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Joint Warfighting in the Twenty-First Century

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Karl H. Lowe, Director – Joint Advanced Warfighting Program

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There has been much recent attention and activity directed toward the development of joint operational concepts. As a tool for force development, a joint operational concept to be useful should:

- Provide guidelines to design operational campaigns in a variety of situations,
- Enable exploration of alternative capabilities introduced over time, and
- Inform experimentation campaigns and investment decisions

Producing such a concept is no easy task. The challenge is to avoid being either too general (and merely producing an imitation of existing vision statements albeit with different adjectives) or so situation specific that it loses wide-ranging applicability.

In this paper, Wick Murray, a member of the JAWP, and Rick Sinnreich, a JAWP consultant, pull together the timeless and the new into a story about joint warfighting in the twenty-first century. In doing so, they have produced a framework and principles that can guide the development of joint operational concepts that meet the above criteria. Their short introductory history lesson highlights an earlier period's military transformations in three areas—professional military education, logistics, and command and control—so germane to the challenges we face today.

Joint operational concepts will be most useful if they provoke discourse and become living documents rather than official pronouncement. Please send comments and criticism to either author.

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Preface

This paper was prepared under the task order Joint Advanced Warfighting Program (JAWP) for the Director, Defense Research and Engineering in the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics. The purpose of this task is to produce breakthrough joint operational concepts.

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

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

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Introduction

On 3 July 1866, three Prussian armies commanded by Field Marshal Helmut von Moltke caught the Austrian army near the small Czech town of Königgrätz on the banks of the Elbe River. In twelve hours, the pounding of Prussian artillery, the assaults of Prussian infantry, and the murderous fire of their needle-guns inflicted 24,000 Austrian casualties and produced 20,000 prisoners and 30,000 deserters, in the process transforming an Austrian army of more than 200,000 men into a confused and fugitive rabble.

For their part, the Prussians suffered fewer than 9,000 casualties and, with nothing to bar their way, were prepared to march on Vienna the following day. In a stroke, the Prussians had crushed an army that virtually every European military pundit considered by far the superior. By the evening of 3 July, the Austro-Prussian war effectively was over, and upstart Prussia had gained complete dominance over northern Germany.

Only four years later, Prussia would go to war again, this time against France who would demonstrate that it had learned nothing in the interval. Meanwhile, Prussian armies once more would display astonishing virtuosity at every level of operations. In a campaign ending almost before it had begun, they utterly demolished the armies of the Second Empire at Metz and Sedan, again inflicting losses hugely disproportionate to the respective numbers engaged.

Wherein lay the secret of Prussia's success, particularly given a military that had not engaged in major operations since 1815? During the half century between Waterloo and Königgrätz, the Prussians accomplished three vital tasks:

- **They created the first formal system of military education.** Grounded in a thorough examination of military history and informed by Carl Von Clausewitz's magisterial *On War,* the *Kriegsakadamie* developed and infused among officers a clear understanding of those aspects of war that are essentially timeless. Together with the war game, professional military education became a key means of formulating and disseminating norms of the

profession, doctrine, standards of conduct, operational concepts, and adaptation of strategy to technology.

In the process, Prussia produced officers intellectually prepared to deal with war's confusion and uncertainty, and able independently to make decisions but consistent with their commander's intentions despite the chaotic horror of the battlefield.

- **At the same time, in a fashion unmatched by any other army in Europe, the Prussians paid careful attention to what was changing in war.** Between 1815 and 1866, Waterloo and Königgrätz, the technology available to military forces changed enormously, introducing radical improvements in their ability to deploy, supply themselves in the field, and mass firepower at decisive points on the battlefield. Military exploitation of railroads enabled the Prussians to mobilize and deploy more quickly than their enemies and to supply their armies more efficiently once deployed. At the same time, after meticulous experimentation, the Prussians adopted the breech-loading rifle design of Nikolaus von Dreyse in 1848, then carefully adapted their infantry's organization and tactics to the needle-gun's increased range, accuracy, and firepower.

Each of these technologies was equally available to Prussia's opponents in 1866 and 1870. What made the Prussian army superior was not simply its adoption of new technology, but rather its exploitation of that technology to execute classic tactical forms of maneuver at speeds and depths that utterly astonished its bewildered adversaries.

- **Finally, nothing illustrates the difference between the Prussians and their adversaries more clearly than the contrasting ways in which they dealt with the telegraph, the cutting-edge technology of late nineteenth-century communications.** For their part, Austrian and French commanders either ignored the telegraph entirely or used it only to try to keep their subordinates on a tighter leash. In both cases, their failure to think through the implications of a faster and more voluminous stream of tactical information resulted in headquarters overwhelmed by the unexpected flood of reports and commanders buried in tactical detail and consumed by the immediate.

In contrast, by carefully integrating the telegraph with revised staff procedures, Moltke in effect exploited it to distance himself from tactical decisions without losing his sense of the battlefield; in that way, he was able to see not only the battle in its entirety but also to anticipate its ebb and flow. Then, using the telegraph to disseminate his intentions rapidly and reliably, he was able to guide the operations of his subordinate commanders without penalty to their initiative and agility.

The Challenge of Change

As the Prussian example suggests, the adaptation of military method to changing requirements and capabilities is neither automatic nor trivial. At stake are not only expensive- and difficult-to-replace weapons and equipment, but also the ingrained mental sets of soldiers and leaders that will govern their behavior in battle. And yet, as the 1866–1870 case indicates, even recognition that change is necessary offers no assurance that competing military institutions will adapt to it in the same way or to equal advantage.

Typically, as with Prussia, those militaries that have coped with change most effectively have grasped the future from a firm foothold in the past. What many called military revolutions often turn out on closer examination to have been revolutionary only in retrospect, and then only to their victims. From the perspective of those making the changes in question, what was taking place was thoughtful and deliberate adaptation.

The crucial difference between adaptive and revolutionary change, in short, is respect for history. War remains above all a violent struggle between independent and hostile human wills, and the essential dynamics of that struggle—however variable the means by which it is conducted—change as slowly as human abilities, desires, and fears. It is no accident that similar military failures recur throughout the history of war, given the fundamental continuities in its nature and the motives of those who wage it.

Respect, however, need not mean imprisonment. In 1866 and 1870, the Austrians and French were trapped by history, the Prussians empowered by it. The difference was in the way history was interpreted, evaluated, and applied. The Austrians and the French, having taken little trouble to study the past, were in no position to gauge the effect of new capabilities on the future. Whereas the Prussians, steeped in a meticulous examination of war's enduring dynamics, confidently could estimate how new tools would alter future military operations.

Today, America's military confronts a similar challenge. The discrete elements of geopolitical and technological change responsible for that challenge are widely recognized. While some debate persists about how quickly a given development will materialize or how broadly it will apply, by and large there is considerable consensus today about the central ingredients of change.

There is much less consensus about what these ingredients imply for the way military organizations will wage war in the future. On the contrary, the last few years have witnessed a menagerie of "competing" concepts, each claiming to be a uniquely appropriate response to emerging defense requirements and technologies.

At the heart of all these concepts is a belief—sometimes explicit, sometimes unexpressed—about the nature of war and how victory is achieved. Terms such as attrition, disintegration, dislocation, annihilation and so on are simply shorthand for a complex set of conditions—some material, some cybernetic, some psychological—whose imposition, it is believed, will convince an enemy to stop fighting and accept defeat. Part of the problem lies in the very ahistorical approach that undergirds how these terms are used. It remains difficult to draw clear distinctions among today's contending operational concepts, or to specify with confidence the conditions in which one or another is most likely to produce victory.

That is the more true because even when his capabilities permit a commander a choice of operational methods, which to pursue often will depend on factors extrinsic to the campaign. In some cases, the most promising method also may be unacceptably expensive. In other cases, it may require more time than political leaders are willing or able to tolerate. And in still other cases, the choice of method may be circumscribed by how the enemy (and others) is likely to perceive defeat. For example, in 1999, Serbia was in no position to exploit the reality that its coerced withdrawal from Kosovo left its armed forces largely intact. Whereas allowing Iraq to evacuate Kuwait in 1991 with its army undefeated would have encouraged Saddam Hussein to claim a moral victory that both his own people and many of his neighbors might well have accepted.

Finally, basing an operational concept on a single narrowly conceived defeat mechanism tends to neglect the enemy who after all is (or should be) central to operational design. It is one thing to speak of "disintegrating" a conventional military formation, for example, quite another to apply that term to an uncon-

ventional adversary for whom lack of explicit integration may be a deliberate feature of his operational style.

Arguments that claim one generic operational method to be inherently more promising than another are, ultimately, sterile. In end, such a judgment can be made only in the context of a real war with an identifiable enemy in a definable geopolitical context. Even then, what appears at one stage of a war to be a preferred operational method may well become infeasible or unproductive in another.

A similar problem afflicts efforts to apply to military operations theories analogized from the behavior of physical systems. Thinking enemies do not obey mechanical laws: like the biological organisms they are, they learn and adapt if they have the time. Careless application of systems theory to military operations risks imputing to an enemy objectives, priorities, risk assessments, and patterns of behavior that he himself would not acknowledge, and the attack of which might have little or no impact on his ability and willingness to fight.

The purpose of an operational concept, in sum, is not to constrain armed forces rigidly to a single method to the exclusion of all others, but rather to help commanders diagnose the alternatives open to them, recognize the strategic and operational implications of adopting one or some combination, and apply available resources most effectively to the methods selected. From the perspective of combat development, limiting equipment procurement, organization, and training to a single presumed defeat mechanism virtually guarantees military myopia and battlefield surprise.

Enduring Features of War and Their Implications

To avoid this myopia and surprise, America's approach to war in the twenty-first century, like that of the Prussian army in 1866, must reconcile what is changing in war with what endures. What are some of those enduring features?

Friction. Above all, the harsh reality is that friction, the almost infinite number of things in war that can go wrong or distort understanding, will continue to afflict decision and action at every level. During the early fighting in Afghanistan, the simple failure to re-initialize a GPS locator properly resulted in friendly casualties, national headlines, and weeks of questions for national leaders. In battle, people make mistakes. They forget and get lost. They ignore the vital and focus on the irrelevant. Occasionally, incompetence prevails despite efforts to weed it out. And in many more cases than historians would like to admit, sheer chance disrupts, distorts, and confuses the most careful plans. We live in an universe dominated by the uncertain and unpredictable. Thoughtful soldiers always have recognized that reality, and modern science has confirmed it. No amount of computing power can eradicate that basic messiness.

