as much military power — and certainly as much political power — as he had prior to the commencement of strategic attack suggests certain doctrinal shortcomings (of course, nothing prevents political constraints from limiting the effectiveness of shock-based warfare either). For an excellent expanded discussion of some of the inherent strengths and limitations in Warden's theory, see Steven M. Rinaldi, *Complexity Theory and Airpower*. For an insightful comparison of the theories of both Boyd and Warden, see David S. Fadok, *John Boyd and John Warden: Air Power's Quest for Strategic Paralysis* [on-line] (Dissertation, School of Advanced Airpower Studies, Air University, June 1994); available from <http://fas.org/man/eprint/fadok.htm>; Internet; accessed 20 March 2001. Fadok makes the excellent point that Boyd's theory is "process-oriented" and aims at "psychological incapacitation," while Warden's theory is "form-oriented" and seeks "physical paralysis." Fadok, *John Boyd and John Warden*, 2. (Fadok also calls Boyd and Warden "twin sons of different mothers." The differences in outlook between these two theorists are great enough to suggest instead something closer to a "distant cousin" relationship.) Shock-based operations are both process- and form-oriented, and aim for both psychological and physical paralysis.

17. To be fair, Warden clearly uses the five-rings model to simplify a complicated thesis; this very simplification, however, damages his theory severely. Even the most elementary description of a complex adaptive system should begin by using something more like a Gordian knot to set the appropriately complex mental image.

18. Milosevic seemed to keep the upper hand in one important area throughout the war over Kosovo: the Serbs managed consistently to stay inside the coalition decision cycle when dealing with the international media. Throughout the war it was evident from press conferences that NATO's leaders were often in a reactive mode when trying to explain coalition actions in the air and on the ground. At times it seemed if Milosevic was able to influence substantially what the western press covered; this may have been a result more of NATO internal confusion than a determined Serbian strategy, but it contributed to degradation of NATO decision cycles nonetheless.

19. It remains unclear exactly what caused the Serbian leader to concede ultimately to NATO's demands (at least until Slobodan Milosevic himself provides us with more complete accounting of what happened and why). For an analysis of some of the more likely explanations for Milosevic's capitulation, see Ivo H. Daalder and Michael E. O'Hanlon, *Unlearning the Lessons of Kosovo*, *Foreign Policy* (Fall 1999): 128-140.

20. Interaction used here is in Clausewitzian sense. That is, war is always the "collision of two living forces.... Thus I am not in control: [my opponent] dictates to me as much as I dictate to him." Carl von Clausewitz, *On War*, trans. and ed. Michael Howard and Peter Paret, indexed ed. (Princeton: Princeton University Press, 1984), 77.

21. There is an adage appropriate for such circumstances: "there's nothing like a hanging to concentrate the mind." Recent examples of nations that endured or survived longer than expected under attack by overwhelming U.S. firepower include Germany and Japan in World War II, North Korea, North Vietnam, Iraq, and most recently Serbia.

22. Naturally the U.S. government will continue to use the other three instruments of national power (diplomatic, economic, and informational) in coordination with military power to achieve desired political effects.

23. The JFCOM Joint Futures Lab calls such a holistic analysis of an opponent's system "operational net assessment," defining it as "a continuously updated system-of-systems analysis of the adversary's total war-making capabilities, to include political, military, economic, social, and infrastructure elements." See United States Joint Forces Command J9 Joint Futures Lab, *Rapid Decisive Operations*, iii.

24. A logical extension from this point would be a more detailed assessment of the concept of centers of gravity ("those characteristics, capabilities, or localities from which a military force derives its freedom of action, physical strength, or will to fight." Joint Publication 1, *Joint Warfare*, V-3.). As important as that discussion is to the task of using military power to achieve political objectives, I omit in this paper additional examination of the specific term 'center of gravity'. Instead, I cover the necessary ground through the

ensuing discussions of the link between shock-based operations and political-military objectives. For a fascinating essay on centers of gravity in a non-linear world, see Pat Pentland, *From Center of Gravity Analysis and Chaos Theory, or How Societies Form, Function, and Fail* [on-line], in Thomas Czerwinski, *Coping With the Bounds*, Appendix 6.

25. In speaking of the difficulty in executing today's wildly diverse military operations, Marine Corps General Anthony Zinni hinted at the need for such a holistic approach to targeting doctrine when he stated, "What we need is cultural intelligence. What I need to understand is how these societies function. What makes them tick? Who makes the decisions? What is it about their society that's so remarkably different in their values, in the way they think, compared to my values and the way I think in my western, white-man mentality?" Anthony C. Zinni, *Non-Traditional Military Missions: Their Nature, and the Need for Cultural Awareness and Flexible Thinking*, in Joe Strange, *Capital "W" War: A Case for Strategic Principles of War*, (Quantico: Marines Corps War College, 1998): 267.

26. Dr Mark Clodfelter reminded me that in World War II General Hap Arnold had a team of economists who advised him on targeting in both Germany and Japan. Moreover, General Arnold sought to track down people who had lived in both countries to get a better idea of what targets were critical to keep the war machine running.

27. The German *blitzkrieg* attack on Poland in 1939 (and France shortly thereafter) is a good example of such a complete assault against an opponent's system, but not surprisingly the rest of the war's participants learned how to adapt quite quickly.

28. It is not that previous warriors and political leaders did not seek more comprehensive indicators of battlefield effectiveness; it is that they simply did not have the tools available to get what they needed.

29. For a brief description of a self-learning system called Disciple, see *Intelligent Agents Get Smarter*, *Signal* 55:6 (February 2001): 67-69. Disciple is designed to 'learn' how to solve a specific problem through a set of rules and application of a knowledge base created by operators and programmers. Once Disciple 'understands' how the problem was solved, it can then draw "general conclusions" about similar future problems. For discussion of neural nets and genetic algorithms that are increasingly being viewed as candidates for self-learning systems, see Murray Gell-Mann, *The Simple and the Complex* [on-line], in *Complexity, Global Politics, and National Security*, 3-4; and Murray-Gell Mann, *The Quark and the Jaguar*, 307-325. For descriptions of artificial intelligence with applicability to military operations, see <http://www.pathfindersystems.com>. PATHFINDER (no relation to the above) is analytical software created by the National Ground Intelligence Center. It was designed to give intelligence analysts an automated means of gathering, analyzing, and integrating data and information from thousands of sources. While not a self-learning or artificial intelligence system, PATHFINDER's characteristics suggest development of such a capability is not too far away. See for example

<http://www.fas.org/irp/program/process/pathfinder.htm>. Some of the most basic self-learning systems on the market today are audio transcription programs, in which a computer is "taught" to recognize particular speech and pronunciation patterns over a period of weeks. The error rate of such transcription systems decreases substantially after several weeks of "teaching."

30. Until we are able to develop and run such a system it will be difficult to predict exactly how many experts will be required at each level of warfare. I assume there would be hundreds of experts at the strategic or national level. When war breaks out somewhere in the world we would dedicate a few dozen experts to help our operational and tactical commanders. One solution is to start with a National Targeting Coordination Board (similar to our current Joint Targeting Coordination Board) to work generic targeting issues (for example, economic, industrial, and transportation targeting concerns that are common to all developed nations), and groups of Regional Targeting Coordination Boards to work specific regional or country issues. Once the Regional Boards developed campaign plans for their assigned countries, they would be reassigned to other duties until needed again in war.

31. The light system is a measurement tool often used when briefing progress toward reaching some objective or when simply communicating the status of certain systems: a green light indicates satisfactory progress towards desired objectives; a yellow light means satisfactory progress tempered by conditions that if left unchecked might further slow or halt progress; the red light indicates failure to achieve the desired conditions. Of course, the simplest indicator of all in combat is when the opponent sues for peace at the bargaining table.

32. Two other major concerns must be considered but for brevity's sake are not addressed in this essay: international legal implications of information operations, and potential affects on our own (or allies') critical information infrastructure. Both will have significant impacts on any shock-based operations plan.

33. As Colonel Paul Herbert pointed out, I do not address in any detail what happens if the United States is involved in a "limited conflict," or one in which it would be politically unacceptable to attack all elements of our opponent's civil-military system. Yet the tenets of shock-based operations will still apply, albeit more at the tactical and operational levels rather than the strategic. Commanders would still need to know where to place their attacks to generate the maximum disorientation, and we would still need an effective shock-based combat assessment system.

34. I view parallel warfare as a combination of physical attack and information operations within a nation's borders. As part of a shock-based operations doctrine, simultaneous warfare erases national borders: it includes information operations throughout the battlespace, which in today's world moves well beyond conventional geographic borders.