Moreover, war more than any other human activity creates a universe of its own: one of fear, horror, anger, and discomfort, all of which merely exacerbate the usual vagaries of human behavior. In the cauldron of war, Clausewitz tells us, "It is the exceptional man who keeps his powers of quick decision intact."[1]

Where friction prevails, tight tolerances, whether applied to materiel, plans, or actions, are an invitation to failure—the more devastating for being unexpected. An operational concept that makes no allowance for the inescapable uncertainties of war is suspect on its face.

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[1] Carl von Clausewitz, *On War*, edited and translated by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), p. 113.

The Primacy of Politics. That is the more true because, as in the past, war in the twenty-first century will remain a political instrument, even when it originates in the behavior of non-state or transnational groups. In a democracy especially, political aims, pressures, and hesitations invariably condition military operations. "When whole communities go to war…the reason always lies in some political situation."[2] Hence no commander is free to plan and conduct operations in a political vacuum, even when military preferences are unambiguous. Like friction, political goals and limitations are part of the fabric of war, and while they can be accommodated more or less effectively, they cannot be evaded.

It is true that the more fundamental the interests at stakes, the freer the commander's hand is likely to be. In World War II, thousands of incidental civilian casualties exercised no restraint whatever on the willingness of Allied political leaders to permit the bombardment of German and Japanese cities and industries. Whereas in February 1991, the death of a few hundred Iraqi civilians from a pair of bombs on Baghdad's Al Firdos bunker sufficed to curtail air attacks on otherwise legitimate urban targets. Similarly, in 1999, the need to hold NATO together seriously impeded the Allied air campaign against Serbia.

Yet even when the most vital national interests are at stake, no military campaign is entirely free of political constraint. During World War II, commanders on both sides found themselves hampered repeatedly by political requirements even when these measurably increased military costs and risks. And when those requirements reflect ill-considered political and strategic decisions, as the tragic history of the Vietnam War reveals, even heroic efforts to execute a sensible plan of campaign may flounder.

As with friction, a joint operational concept that takes political permissibility for granted, or that assumes that, once granted, it will endure without regard for changing political imperatives, is doomed to irrelevance. The political character of war demands an inherent flexibility in military organization and planning, and places a premium on the design of joint forces with the versatility to adjust patterns of operations rapidly and without extensive reorganization to shifting political needs.

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2 Clausewitz, *On War*, p. 87.

Misreading the Enemy. Still another enduring feature of war is the recurring failure of political and military leaders to recognize their enemy as something more than a passive object that will react in accordance with their plans. War, Clausewitz reminds us, "is not the action of a living force upon a lifeless mass…but always the collision of two living forces."[3] Even where adversaries share a similar historical and cultural background, the mere fact of belligerence guarantees profound differences in attitudes, expectations, and behavioral norms. Where different cultures are in conflict, the likelihood that adversaries will act in mutually predictable ways is even smaller.

Hence, while finite comparisons of numbers, technology, training, and so on certainly are not irrelevant in the calculus of war, they are far from sufficient to forecast either how an enemy will behave when battle is joined or what kinds of deprivation will have the greatest effect on his willingness to endure the struggle. For example, casualty rates that often exceeded 80 percent had little impact on the determination of Hitler's *Waffen SS* or the People's Army of Vietnam, whereas the loss of fewer than 30 percent of their fighting systems sufficed to wreck the morale of Saddam's hapless legions.

Given that reality, operational concepts that assign an intrinsic importance to certain kinds of enemy resources based on their equivalent importance to us risk dissipating military effort against objectives that in fact may have little impact on the enemy's own calculations. Spectacular German victories against Soviet armies in 1941 led German military leaders to conclude that Stalin's regime had been crippled beyond repair. No one informed Stalin, however, and two years later, the Germans in turn would be suffering catastrophic defeats at the hands of a resurgent Red Army.

Similarly, the US military embarked on war in Vietnam confident in its technological and organizational superiority, only to discover, as the French and Chinese had before them, that the dynamics of insurgency in a wholly unfamiliar cultural milieu made much of that superiority effectively irrelevant to the achievement of strategic success.

Throughout history, the failure to accept that the enemy, though entirely rational from his own perspective, may not share the same rationality has prevented mili-

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[3] Clausewitz, *On War*, p. 77.

tary institutions, including ours, from understanding the kinds of wars on which they were embarked. Too often armies have attempted to make the actual war conform to prewar doctrinal assumptions. The persistence of such efforts even in the teeth of visibly contrary evidence furnished by an enemy's actual behavior only magnifies the need to frame operational concepts in a way that facilitates recognizing and adapting to the actual evidence of the battlefield.

Faith in Quick Victory. If misreading the enemy is one of war's commonest errors, another is going to war in the expectation that victory will be swift and decisive. In this area as in few others, the ghost of Napoleon has hovered over the expectations of Western politicians and preparations of military organizations during the past two centuries. In 1805 and 1806, the French Grand Army overthrew its opponents in two masterful campaigns. At Austerlitz in December of 1805, Napoleon ended the 1,100-year history of the Holy Roman Empire. Ten months later, at the double battle of Jena/Auerstadt, French armies destroyed the Prussia created by Frederick the Great in a single day. Those and the later Prussian victories that introduced this paper further encouraged Western generals and politicians, from Robert E. Lee to Adolph Hitler, to become mesmerized by the grail of swift, decisive victory.

The reality, however, is that modern war only rarely produces such victories. For every precipitate triumph such as Germany's over France in 1940 and the US-led coalition's over Iraq in 1991, there have been far more conflicts that lingered, and not a few that have ended without any decisive result whatever. Modern states are so robust and the means of war have become so readily available even to non-state groups that quick victories almost invariably require an unusual confluence of strategic and operational conditions.

Meanwhile, no single factor has contributed more to disastrous military adventures than operational concepts premised on quick victory. General Alfred von Schlieffen's elaborate plan to defeat France in one massive blow induced Germany in 1914 to violate British-guaranteed Belgian neutrality, assuring British belligerence and a blockade that contributed significantly to Germany's ultimate defeat. Similarly, Japan's facile conviction that abrupt destruction of our naval forces in the Pacific would induce the United States to accept Japanese conquests in Southeast Asia led to Pearl Harbor and eventually to Hiroshima.

In the end, swift, decisive victory is like winning the lottery: rewarding if it happens, but not something on which to bet one's life savings. In modern war espe-

cially, the race is less often to the swift than to the steadfast. Hence, while joint operational concepts should never foreclose the possibility of rapid strategic success, they also must anticipate the much greater likelihood that war once begun will be prolonged.[4]

War As Engineering. The preceding features of war have recurred repeatedly without regard for the nature of the contest and the belligerents. It may however be worth mentioning one additional feature unique to the United States: Americans' predilection for dealing with war as if it were a gigantic engineering problem. Primarily, this is an artifact of geography and history. Protected by two oceans, Americans throughout much of their history have had the leisure to concentrate on taming nature undisturbed by external threats. West Point, it is worth recalling, was founded primarily as a school of engineering, not of tactics.

Meanwhile, those same oceans also have required us to learn how to project power on a scale nearly unimaginable to other nations. Like the taming of the continent, this too has tended to focus American military concern on the measurable logistics of war rather than its less easily calculated human dynamics. World War II highlighted this tendency. Despite their initial unpreparedness, America's armed forces were able after astonishingly little delay to mount two great drives against Japan, a successful defense of the North Atlantic, strategic bombing campaigns against Germany and Japan, and an invasion of northwest Europe, all while furnishing materiel support to Britain and the Soviet Union.

But the same attraction to engineering solutions also produced some expensive mistakes. In 1942, for example, the United States began deploying heavy bombers to Europe to conduct an elaborate air campaign aimed at destroying Germany's war economy. Mathematical calculations that unprotected formations of heavy bombers could strike deep into the Reich without suffering unacceptable losses, and that the resulting destruction of industrial facilities would collapse the German war effort from within, both proved false—and the error cost thousands of young Americans their lives.

On the other hand, though it largely failed to achieve the objectives for which it had been designed, the strategic bombing campaign succeeded beyond imagining

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[4] Recent wars in Afghanistan and Iraq may be exceptions. However, at this writing it remains to be seen whether either war really has ended, or whether instead the adversary simply has moved to a different phase with different tactics.

in one for which it had not. By forcing the *Luftwaffe* to expend itself in the air defense of the Reich, strategic bombing virtually destroyed the pilot force needed to dispute control of the air when the Allies invaded the continent. Meanwhile, nearly half a million German soldiers and more than 12,000 anti-aircraft guns were relegated to urban air defense that would have been far more effectively employed supporting ground operations. In the end, it was the unintended results of the strategic bombing offensive that truly justified its costs.

In sum, war is not engineering, and an operational concept is worse than useless that relies on theoretical assumptions in defiance of empirical evidence. Moreover, our powers of foresight are limited. Not every desirable result reliably can be foreseen from any proposed operational method. Joint operational concepts for the twenty-first century should apply the best evidence we have. But they also must leave room for serendipity.

The Changing Operational Landscape

The preceding are by no means the only recurring features of war that will not change over the next twenty years or one hundred, but they are among the most important in determining the success or failure of military operations. Against them, we must juxtapose the changes in the military landscape that current evidence suggests are most likely to affect future operations.

The Widening Spectrum of Conflict. Perhaps the most visible is a broader and more complex range of military challenges. While open warfare between national states and insurgencies within them are unlikely to disappear, the emergence of global terrorist and criminal organizations with radical objectives and access to advanced weaponry has engendered new military threats for which earlier experience has left us ill-prepared. Meanwhile, changing public and political perceptions of the role of military forces have significantly enlarged the other-than-war responsibilities to which those forces have been committed, from peace enforcement to humanitarian operations.

Moreover, these challenges increasingly are operationally indivisible. In Afghanistan, for example, conventional, counter-guerilla, counter-terrorist, peacekeeping, and civil support operations all have occurred simultaneously, and future conflicts are likely to witness a similar convergence of military tasks formerly distinguishable, if they arose at all.

Transparency. Another major change is the growing transparency of military operations, not only to the belligerents themselves but also to their respective publics and the world at large. Access to space already is becoming universal, and it is becoming increasingly difficult to move and position conventional military forces undetected. Meanwhile, combat operations transpire in the glare of global media whose independent access to information sources and communications systems is virtually impossible to restrict even were it politic to do so.

One result is the increasingly frequent elevation of tactical events to a strategic level of concern. As the earlier described friendly-fire incident at Mazar-e-Sharif

demonstrated, events that once would have been buried in the "noise" of battle today can acquire an unprecedented and often uncomfortable notoriety, forcing senior decision makers to waste time and energy on matters of little intrinsic operational significance.

The Rising Premium on Speed. Another effect of greater transparency is a growing concern for speed at every level of operations. From the tactical challenge of linking sensors with shooters to attack fleeting targets, to the operational one of maneuvering air, land, and maritime formations before an adversary has time to adjust, to the strategic challenge of achieving a desired military result before factors extrinsic to an operation begin to impinge on it adversely, speed is becoming an ever more essential ingredient of warfighting.

Just as transparency is making it more essential, however, operational speed is becoming harder to achieve. Expanding urbanization increases the likelihood that military forces will confront complex topography even where nature itself does not impose it. That and the resulting intermingling of military forces with noncombatants are complicating both movement and fires, and in the process threatening to impose considerable restraints on operational tempo.

Speed also is adversely affected by the expanding range and lethality of conventional weaponry. The days when massed air, land, or maritime formations could maneuver out of contact without hindrance are coming to an end. As stand-off weapons proliferate and their precision improves, radii of vulnerability are expanding well beyond the zone of direct contact. Even systems and facilities external to the theater of operations are becoming vulnerable to stand-off attack and unconventional threats.

Most of all, however, speed is inhibited by the increasing porosity of international borders to the instruments of violence and those who employ them. What makes terrorism so challenging is less its inherent military capability than the relative ease and stealth with which that capability can be shifted from place to place and replenished while the will to fight persists. To a lesser extent, the same stealth and durability characterize other unconventional threats, and, as weapons become more lethal and portable, may increasingly characterize regular military forces as well. Hence the conditions in which a determined enemy can be engaged with assurance that tactical victory will produce a strategic decision are becoming harder to create.

The Impact of Emerging Technology. Finally, emerging technologies promise to affect future military operations in ways that even their developers cannot clearly foresee. By far the most important are information technologies, which already both empower and complicate military command and control. On the one hand, the more rapid collecting and sharing of information by modern sensors and communications have enabled joint forces to collaborate with unprecedented speed and ease, as in the effective marriage of tactical airpower with special forces targeters during the early phases of the war in Afghanistan. On the other, the increased quantity, diversity, and resolution of information and the appetite for instant knowledge it engenders at senior levels risk drowning subordinate commanders and staffs just as it did the Austrians in 1866 and the French in 1870. Moreover, the greater the dependence of weapons and tactics on a routine flow of detailed information, the more damaging the effect of an interruption in that flow and the greater its vulnerability to disinformation.

Precision weaponry similarly cuts in more than one direction. Precision does permit a far more effective tailoring of effects to targets and their immediate environment, allowing more economical attack with less risk of collateral damage. But that same precision demands much more accurate target location and identification. Precision fires are less tolerant of sensor error than the massed fires they replace, and likewise more vulnerable to deception.

Finally, perhaps the most important changes are likely to result from developments in advanced materials fabrication and component miniaturization. Preoccupation with formations has tended to obscure the promise of radical improvement in the independent mobility, lethality, and survivability of military platforms from aircraft and naval vessels to the individual soldier and his fighting systems. As transparency and stand-off capabilities diminish the ability to mass forces without unacceptable risk of detection and attack, and as speed at every level of war becomes a more crucial prerequisite of military success, the premium on stealth and self-sufficiency of individual systems will only increase.

The Implications of Change

The preceding are only a few of the developments that will influence the conduct of joint operations during the next twenty years, but they suffice to indicate the dimensions of change to which the organization and operations of America's joint forces must adapt in the years ahead. Military commentators have come to identified jointness with the operational level of war or an increasing level of cooperation among the services on the battlefield. While it may well involve the application of force at the operational level of war, increasing cooperation among the services, or interoperability jointness, can involve considerably more. As jointness is played out on the battlefields of Afghanistan and Iraq, it has involved an increasing interdependence of capabilities. In some cases, such interdependence can involve forces at the operational level; in others, it can reach down to the individual aircraft and the squad engaged in urban combat, with the interaction between the two playing an essential role in combat effectiveness. With the ability to network combat forces, such interdependence among sensors, combat capabilities, and military forces with only increase in the future.

The next several paragraphs address some of the implications of those changes, and suggest how joint methods and organizations can accommodate them without ignoring the enduring lessons discussed earlier.

Effect-Based Operations. The more diverse the challenges with which military forces are confronted and the more immediate and visible the political impact of tactical events, the more essential it will be to tailor joint operations finitely to the achievement of political aims. In a sense, effect-based operations are no more than a restatement of the principle of the objective enshrined in military thought for more than a century. The modern concept differs from its predecessor primarily in recognizing the objective as having complex elements often in tension, and the enemy as a complex, adaptive system, only one element of which is its military forces. Central to the notion of effects-based operations is the conviction that careful examination of the enemy and the manner in which he operates and responds to our actions can reveal exploitable physical, psychological, and

cybernetic weaknesses whose successful attack will have a cascading effect on his ability and willingness to fight.

The prerequisite for successful effects-based operations is knowledge of the enemy that goes well beyond a one-dimensional appraisal of his technical military capabilities and order of battle. Such knowledge is always hard to attain because it depends on an understanding of the enemy as he is rather than as we would like him to be. It requires an integration of insights gained from technological capabilities with those obtained by understanding the enemy's culture, ideology, and intellectual framework. And because the latter—the intellectual framework—is so often marred by our own perceptions and mirror imaging, it requires a willingness to challenge basic preconceptions and assumptions, no matter how difficult such efforts might prove.

Moreover, because the enemy will adapt, operations designed to attack specific weaknesses must also anticipate the second-order effects of those attacks. Indeed, in some cases, the latter may be more important than the targets themselves. Just as a feint seeks to provoke a reaction in one place to weaken the enemy in another, so effects-based operations may target one aspect of the enemy's war-making power primarily to expose or neutralize another. To be useful, then, the selection of effects must account for multiple objectives and reflect what matters to the enemy and what can reasonably be assessed by us, not just what our own capabilities are best suited to attack. In turn, that assumes understanding of the enemy on a *cultural and psychological level*, not merely as an automaton following predictable rules of behavior.

Above all, effects should be treated as an aid to decision-making, not a template to be applied mechanically. As the earlier example of strategic bombing suggested, planning also must leave room for the unintended consequences of operations designed with another effect in mind. In many cases, those consequences may well turn out to be more important than the intended effect—but only if the joint force is prepared to exploit them rapidly and effectively when they occur.

Multi-Dimensionality. The likely convergence within the same battlespace of operational challenges from conventional combat to stability and support requires a joint force able from the outset of planning to integrate not only multiservice but also interagency and multi-national capabilities. It must do so in a manner that maximizes the complementary and not merely the additive contribu-

tions of each component. The war on terrorism already has highlighted the synergy obtained by combining military, intelligence, civil support, and law enforcement capabilities in a single coherent effort. Future joint task forces must be able routinely to support and be supported by national and coalition agencies from intelligence to civil relief, and that ability must be independent of the scale of the contingency and the size of the joint force committed to it.

That task will be easier to the extent that technological and procedural incompatibilities are diminished through technology sharing and joint doctrinal development. Even so, given the disparities in US and foreign technology and lingering interoperability problems even among US agencies and military services, this task will depend heavily on the routine availability of effectively trained and equipped liaison personnel. Those individuals must possess the language skills, technical expertise, and self-reliance to meld mutually dependent but technically and/or culturally dissimilar force components into a smoothly working team.

Operational Granularity. The diversity of potential military requirements also suggests that future joint forces must be able to integrate effectively in much smaller packages than in the past without forfeiting the ability to coalesce rapidly into larger aggregations as operational requirements change. This implies not only the development of smaller and more self-sufficient tactical organizations but also their routine joint employment in integrated training and exercises. While organizational improvisation is an American military strength, every such improvisation is an invitation to friction. Moreover, improvisation compels commanders and their subordinates constantly to reinvent procedures that more settled organizational relationships would make unnecessary.

At the same time, the scale, intensity and duration of military operations can never be reliably predicted. The initial commitment of joint forces therefore should not prejudge the potential requirement for follow-on forces, and expansibility must be a consideration of every such commitment. The lower the echelons at which joint integration has become routine, the smoother force expansion will be if it is required, and the less vulnerable to capability imbalances and their adverse effect on operational tempo.

It should be understood that greater granularity in the integration of joint forces neither precludes concentrating single service capabilities at higher echelons of command when appropriate, nor presumes any particular supporting-to-

supported relationship among the components involved. Rather, the challenge is to tailor joint forces to an expanding spectrum of contingencies without having to fracture cohesive organizational relationships as the only means of creating new ones.

Interdependence. The multiplicative effect of combining arms with different inherent capabilities in the context of a unified plan of operations has been clear for centuries. By offsetting the weaknesses of one capability with the strengths of another, combining arms produces a level of force robustness that no single capability could provide. At the same time, the simultaneous application of multiple capabilities confronts an enemy with the dilemma that evasion of one threat inherently exposes him to another.

In the joint arena, the major obstacle to combining service efforts effectively always has been the problem of synchronizing capabilities that operate with different technology in different environments, and are affected differently by time and space. Thus, effective cooperation between land and maritime forces historically has been difficult to achieve; until the twentieth century, successful amphibious operations were far outnumbered by those that failed. In our own Civil War, despite overwhelming federal naval supremacy, only Ulysses S. Grant in the Mississippi Valley campaign was able to develop an effective partnership with naval forces. Truly integrated amphibious operations were perfected by the US Marine Corps only in the 1930s.

Integration of air and ground forces has proved even more troublesome. For the U.S. Air Force, the speed and range of aircraft, the technical challenges of arming, fueling, and maintaining them, the complexity of matching their specialized weapons to appropriate targets, the need to protect them en route to and from their objectives, and the requirements of airspace deconfliction all urge centralized management of air assets at the theater or joint taskforce level. In contrast, the Army and Marine Corps routinely associate air with ground formations as far down as the Army brigade and Marine Expeditionary Unit.

History and service cultures make it unlikely that these differing approaches to the integration of air and ground forces will be reconciled soon, nor is it essential that they should. The effective, albeit improvised, integration of air and ground assets during the war in Afghanistan proved that, properly exploited, new information technologies can dissipate many of the procedural delays that have

impeded effective air-ground integration, whatever the formal arrangements through which air command and control is exercised.

Instead, one of the major challenges of future interdependence will be to determine in each prospective joint operation the initial roles to be played by air, ground, maritime, and special forces in attaining the desired tactical effects, and to ensure that command and control arrangements are sufficiently flexible to allow those roles to be adjusted smoothly as operational conditions and requirements change. The more comprehensively sensor and communications systems are networked, and the more versatile the munitions available to the fighting platforms of all the services, the easier that flexibility will be to achieve.

Precision. Strictly speaking, "precision" describes the conformity of an object or action to prescribed requirements with minimal deviation. Unlike accuracy, with which it is often confused, precision is a relative, not absolute, quality. It can be judged only in relation to the purpose to which it is applied. An object or action can be precisely wrong as easily as precisely right. During the air campaign against Serbia, for example, the Chinese embassy in Belgrade was a victim rather than the beneficiary of improved delivery precision.

As that incident revealed, precision in war is a two-edged sword. Insofar as it enables actions to deliver results more reliably, precision is a highly desirable quality, whether applied to weapons or to the operations employing them. But the tighter the tolerance, the greater the vulnerability to friction and the more important the aptness of the purpose to which precision is applied.

In joint warfighting, precision is a logical complement to effects-based operations. The more discrete the effect desired, the greater the premium on precise application of the force necessary to produce it. From an operational and logistical perspective, precision contributes to economy of force. From a strategic perspective, it diminishes the risk of unintended consequences. But it does both only to the extent that effects are correctly defined, and thus precision is hostage to the reliability of the information that underwrites it.

Reliance of joint operations on precision therefore cannot be divorced from an appraisal of the information environment. Where information confidence is low, reliance on precision in lieu of mass may be not only ineffective but also positively harmful. A clever adversary will do his best to increase that risk by encour-

aging reliance on precision where its application can be misdirected or otherwise frustrated.

In joint operations, therefore, precision and mass must be understood as *complementary*, not *interchangeable*, requirements. To cope with a complex, adaptive enemy, the joint force must be able to employ both with equal facility.

Simultaneity and Sequence. As earlier discussion noted, conviction in quick victory has been one of war's most enduring and dysfunctional syndromes. Nonetheless, some today insist that the power of new information technologies married to increased precision and speed will allow joint forces to operate simultaneously against multiple major objectives in lieu of the sequential operations characteristic of most past military campaigns.

Where it is feasible, tactical simultaneity is attractive and always has been. By compelling an enemy to cope with multiple threats, simultaneous operations prevent him from concentrating on any one. They are more likely than sequential operations to overload enemy information and command and control systems. Finally, to the extent that the enemy relies on interdependent capabilities, simultaneity produces synergistic degradation as damage in one area affects performance others. For example, destruction of a key sensor-to-shooter link not only deprives the enemy of the weapon immediately affected but also increases the target-servicing burden on the remainder.

Operational simultaneity is another matter. Even where capabilities are unequal, the size of the theater, the nature of the topography, and the robustness of the enemy force limit the extent to which simultaneous major operations are tactically and logistically feasible. Moreover, some activities simply are imprudent unless and until conditions favoring them have been achieved. For example, except in unusual circumstances, no joint commander would readily move maritime forces into confined waters without prior mine-clearing operations, nor commit airborne or air assault forces to an opposed entry without prior suppression of enemy air defenses. In these and many other areas, sequential operations are intrinsic to force protection and operational success.

Most important, however, operational simultaneity is sensitive to the skill and resilience of the enemy. Unless virtually entrapped (and sometimes even then), a competent enemy can defeat simultaneity by the simple expedient of selectively refusing to engage. Efforts to conduct simultaneous operations during the Viet-

nam War frequently foundered for just that reason. Operational simultaneity presumes the existence of conditions—political, geographical or other—that compel an enemy to engage simultaneously.

Feasibility apart, the principal risk of a rigid commitment to simultaneity is *failure to plan in depth*. Among the most common causes of stalled campaigns is the *failure to plan the sequel to an operation* before launching it. At best, the result is likely to be a force poorly positioned for follow-on operations. At worst, it can shift the initiative to the enemy.

In sum, at the operational level, simultaneity can be a goal but never the condition of joint force operations. And even when sought, it does not relieve the joint force of the obligation to plan for a more sequential campaign than is intended or desired.

Non-Contiguous Operations. Although concurrent maneuver by widely separated forces often is discussed as if it were a modern invention, in fact it has been the predominant operational pattern since Napoleon. Only the suppression of mobility by firepower in the early twentieth century forced armies to adopt linear patterns of operation, patterns that the airplane, tank, and wireless radio eventually ruptured. However, as the Iran-Iraq War of 1980 to 1988 demonstrated, even those technologies cannot invariably prevent linearity from reemerging on the battlefield.

Advances in mobility, sensors, precision firepower, and especially information technologies now are believed to offer new incentives for non-contiguous maneuver and pose new threats to military forces declining to adopt such an approach. The form of this maneuver, however, is quite different from the deep penetrations and wide encirclements of traditional mechanized operations. Rather, the patterns typically represented in today's graphics look more like maritime than land operations, with widely separated engagements occurring more or less independently and little or no effort to control the intervening geography.

The premise of such operations, apart from the mobility, firepower, and distributed command and control required to execute them, is a nodal enemy; that is, an enemy whose critical combat enablers, whether forces, fires, logistics, or command and control, are deployed in cohesive and geographically confinable locations. Fighting in Afghanistan reflected just such a pattern after the initial defeat of conventional Taliban forces. But OPERATION ENDURING FREEDOM also re-

vealed both the prerequisite for and key implication of non-contiguous operations.

The prerequisite is some action inducing an enemy to become nodal. In Afghanistan, the agent was uncontested airpower, which forced Taliban and al Qaeda fighters to evacuate the exposed Afghan lowlands and congregate in the mountainous central and border areas. During the Vietnam War, in contrast, US and South Vietnamese forces rarely were able to compel the enemy to clump in that fashion despite air supremacy. The principal obstacle was terrain, which made it difficult or impossible even with overwhelming force to deprive enemy forces of freedom of maneuver. Only when they chose to defend in position, as in Hue in 1968, was it possible to force decisive engagement.

In short, unless the enemy deliberately chooses to make himself assailable in targetable nodes, the prerequisite is some prior action by the joint force to compel him to do so. The implication follows directly: Unless forced to do so or unless he is incompetent, an enemy, especially one inferior in conventional combat power, will become nodal only when special conditions make it advantageous, as, for example, by occupation of an urban area or other complex terrain.

In execution, the key effects of non-contiguity are on *logistics* and *command and control*. Non-contiguous operations necessarily complicate sustainment. The requirement to replenish, maintain, and evacuate from widely separated locations magnifies the burden on transportation assets and distribution mechanisms. Moreover, concurrent engagement by forces beyond supporting distance from one another deprives the logistical system of the intrinsic versatility and robustness furnished by shared lines of support.

Non-contiguous operations also complicate protection of the sustainment flow. Even when they originate from only one or a few logistical staging areas, multiple lines of support and points of delivery present the enemy an enlarged target array, while simultaneously multiplying friendly air, surface, and subsurface defense requirements.

Finally, non-contiguity complicates distribution, especially of critical low-density supplies and equipment. As we learned in Vietnam and have relearned in Bosnia, Kosovo, and Afghanistan, it is unlikely in a distributed battlespace that any such item will be made available to the system or unit requiring it in a timely way

unless the moment and location of need already have been forecast. Non-contiguous operations put a special premium on *reliable logistical prognostics*.

The impact of non-contiguous operations on command and control requires little elaboration. Such operations increase communications distances, complicate synchronization, and expose the joint force to piecemeal engagement. Moreover, the surrender of direct control over the "white spaces" among committed forces increases the burden on information and fires, and unless managed carefully, can furnish the enemy both sanctuary from friendly attacks and staging areas for his own.

None of these complications need be fatal, but all incur additional risk. The risk can be mitigated by exploiting new information technologies to furnish ready access throughout the joint force of a more comprehensive and timely common operating picture; improving the logistical durability and self-sufficiency of smaller units; reducing demand for combat consumables; better integrating C4ISR[5] systems to track enemy movement into and out of white space; and, finally, furnish early warning of developing threats and permit their timely and effective engagement.

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[5] Command, control, communications, computers, intelligence, surveillance, reconnaissance.

Employing Joint Forces

With the notable exception of Grant's Mississippi Valley campaign mentioned earlier, integrated joint operations are a creature of the twentieth century. The first true joint operation was Britain's 1915 assault on the Gallipoli peninsula, the only major amphibious operation of the First World War. Despite overwhelming naval superiority and the extraordinary heroism of British and ANZAC troops, the operation was a dismal failure. The major contributor to the failure was a complete breakdown of joint integration.

During World War II, US military forces became masters of joint operations. But it took the services three long years of military operations in the Pacific and in Europe to achieve an effective level of joint cooperation. Even then, joint integration occasionally collapsed. The near disaster on Normandy's Omaha Beach, for example, resulted in large part from the SHAEF planners' overestimation of the ability of air bombardment to destroy shore defenses and their underestimation of the ability of naval gunfire to suppress those defenses, this despite three years of experience in the Pacific predicting precisely that result.

Inevitably, joint lessons learned in war too rarely survive the peace. Accordingly, while recognition that virtually all future operations are likely to be joint today has become the conventional wisdom, preparing joint forces for operations remains largely a matter of improvisation. Apart from the Marine Corps and Special Operations forces, no service organizes itself routinely to interface with its sister services, and even the Marine Corps organizes for routine integration only with the Navy.

Useful as it is, the ability to improvise is no substitute for organizations optimized to work effectively with their joint partners. Successful full-spectrum operations will require the services to adjust their internal organizations and doctrines to reconcile institutional needs and habits with joint operational effectiveness. In the process, they will have to organize in a way that expands their range of joint employment options and improves their ability to deploy and sustain joint forces across global distances. Finally, for all these purposes, and to ex-

ploit the power of emerging information technologies, the machinery of joint command and control must be reconfigured and enhanced.

Organizing for Operations. At the heart of the organizational and operational impediments to successful joint integration are profound differences in the way each service sees the face of war. Service cultures comprise a set of traditions, beliefs, biases, and assumptions that condition the way the personnel and especially the leaders of each military service approach their business. Since man first went to war at sea as well as on land, there has been a marked difference in these cultures. The expansion of war to the air at the beginning of the twentieth century simply added another distinctive culture to the mix.

At base, differences in service culture reflect differences in the environments in which the services operate and the tools they employ. War on land is embedded in and to a large extent driven by the ground itself, an extraordinarily disorderly environment in which the obstacles to knowledge, movement, and communications multiply friction, and in which, therefore, progress is slow, direction and momentum are difficult to sustain, the risk of surprise is omnipresent, and command and control are inherently fragile. The culture of ground forces, therefore, is predisposed to worry about such matters as unity of effort, synchronization of activities, and clear lines of authority.

In contrast, war at sea takes place in a relatively uniform medium and across vast distances. The sea itself is unforgiving, and naval operations reflect the peculiar challenges of fighting in an environment inherently hostile to man. On the one hand, the concentration of naval power in a finite number of relatively self-sufficient platforms inherently enhances control. On the other, the very scale of the distances across which those platforms operate demands a high degree of command autonomy.

Finally, while war in the air, like naval warfare, takes place in an unforgiving medium, the air also is the most transparent of the combat environments, and aircraft are the most agile of fighting platforms. Where war on land proceeds in miles per hour and at sea in tens of miles per hour, war in the air takes place at hundreds of miles per hour. That agility makes the airplane the most dynamic and versatile of fighting platforms, but also magnifies its exposure and fragility. Consequently, air operations have bred a culture of close teamwork and centralized planning designed to optimize air-delivered effects and minimize the attendant risk to assets that are scarce, expensive, and difficult to replace.

Simply mandating closer joint cooperation will not reconcile these cultural differences. The Goldwater-Nichols Department of Defense Reorganization Act of 1986 addressed some of the symptoms of service parochialism, and the services themselves have worked hard to improve joint interoperability. But all these efforts essentially have operated at the margin, seeking to diminish the adverse impact of cultural differentiation without disturbing the internal operating habits and beliefs that foster it.

And yet, wartime experience proves that the problem is not insuperable. During each of America's major conflicts—though not without bitter argument—forces in the field have managed to improvise joint arrangements, sacrificing cultural predilections for practical cooperation. During World War II, ground and naval forces perfected amphibious operations to a degree unimaginable in earlier conflicts. Acrimonious disputes between ground and air forces eventually gave way to the extraordinary symbiosis that characterized air-ground operations from Normandy onward. A similar evolution occurred in Korea, Vietnam, and the Gulf War, and recently has occurred again in Afghanistan and Iraq.

This persistent difference between wartime and peacetime experience suggests that real multi-service integration does not emerge from abstract studies and doctrinal statements, or even useful but often sterile classroom education. Rather integration comes from the prolonged experience of commanders and deployed units working together under pressure in circumstances where the penalties of inadequate joint cooperation are both visible and measurable. Apart from war itself, the only way to approximate that experience is through joint exercises in actual field conditions, under the scrutiny of demanding evaluators supported by instrumented assessment tools. In turn, such exercises are likely to be effective only in circumstances in which designated joint forces are formally associated with one another long enough to learn each other's habits, exercise together, assess their mistakes, and make adjustments based on those lessons.

One suggested solution to this problem is the creation of standing joint mission forces stationed, organized, trained, and equipped for commitment as integrated force packages. As a universal alternative to today's organization, however, such standing joint forces would cause as many problems as they solve. They would have to be organized either in a wide variety of sizes and configurations, or else in packages small enough to permit force expansion by simple multiplication. Neither would be easy to accomplish, nor would the result afford the kind of operational flexibility likely to be required by the prospective multi-

dimensionality of the threat. Moreover, force expansion is more than just a matter of multiplying assets. Different contingencies and different phases of the same contingency call for different force mixes. An organizational solution that complicates rather than facilitates tailoring joint forces to actual needs would be no solution at all.

However, limited to the military equivalent of "first responders," such joint mission forces would be both more feasible to organize and more valuable operationally. It should not be difficult to devise a finite number of such formations of varying size and composition, each tailored to a specific category of contingency. Ideally, such formations should be collocated in peacetime, train together routinely, and be committed only as complete packages. The Marine Corps and today's Special Operations Command already provide workable models for such organizations, and it would not be difficult to adjust those models to incorporate other service elements.

To be useful, however, the composition and command and control of such standing joint "first responder" forces must allow for more than one operational objective and method. One joint mission force, for example, might be organized from the outset for primary reliance on offensive air operations, with ground and maritime elements organized, equipped, and trained primarily to support those operations. At the same time another might be designed for seizure and control of territory, with air and maritime elements optimized to support ground operations. Such differentiation by objective and method not only assures strategic versatility but also is the only way to guarantee that joint learning occurs across the full spectrum of potential strategic and operational requirements. Indeed, as suggested earlier, ultimately that learning would be an even more important contribution of joint mission forces than their immediate strategic utility.

An essential concomitant of standing joint mission forces is the modularization of the remainder of the joint force in a way that would permit rapidly tailored augmentation of joint mission forces for larger and more complex contingencies. Because the actual evolution of military commitments cannot be predicted, neither can the required organizational evolution of committed forces. In Bosnia, for example, what began as a peacekeeping commitment evolved into peace enforcement; whereas in Kosovo, precisely the reverse sequence occurred. Similarly, as Afghanistan has reconfirmed, the scale and intensity of combat operations are highly variable. Joint forces must be able to accommodate this variability without

having to pause for fundamental reconfiguration each time the character of a campaign changes.

In effect, then, joint mission forces must be designed not only as a self-contained response to smaller contingencies, but also as a rapidly deployable base on which to assemble the joint force required for larger ones.

Optimizing Service Roles. While Title 10 of the US Code prescribes the formal role of each service as a component of America's joint military forces, the reality is that no aspect of joint operations is more sensitive to strategic requirements and technological capabilities than the actual operational roles assigned each service in a joint operation or campaign.

That each service enjoys comparative advantages over the others in certain environments is undeniable. No ground force easily could contest maritime supremacy, for example, nor a purely maritime force control of the air. But military operations have become far too complex to permit assigning operational roles based solely on such narrowly construed competencies. Instead, in actual operations, the allocation of service roles depends integrally on the military objective and the circumstances in which it must be pursued, and moreover is likely to change repeatedly as the latter evolve.

Specification of the initial role to be played by each service in an operation, how that role relates to those assigned other service components, and the way in which that arrangement is likely to change over time or in different contingencies should be among a joint commander's first concerns. In turn, that presumes prior agreement on what conditions, if produced, are most likely to contribute to accomplishment of the military objective.

Effects-based planning can help make this determination more reliable and less vulnerable to sterile debate about service preeminence and which service should support or be supported by another. By specifying the discrete effects most likely to produce a desired material or psychological impact on the enemy, examining the political, topographical, demographic, and other conditions influencing achievement of those effects, and comparing those conditions with available capabilities, joint planners can develop a role assignment that maximizes the combined, not merely the individual, competencies of all the service components involved. The same analysis will enable them to forecast how that assignment is likely to vary if and as objectives and/or environmental conditions change.

Thus, in Afghanistan, early offensive operations saw Special Operations Forces and Afghan ground elements furnishing the supporting anvil on which coalition airpower hammered concentrated Taliban defenses. In later operations, air assets provided close support to ground forces engaged in rooting out dispersed and concealed enemy forces. Similarly, in recent joint war games, ground and air forces have been employed as the supporting means by which a maritime force was enabled safely to penetrate confined waters from which, in turn, it subsequently supported deeper air and ground operations.

This alternation in supported and supporting responsibility is likely to be common in any major conflict, and to some extent in lesser contingencies as well. Optimization of service roles presumes service combatant organizations with the inherent flexibility to shift roles quickly and easily, a logistical system that facilitates such role changes, and above all, a C4ISR system that can foresee the necessary rearrangements and adapt to them.

Managing Risks. Sensible assignment of service roles in any operational circumstance cannot be determined without sensitivity to the differing exposure of service-unique assets to risk. For example, as noted earlier, ground forces operate in an environment where early warning of threats is inherently difficult to obtain, especially in complex terrain and against an enemy who has had leisure to prepare the ground. While armored forces enjoy some inherent protection against unforeseen threats, lighter forces are more exposed. All ground combat forces, but light forces most of all, depend heavily on responsive fire support against enemies whose location, composition, and strength cannot reliably be forecast. Air and naval support of ground forces must be sensitive to this intrinsic uncertainty, and to the time sensitivity of supporting fires and the need for their close coordination.

In contrast, operating in the most transparent of environments, aircraft are the most easily acquired of targets. While modern stealth capabilities diminish this visibility, aircraft remain vulnerable to both air and surface threats and can neither fly safely nor fight effectively in a still-effective air defense environment. Even where an air defense system has been degraded, aircraft remain vulnerable at low altitudes, and are hampered in the rapid acquisition of dispersed and concealed targets. Ground forces supporting or supported by air elements must understand this inherent vulnerability, and operations relying heavily on air delivery, whether of munitions or people and equipment, must be designed and sequenced to assure prior air defense suppression.

Finally, naval operations can never ignore the oceanographic conditions in which joint operations transpire, especially when, as will be true most of the time, those operations require entering shallow and/or confined waters. While naval combatants are inherently well protected, their vulnerability increases directly with proximity to land and the reduced warning time and loss of maneuver space it implies. Subsurface threats such as submarines and mines only increase that vulnerability, as does exposure to land-based unconventional threats from small craft to underwater demolition teams. Air and ground activities that depend on or that support maritime operations must accommodate and to the extent possible help mitigate those inherent risks.

The foregoing touch only lightly on the ways in which risk differentially affects service capabilities. By permitting faster and broader sharing of situational information as it is acquired, and by allowing more rapid analysis of the effect on vulnerability of changes in force composition, disposition, and support priorities, improved joint C4ISR systems can help manage these risks and diminish some of the concerns that traditionally have impeded closer multi-service cooperation. But the design and sequencing of operations, the distribution of activities among the components, and the manner in which those activities are harmonized still must reflect a careful comparative risk assessment.

Assigning Geographic and Spatial Responsibilities. In part reflecting service-unique risk concerns, and in part different operating styles, the assignment of responsibility for the battlespace historically has been among the most contentious of joint issues. Even the integration of ground and maritime forces, and of Marine and Army forces, occasionally has produced such problems, as World War II's Pacific campaigns reveal.

But the problem is most acute with respect to integration of air and surface forces, reflecting their varying sensitivities to the impact of time and space. For air forces, free of terrestrial limitations, any segmentation of the airspace, hence the surface beneath it, inherently is artificial. Apart from assuring safety from collision or fratricide, which increasingly can be accomplished in other ways, segmenting the airspace merely restricts exploitation of the airplane's speed and versatility. Airmen resist division of spatial responsibility, preferring instead to coordinate and deconflict air operations through centralized management and standing operating procedures.

Naval and especially ground forces see the problem differently. For the Naval forces, especially when operating close to shore, survivability from attack varies directly with warning time. The latter in turn is sensitive to the seaspace on, over, and under which they have positive control. Modern information systems have diminished this problem, but the tragic destruction of an Iranian civilian airliner by the American cruiser USS *Vincennes* in 1988 underlined that it has not evaporated. Naval forces are less willing than air forces to dispense with formal geographic restrictions on air and surface operations, and especially subsurface operations, which are even more difficult to control in any other way.

This is even more true of ground forces, which perforce operate in an environment in which noncombatants are ubiquitous, positive discrimination of friendly and enemy forces is difficult, and the operations of one formation may directly influence and be influenced by those of an adjacent force. Ground forces therefore routinely segment the battlespace, and the assignment of spatial responsibility is an essential tactical requirement. That is true, moreover, without regard for the concentration or dispersal of forces. Indeed, the more non-contiguous operations become, the greater the risks associated with failure to assign clear geographic responsibilities.

Past efforts to reconcile these differing approaches to management of spatial responsibility have been problematic. At best, procedural solutions have impeded responsive cooperation between air and surface forces and the timely attack of fleeting targets. At worst, they have resulted in fratricide and/or collateral civilian damage, diminished mutual confidence, and (occasionally) political embarrassment.

If there is a single area in which exploitation of advanced information technologies and precision can make a significant difference in joint operations, it is here. To the extent that joint forces have access to a reliable common operating picture in real time, and weapons effects can be predicted with confidence, rigid procedural controls can be replaced with more flexible and responsive on-the-fly coordination without penalizing efficient force employment and protection. We already have had a taste of that in Afghanistan, where strike aircraft routinely have launched without target assignments, receiving friendly and enemy situation updates and targeting information en route to the battle area.

Similarly, enjoying such real-time situational awareness, ground and naval forces can dispense with arbitrary boundaries and operating areas, replacing precon-

ceived and tactically rigid procedural synchronization mechanisms with self-synchronization grounded in broad command guidance and reliable navigation and communications systems. Friction of course will not disappear, and positive spatial controls may still be required in situations where communications are unreliable, information is ambiguous, or the sheer intensity of operations makes real-time coordination unacceptably burdensome. But such cases should become the exception rather than the rule.

Joint Deployment and Sustainment

In 1942, the great problem confronting the US military was the iron grip of geography—the sheer distance separating US forces from the battlefronts where they would have to fight. Their success in overcoming that problem constituted a logistical triumph, a performance no other World War II combatant came close to matching.

However, it was a short-lived triumph. Following the Korean War, practice in mounting large expeditionary operations almost immediately gave way to the permanent forward stationing necessary to deter communist expansion in Europe and Asia. Not until the Vietnam War was the United States again required to sustain large expeditionary forces in combat, and the proximity of permanent bases in Korea, Japan, Okinawa, and the Philippines hugely simplified the force projection challenge. In contrast, the Persian Gulf War required the creation virtually from scratch of a theater infrastructure, and the four months consumed in doing so not only delayed ejection of Iraqi forces from Kuwait, but also invited a preemptive Iraqi attack on Saudi Arabia that happily never materialized.

In the future, the widening spectrum of conflict and reduction in permanent overseas basing associated with the end of the Cold War virtually guarantees that US forces will find themselves committed to operations such as those in the Persian Gulf and Afghanistan that require deployment from strategic distances to theaters without developed base structures. Unlike those cases, however, such a deployment in the future may well confront an enemy willing and able to contest access to the theater both immediately and over time. Meeting that challenge will require joint forces to solve several interrelated problems.

Defeating Anti-Access. On October 12, 2000, two terrorists in an explosive-filled rubber boat attacked the destroyer USS *Cole*, conducting a routine refueling stop in the Yemeni port of Aden. The attack inflicted severe damage and 39 casualties, including 17 dead.

While the success of such an attack might be much less likely in a shooting war, the Cole incident highlights the vulnerability of strategic deployment to a growing range of threats, from stand-off attack by missile, air, surface, and subsurface conventional weapons to the unconventional means used to damage the *Cole*. Historically, deploying forces always have been most vulnerable in the transition from deployment to engagement. Increasingly, that vulnerability extends to the staging process as well.

Defeating enemy anti-access requires a concerted joint effort extending from the deployment and sustainment point of origin to the engagement area. In an extreme case, it may involve activities as disparate as securing deployment ports and airfields both in the United States and abroad, protecting sea and air sommunication, establishing an effective air and missile defense umbrella in the commitment area, enforcing an effective surface and subsurface exclusion zone in littoral waters, and seizing territory within the enemy's reach from which to mount decisive air, naval, and ground combat operations. Smaller-scale contingencies involving less capable adversaries may render some of these activities less necessary, but unless force projection is entirely unopposed, some almost invariably will be required.

While the faster that secure access can be achieved the better, defeating anti-access efforts almost always will require some degree of sequence. Given growing battlespace transparency and the lethality of modern weaponry, neither ground nor surface naval units can safely enter a theater of operations until that entry is reasonably secure from air, missile, and subsurface threats. Likewise, ground-based air units cannot safely deploy to local bases until they have been secured from attack, including unconventional attack. Possession by a prospective enemy of a significant anti-access capability will inherently limit the degree of operational simultaneity that can safely be pursued.

Moreover, even in a smaller-scale contingency, assuring safe access will not likely be limited to protecting initial deployments. On the contrary, in prolonged operations, the unconventional threat to access may grow even as the conventional threat is reduced. During the battle for Okinawa, for example, Japanese *kamikaze* attacks persisted virtually until the island was secured, and came close to depriving forces ashore of both naval support and replenishment. Defeating anti-access, in short, remains a critical operational requirement from the moment hostilities begin until they end.

Basing and Staging. In addition to highlighting operations directed specifically at assuring access, the growing magnitude of the anti-access threat has broad implications for the way joint forces deploy. Perhaps the most obvious is the increasing penalty associated with reliance on fixed points of entry in the area of operations, including ports, airfields, and staging areas. Their very immobility makes them more vulnerable to conventional attack, and their typical proximity to urban centers makes it more difficult to secure them against unconventional threats as well.

Future joint operations therefore will place a premium on strategic mobility assets that can operate from and deliver forces to unimproved points of entry, either over the shore or at undeveloped inland aerial points of debarkation. Such assets, from shallow-draft, high-speed sealift to airlift capable of routine operations from unimproved landing sites, are increasingly within the reach of technology.

That task will be easier to the extent that all joint forces dependent on strategic airlift and sealift are designed from the outset for force projection to austere theaters. That always has been true of the Marine Corps and has now become an Army transformation objective as well. The Navy and Air Force, of course, self-deploy their combatant forces. But even those typically require in-theater support from casualty evacuation to maintenance and repair, and these supporting functions can contribute significantly to both the initial deployment burden and the logistical footprint in the theater. By eliminating duplication of these functions wherever they are not service unique, tailoring them more closely to projected requirements through improved C4ISR and more advanced logistical prognostics, and shifting to lighter, more easily transportable, and less manpower-intensive equipment, future joint forces can at once ease competition for strategic lift assets and diminish the vulnerability of the deployment and sustainment effort to deliberate or accidental disruption.

Finally, the increased risk associated with basing and staging in the theater lends additional weight to the case for a more granular integration of joint combatant forces. Especially in the early stages of deployment, the ability to field cohesive joint forces that enjoy full dimensional capability and protection without regard for initial force size would enhance both their own strategic utility and survivability and that of follow-on forces, should these be needed.

Rationalizing Strategic Lift. Even at the zenith of World War II, with the United States fully mobilized and producing transport ships and airplanes at a rate that has never been equaled, strategic lift was perhaps the single most severe constraint on military operations, and so it has remained ever since. There never has been enough lift to satisfy all transport requirements, especially in the early days of a contingency, and that situation is unlikely to change. How to apportion strategic lift assets among the components of a joint force, and when and how to alter that apportionment, remains among the most difficult of operational choices.

Conventionally, airlift is viewed as the most versatile as well as fastest mode of strategic transport. Aircraft such as the C-5, C-17, and C-130 have radically improved our ability to deliver forces to a theater of operations, shift them within it, and sustain them. Without such assets, it is almost inconceivable that we could manage operations such as those in Afghanistan, let alone more combat-intensive operations such as Korea or Vietnam.

But airlift also confronts limitations. For one thing, obviously, it requires confident air supremacy. The United States has not faced a serious challenge in the air since the demise of the Soviet Union, but such a challenge in the future cannot be dismissed out of hand. Moreover, airlift imposes inescapable limits on the size and weight of cargo. This is a matter not just of the limitations of aircraft themselves, but also of their reception airfields. Unimproved air points of debarkation especially are limited in the number and weight of sorties they can accommodate. Finally, airlift is an inordinate consumer of fuel, which itself constitutes a major competitor for lift in any situation where fuel is not readily available within the theater.

All three constraints—air supremacy, fuel consumption, but especially capacity—bear less heavily on sealift, on which prolonged expeditionary operations traditionally have relied. But sealift faces constraints of its own. Today more than ever before, it too is vulnerable to standoff attack from the air as well as the subsurface attack that has been its nemesis since World War I. Like airlift, sealift today remains heavily dependent on developed ports of debarkation, and for the deep-draft vessels comprising the bulk of today's sealift assets, these ports are likely to be even fewer in an austere theater than arrival airfields. Most important, of course, sealift is limited to delivery to coastal littorals. Inland operations require surface or air transport for onward movement, and the transshipment and staging associated with it.

Future lift technologies, if developed and acquired in a timely way, will diminish many of these limitations. Even so, the traditional sequence of relying on airlift for entry and sealift for follow-on deployment and sustainment may need to be reconsidered. Competition for airlift, not only among the components but also between their combatant and sustainment elements, will be heaviest in the early stages of a contingency, when both airlift and arrival airfields are the least numerous, whereas generation of Civil Reserve Air Fleet assets and the securing of fields they can use may significantly increase later airlift availability. Meanwhile, provided commitment decisions are made promptly, sea transport may in some cases prove more useful even for early deployment, notwithstanding onward movement requirements.

In addition to improved transport, rationalizing air and sea lift has implications for the way both combatant and sustainment forces are packaged for deployment. At a minimum, in the future it may be as important for follow-on forces and sustainment to be transportable by air as it is for initially deploying forces. At the same time, early deployment of standing joint mission forces, if they are established, should be as readily transportable by fast sealift as by airlift, and joint exercises should routinely require the exploitation of both means of transport.

Streamlining Responsibility for Logistics. Although considerable progress has been made at the national level in rationalizing and streamlining logistical functions, including centralized procurement of common use items, theater logistics today remains hostage to the 1948 Key West Agreement relegating primary responsibility for logistics to the individual services. One result is that common functions, from vehicular maintenance to legal affairs, are duplicated in three and occasionally all four of the services.

If future joint forces are to integrate effectively in smaller packages than in the past, the current pattern must change. Recent joint war games almost without exception have revealed the penalties in responsiveness and versatility associated with the lack of an integrated joint theater logistics system. Independent service logistics management systems waste people, consume time, and increase friction. At the same time, duplication of theater logistical functions magnifies the burden on strategic deployment assets and enlarges the footprint—hence the vulnerability—of deployed forces themselves.

There always will be a requirement for direct service oversight of component-unique logistical requirements from major end-item replacement to maintenance

and repair of platform-specific sub-systems and components. Increasingly, however, the most critical logistical challenges may involve expensive but fungible electronic components in use throughout the deployed joint force. Similarly, in areas ranging from casualty evacuation and treatment to civil affairs, increased force dispersal and the need to avoid large and vulnerable in-theater bases argues for maximum sharing of logistical resources without regard for the color of the uniform.

As in other areas, in recent operations from the Balkans to Afghanistan, the services themselves have demonstrated considerable ingenuity in working through and around formal service logistical accountability to accomplish the mission. As with operations, however, logistical improvisation should be exceptional rather than routine. Moreover, if the in-theater footprint associated with future deployments is to be reduced, as envisioned by current focused logistics concepts, the burden currently borne by in-theater stockage must shift to the distribution system, and that too argues against having to improvise joint logistics arrangements anew in every contingency.

One objective of a sensible joint operational concept, therefore, should be to establish and exercise deployable joint logistics headquarters reporting directly to the Regional Combatant or Joint Task Force (JTF) Commander, with the means and authority to control the flow of logistical assets into the theater, integrate them with whatever host nation resources are locally available, prioritize their apportionment among the components, and assure their efficient overall employment across the deployed force without regard for service provider.

Hedging Logistical Prediction. Together with effects-based planning, more effective joint theater logistics management supported by improved C4ISR and logistical prognostics can significantly diminish unnecessary logistical redundancy just as enhanced precision can significantly diminish logistical demand. Nevertheless, since the enemy has a vote in determining the intensity and duration of operations, it is unreasonable to expect perfect logistical forecasting. Estimates for OPERATION OVERLORD in June 1944, for example, considerably underestimated ammunition requirements for the *bocage*[6] fighting in June and July while overesti-

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6 In western France (e.g., Bocage Normand, Bocage Vendèen), a well-timbered district in distinction to the *campagne*, which denotes a hedgeless tract of farmland characteristic of old-established areas of open-field agriculture. The fields of *bocage* country are small, irregular, and enclosed by hedges and groves of trees. There have been attempts to cut down the

mating fuel requirements. Ironically, SHAEF logisticians then reversed the flow just in time for the breakout and exploitation in early August. The resulting fuel shortage forced Allied armies to halt at the German frontier in early September, granting the Germans the breathing space that made possible their subsequent Ardennes counteroffensive in December.

The point here is not that Allied logistical planners were derelict, but rather that logistical forecasts can never be completely reliable. Traditionally, armies compensate for this uncertainty through oversupply. The much-criticized "iron mountain" of materiel that remained in Saudi Arabia at the end of the Gulf War reflected just such hedging. Those who complained about it might, with as much justice, have criticized Saddam Hussein for capitulating too quickly.

In one sense, however, the criticism was justified, for the real problem was not that so much materiel was deployed but rather that, in too many cases, no one in the theater really knew what had been deployed until after it arrived. Even then, shipping containers often had to be opened merely to discover their contents.

Clearly, neither focused logistics nor sensible hedging can be undertaken without accurate tracking of supplies from requirements generation through shipment to delivery. It is one thing to hedge unanticipated needs, another altogether to oversupply from ignorance. Modern information technology enables businesses to track shipments in real time at individual item resolution, and military forces must be able to do likewise. Moreover, the information systems supporting that tracking system must be common across the services.

Given that ability, how should uncertainty be hedged? In part, that depends on the role and criticality of the commodity in question. The problem is most visible with respect to "high demand/low density" items such as sensors and unmanned aerial vehicles. But it also may affect less obvious commodities such as AIDS-free certified whole blood. In each case, whether to hedge by oversupply, and if so, in what quantity, requires answering several questions: How critical is a shortfall in the item, and how long can it be tolerated without major impact on the conduct of operations? How easily can other items substitute for it? If not

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hedges and trees to promote agriculture, but the results were disappointing, serving only to confirm the traditional richness of the *bocage* in the raising of cattle for dairying and meat.

on hand when and where needed, how rapidly can it be furnished, and from where? If oversupplied, where will the surplus be positioned, and how secured?

In the end, the responsibility for effective logistical hedging, as for logistical forecasting in the first place, resides with the operator, not the logistician. The more closely operations are tailored to objectives and the more carefully planners resist projecting beyond the actual evidence in making assumptions about future enemy behavior, the less likely a serious logistical shortfall. Logisticians can and should help by framing logistical constraints in operationally meaningful terms. But, like operations themselves, balancing logistical cost against risk finally is an undelegatable command obligation.

Joint Command and Control

In meeting the obligation of balancing logistical cost against risk, as in everything else discussed in this paper, effectiveness finally will depend on the mechanisms through which joint command and control is exercised. Since the eighteenth century, when the battlefield began to expand beyond the line of sight of commanders, military organizations have struggled to find the proper balance between the control necessary to harmonize the activities of subordinate units and their freedom to react quickly to unforeseen threats and exploit unexpected opportunities.

The development of communications technology that began with the telegraph has only exacerbated this challenge. Indeed, much of the history of doctrinal development in the twentieth century could be characterized as a contest between efforts to improve top-down control and efforts to facilitate more reliable decentralization. Today, as far more powerful information technologies become available, how best to exploit them is at the top of every service's transformation agenda. It, therefore, is a pressing joint issue as well.

One way to deal with that challenge is to consider it in relation to four desirable qualities of effective joint command and control:

- knowledge rather than assumption-based planning;
- adaptive command-and-control mechanisms that inform and execute commander's intent without stifling subordinate opportunism;
- achievement of faster tempo without loss of synchronization; and
- maintenance of operational coherence.

Knowledge-Based Planning. The modern explosion in sensors and digital communications has led to optimistic assumptions about the certainty on which future command and control can rely. To some extent, those assumptions are justified. The ability of modern GPS-based navigation and communications systems to locate and identify friendly air, naval, and land elements in real time alone

has materially transformed the command and control problem, increasing situational awareness, while diminishing the distraction of subordinate units by active reporting and the burden on higher-level staffs of assembling and reconciling those reports. Similarly, proliferation of advanced sensors from satellite imagery to unmanned aerial vehicles enormously expands the radius within which threats can be detected and their activities monitored in real or near real time.

The problem today is how to exploit all that information without becoming submerged in it. Information fusion and presentation mechanisms have yet to catch up with data generation. Commanders and staffs are in many cases reduced to choosing between a suffocating level of detail or the use of aggregation tools that simplify interpretation only at the risk of filtering out or obscuring vital information.

One solution to this problem is filtering information through preconceived requirements and priorities relevant to the particular consumer. For example, locations of friendly units below a certain size may be uninteresting at higher levels of command except in unusual circumstances. Similarly, threat activities may be dangerous to the execution of friendly plans only if and when they occur in certain locations or reach a predetermined level of intensity. The application of such thresholds can significantly diminish the burden on both communications and decision-making.

But as past experience has confirmed, it also can be very dangerous. Any operational plan ultimately is no more than a hypothesis, confirmation of which is hostage to friction and the behavior of the enemy. Careless application of information thresholds risks filtering out the very information that would otherwise lead to alteration of the plan, or at very least, to a deliberate search for additional confirmation. If thresholds are to be used, therefore, it is essential to know their confidence limits and to establish routine review and assessment procedures assuring that information thresholds remain relevant and reliable.

From a joint perspective, this can be accomplished only if both the thresholds themselves and the means through which they are adjusted are shared across the components. Given the different environments in which they operate, the tools they employ, and the variation in the threats to which they are sensitive, there can be no assurance that detail irrelevant to one component will be irrelevant to another, even though acquired through service-unique means. Knowledge-based

planning presumes the ability of each component to apply different filtering criteria to the same information base. Threshold mechanisms and review procedures in joint command and control systems must permit this component flexibility.

Thresholds alone of course are not enough to guarantee knowledge-based planning. Raw information is not necessarily self-explanatory, and the faster and more voluminous the flow of information, the greater the difficulty of extracting meaning from it in a timely way. In the past, the lag between receipt of information and its analysis and redistribution has been among the major contributors to divergent assessments among commanders of rapidly changing situations, and delay and confusion in reacting to them in an integrated way.

Here as elsewhere, an effects-based approach to planning can help by more clearly assigning value to certain kinds of information, and by establishing the level of reliability and fidelity required to underwrite different actions of the joint force. In the most obvious example, the level of location accuracy prerequisite to striking an enemy in open terrain may be quite different from that required to attack the same force in urban surroundings. Similarly, the priority associated with acquiring an enemy missile system may be much higher than that associated with tracking the movement of a detected enemy ground formation, provided the latter can reliably be reacquired before it can adversely affect friendly operations.

But the greatest impact of networked information may be to empower multi-echelon analysis rather than forcing subordinate units to defer action until raw information has made its painful way up, and processed information down a stove-piped analysis chain. In this sense, knowledge-based planning may not so much increase the absolute level of certainty as accelerate achievement of an acceptable level of uncertainty. The real objective of knowledge-based planning should be to empower subordinate commanders to exploit fleeting opportunities more rapidly, without depriving their superiors of the ability either to influence current activities or to visualize and shape future operations.

Adaptive Command and Control. The key to achieving that sort of adaptive command and control is more rapid and effective development, promulgation, and adjustment of the commander's intent. Traditionally, commander's intent has been viewed essentially as a forecast of the way the commander expects an operation to unfold. Its purpose is to enable subordinates confronted with unex-

pected threats and opportunities to act rapidly on their own initiative without disrupting the coherence of the operation or accepting more risk than the commander can tolerate.

Today's challenge is to exploit emerging information and communications capabilities to produce a more dynamic interaction between commanders and subordinates without penalty to subordinate initiative. By exploiting the common operating picture, and through effective use of thresholds and priorities, commanders should be able more easily to review current activities, assess their likely impact on the force mission, and issue timely adjustments to intent without having to impose unnecessary restrictions on subordinate freedom of action simply to maintain control.

Far from requiring more frequent reference to the commander prior to action, adaptive command and control instead becomes a process of feedback and assessment that unleashes subordinates. To that end, commander's intent must convey not only the near-term conditions to be produced by subordinate activities—destruction of targets, seizure of objectives, and so on—but also the situational assumptions underwriting those activities and what adjustments are likely to be required should those assumptions turn out wrong. From a joint perspective, that includes changes in the situation that might require on-the-fly adjustment of the relationships among simultaneously engaged joint forces.

In an adaptive command and control system, knowledge-based planning furnishes successive points of departure while constantly evolving the commander's intent furnishes the intervening means of control. In turn, rather than collating reports and generating orders, the main function of staffs becomes identifying indicators that the commander's intent must change, and assessing the impact of that change on future planning.

In the ideal, then, planning becomes a largely empirical process of hypothesis development and testing, driven and informed by a constantly evolving body of evidence. The commander's intent remains an art, enriched by information but ultimately governed by the commander's personal feel for the changing dynamics of the battle.

Accelerating Tempo. Earlier, this paper discussed both the increasing premium on speed and some of the growing obstacles to achieving it. Not all of these obstacles can be overcome simply by improving joint command and control, but

some certainly can. Indeed, it is precisely those elements of delay that impede rapid decision and coordination that are most directly within our means to diminish.

One such obstacle—the situational uncertainty that compels commanders to restrict subordinate freedom of action for fear of irretrievably damaging results—already has been addressed. By planning continuously from knowledge and controlling through dynamically adapted intent, commanders in the future will be able to diminish ignorance and manage uncertainty to a degree previously unattainable without penalty to tempo.

There remains the problem of harmonizing the simultaneous activities of myriad separate organizations and platforms all of which occupy the same battlespace and which, therefore, unless synchronized in some fashion, not only cannot support one another, but also could endanger each other as much as they endanger the enemy.

Challenging even for a single service component, synchronization is even more difficult for joint forces operating in different modes, at different velocities, and with different exposure to threats and the environment. After planning, therefore, joint synchronization has been perhaps the greatest single contributor to operational sluggishness.

Some of that sluggishness can be eliminated simply by more effective sharing of real-time information. Replacing rigid geographical and spatial restrictions and the consequent requirement for time-consuming clearances and approvals with on-the-fly coordination based on a common operating picture can help. But true self-synchronization requires more than just spatial and target deconfliction. The objective, after all, is not merely that joint forces not mutually interfere with one another, but also that they positively complement each other's capabilities.

For that to happen, planning must be truly joint from the outset and, as earlier suggested, without preconceived assumptions concerning the role each component will play in a given operation. To self-synchronize, component elements must have a common understanding of which elements desirably should adjust and how a situation in execution could turn out to be different from that assumed during planning. And while this can be accomplished on-the-fly within limits, as we have seen in Afghanistan, the better it has been anticipated, the more rapid and effective self-synchronization is likely to be.

Modern communications can help not only by furnishing a common operating picture but also by permitting the involvement of all elements of an operation in its planning from the outset. In the past, typically, both within and among service components, synchronization simply has meant assuring that supporting activities understood the nature, purpose, and timing of their particular contribution to an operation. So conceived, it could contribute little to the rapid adaptation of the operation to changing conditions. Only if every element involved in an operation understands the overall effects to be produced and avoided can effective self-synchronization reasonably be expected.

Self-synchronization, in short, is not about freelancing. Rather, it seeks to produce the same complementary effects and decreased risk that more formal coordination is intended to assure, but without its costs in delay and rigidity. It therefore depends not only on the empowering of subordinates to make decisions, but also on planning and execution mechanisms that assure every participating element early influence on the operational or tactical design, and the ability to anticipate how their own actions must be adapted to unforeseen circumstances to further the success of the force as a whole.

Maintaining Operational Coherence. Although, as suggested earlier, it is true that tactical events have growing strategic and political visibility, the most serious risks associated with desynchronization apply, not to tactical operations, but to the operations of the joint force as a whole. Those fond of quoting Helmuth von Moltke's famous admonition that no plan of operations survives the first major engagement tend to ignore another of his next comments: that an error in initial dispositions may never be corrected[7]. What he was concerned about, and what remains an equally vital task today, is the maintenance of operational coherence: a campaign design capable of adapting to immediate needs without losing sight of the ultimate objective.

For all the reasons discussed in earlier sections of this paper, no challenge is greater for a joint commander. Friction, political pressures, transparency, and the enemy all conspire to disrupt operational coherence. In this area, moreover, modern information technologies are by no means an unmixed blessing. Where theater commanders in the past enjoyed a certain insulation simply by virtue of

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[7] No Operations Plan will ever extend with any sort of certainty beyond the first encounter with the hostile main force.

distance, today that insulation has evaporated. It is no accident that the commander of operations in Afghanistan chose to keep his headquarters in Tampa—communications with the field might be less convenient but those with Washington were not.

It may be appropriate, therefore, to end this paper with a brief consideration of what the Israelis call "discourses"—the conversational interactions between the joint commander and his political leaders (including coalition leaders) on the one hand, and his component commanders on the other. For it is these discourses, finally, that will determine whether any campaign, regardless of its objective, remains operationally coherent.

Perhaps the best recent example of how discourses, or lack of them, can threaten to unravel a campaign occurred in the course of an ultimately successful one—NATO's 1999 effort to compel Serbia to evacuate Kosovo. The ins and outs of the theater commander's interaction with his US and NATO superiors, Allied commanders, and his own subordinate component commanders (and their parent services) are too recent and have received too much press to deserve elaboration here. What can be said without much fear of contradiction is that, cumulatively, those interactions visibly hampered the conduct of operations, and more than once threatened to derail the campaign altogether.

There is no reliable preventative against this sort of situation, sensitive as it is to the peculiar political circumstances of a military contingency and the personalities of the leaders involved. Indeed, those very imponderables are among the reasons war always will remain beyond the power of mere computational means to rationalize. But it is possible to improve the odds that the discourses that underwrite operational coherence will produce more light than heat. Two principal requirements both turn on effects.

The first is the need to achieve a common understanding of the actual political objective military operations are intended to support, and as important, to recognize when it changes, as it often will. In the Kosovo case, initial political concern about Serb ethnic cleansing soon gave way to much more profound concern about NATO's perceived cohesion and effectiveness, and eventually, when success was assured, to concern about how Kosovo would be managed after Serbia's evacuation. Each of these successive concerns affected and complicated the maintenance of operational coherence.

Note, moreover, that the operative word is support, not achieve. It was not military operations alone that produced success in Kosovo, but rather a combination of military, diplomatic, and internal political pressures whose respective effects on Serbia's leadership we may never fully understand. What is more important, the integration of those other pressures with military operations seems on the available evidence to have been—at best— unsystematic.

A serious effort in the future to apply effects-based thinking to the discourse between the theater commander and his superiors should, at very least, improve the likelihood that all resources likely to contribute to the political objective are considered, and military operations are framed ideally to enhance, but at worst not to obstruct, other means of coercion and persuasion. Apart from grounding the initial campaign design in firm political footing, such an approach also is the best assurance that shifting political concerns are diagnosed and operations are reconciled with them before the two begin unacceptably to diverge.

The second requirement, closely connected with the first, is to inform the discourse with realistic and supportable projections of what effects military capabilities reasonably can be expected to produce. The challenge here is to stick to evidence, not theories, and moreover to evidence that convincingly can be associated with military choices. It is one thing to project operations that reliably will deprive an enemy of coastal defenses, say, and at what cost; another thing entirely to forecast whether his reaction to that deprivation will be capitulation, or merely a defense in depth, instead of on the coast.

For joint commanders, that task is made no easier by the need to steer among competing service convictions in the importance of their respective capabilities—convictions that are essential to professional confidence and institutional morale but also dangerous to joint cohesion. Moreover, political leaders are as desirous of certainty as anyone else, and are therefore the more susceptible to exaggerated claims of military effectiveness.

Here too, effects-based thinking can help. By linking joint capabilities more directly to the complementary and not merely singular effects they can be expected to produce, the joint commander can make clearer to political leaders the expected military price of excluding or curtailing the employment of one capability or another. Doing so does not guarantee him a free hand, but makes approval of a coherent operational design much more likely.

Conclusion

The current campaigns in Afghanistan and Iraq may well be the opening round in a series of new and unprecedented challenges to the security of the United States. So far, American military forces have demonstrated an adaptability and flexibility that reflects great credit on the institutions that have created and employed them.

If there is a risk to those institutions today, it is that coming decades may look much like those through which Prussia lived from 1815 to 1866, during which no major military threat loomed on the horizon. It in no way diminishes the extraordinary performance of US military forces in combat operations from Panama to Iraq to acknowledge that in none of those contests have we confronted an enemy approximating our military capabilities, even on his own ground. And yet, in the entire history of the world, such a condition rarely has prevailed for more than a generation or two.

As it was for the Prussians of the nineteenth century, therefore, the challenge confronting America's military forces is to adapt not only to the threats we face today, but also to those we cannot clearly foresee. We cannot be certain in ten years or twenty whom we may fight and where, nor on what provocation. We can, however, be certain that our enemy will know at least as much about us as we know about him, and that he will exploit that knowledge as well as he is able to increase his own chances of success and diminish ours.

US military doctrine has long held that military operations should strive to throw an enemy off balance quickly and keep him that way until he yields or collapses. Operations throughout the past decade reflect increasing awareness that the more time an adversary is given to adapt, the harder that task becomes and the more costly (militarily and politically) its outcome is likely to be.

At the same time, the laws of physics have not been repealed, nor has the tyranny of geography relaxed. War in the new century still will require the United

States to project overwhelming force to global distances and sustain it until victory is achieved.

Only truly integrated joint forces can reconcile these competing imperatives, forces that can deploy rapidly, sustain themselves without prolonged logistical preparation, and capitalize on superior information to empower commanders and enable each service component to complement the others strengths and diminish their vulnerabilities.

In the twenty-first century, warfighting will be joint because it must be. Technology will help—indeed, already has begun to help. But the crucial challenges are intellectual, not technological. "All things are ready, if our minds be so," Shakespeare's Henry V assured his officers before Agincourt. The same might be said today of America's joint forces.

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The Joint Advanced Warfighting Program

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Thoughts on Effects-Based Operations, Strategy, and the Conduct of War, Williamson Murray with LTC Kevin Woods, USA, (draft).

Joint Advanced Warfighting Program Fiscal Year 2003 End of Year Report, Karl H. Lowe, et al., (draft).

Assessment of Future Joint Force Operations, Gleeson, Dennis J., Adrienne Janetti, Mark Lewis, and Jeff Jaworski, (draft).

Awaiting Publication

Joint Urban Operations Sensors Workshop, August 7-8, 2003, Kent Carson, Brian Hearing, Howard Last, Larry Budge, IDA Document D-2926, August 2003 (draft final).

Open Source Lessons Learned from Operation Iraqi Freedom, Adrienne Janetti, Jeff Jaworski, Drew Lewis, and Alec Wahlman, IDA Document D-2968, May 2003 (draft final).

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13. SUPPLEMENTARY NOTES

14. ABSTRACT

To avoid surprise on the battlefield, the US military's approach to war in the twenty-first century must reconcile what is changing with what endures in war. A commander must be able to diagnose the alternatives open to him, recognize the strategic and operational implications of adopting one or some combination, and apply available resources most effectively to the methods selected. The authors examined past military transformations in three areas: professional military education, logistics, and command and control. The results were a framework and principles that can guide the development of joint operational concepts. A joint operational concept should meet the criteria of (1) providing guidelines to design operational campaigns in a variety of situations; (2) enabling exploration of alternative capabilities introduced over time; and (3) informing experimentation campaigns and investment decisions. Using a joint operational concept as a tool for force development will not constrain armed forces rigidly to a single method to the exclusion of all others.

15. SUBJECT TERMS
Command, control, communications, deployment, experimentation, integration, investment, joint forces, joint operational concept, logistics, politics, professional military education (PME), Prussia, sustainment, technology, transformation, war.

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