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The Professional Journal
of the United States Air Force

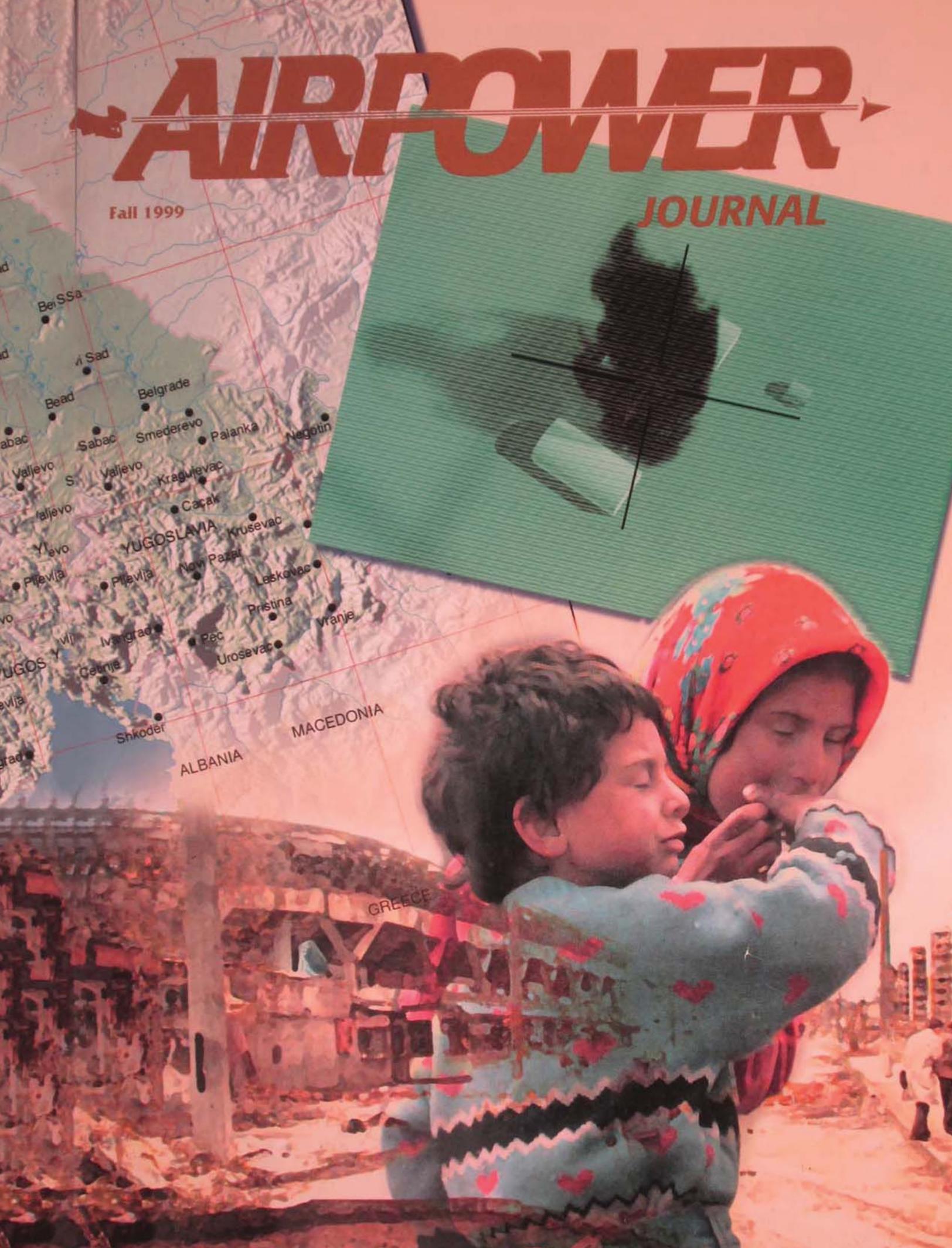


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Fall 1999

JOURNAL



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“Raise the Standard!”

WITH THESE WORDS in 1642, the royal standard (flag) went up over Nottingham, announcing that England was at war. Thus began the English Civil War involving forces loyal to King Charles I and the famous Ironsides of Oliver Cromwell. As the new editor in chief of *Airpower Journal*, I also have a vision of raising the standard, of “going to war” to produce the best possible professional journal for the Air Force. Needless to say, unlike the unfortunate Charles, I would like to keep my head in the process.

The standard of this *flagship* periodical has already been very high, but along with a dynamic Air Force, it must continue the pursuit of “excellence in all we do.” In that endeavor, we intend to focus on two things—(1) an improved distribution process and (2) the quality of articles—so that *APJ* will reflect the decisive operational and strategic issues affecting the Air Force and Department of Defense. I will elaborate on these two areas, starting with the second one—articles. Promoting journal excellence through superior articles is a complex process that begins with avid readership.

Obviously, the fact that you are reading this indicates I am preaching to the choir. Yet, the choir has a fundamental role in raising the standard. Since *APJ* is only as good as the quality of articles received, we depend on readers to pass the journal to others and to contribute ideas to the professional dialogue. Our target audience of readers and contributors includes Air Force members of all ranks and position but with an emphasis on mid-level officers, the men and women who are out there doing the operational business of

the Air Force—and hopefully have something to say about those operations.

It is for good reason that our services emphasize academics for these people and for all other members of the profession as well. We are to be thinkers. Unfortunately, however, the military’s high-tempo environment often relegates thinking and writing to a few specific times during the career—usually at graduate school or during professional military education (PME). Indeed, the majority of articles sent to *APJ* are from PME students. To use the football game analogy to perhaps a ridiculous extreme, members of the profession of arms are usually so busy carrying the ball or grinding it out along the line that they have little time to really think or write about what they are doing. The PME huddle affords the opportunity for reflection and often requires some papers, but for many students those may be just academic exercises. The benefit that *Airpower Journal* should provide in this analogy is a forum for thinking *during* the entire game, not just while members are in PME or at other schools.

To invite improved dialogue through articles and opinion pieces, *APJ* now has a few modifications. The Ira C. Eaker competition for the year’s best essay will be joined by a quarterly “Editor’s Choice” identification of exceptionally noteworthy articles in terms of research, interesting and unique ideas, and pertinence to the Air Force. The “Way Points” section is renamed “Vortices” to indicate a forum for shorter, spin-off types of opinion pieces that may hopefully generate beneficial “cognitive turbulence.”

As mentioned, a major area of actual daily turbulence in today’s Air Force is the operations tempo, and ideally *APJ* can play a part in

helping members understand and deal with that situation intellectually. As the Air Force continues to get "engaged" globally, it faces a very real danger of getting "divorced" locally. Across the service, frustration mounts when offices and organizations are forced to accommodate personnel and materiel shortages—a situation that can result in shortsighted, unhealthy competition and a lack of teamwork. We hope that *APJ* will be a sounding board for ideas to help members consider improved operational methodologies; this could potentially alleviate frustration and keep focus on the team effort.

In promoting the Air Force team, by its nature *APJ* sits precariously between criticism on the one hand for presenting controversial ideas and criticism on the other hand for being a "party-line" publication. Yet, to be a viable part of the strategic mission of the Air Force, *APJ* should do both as a forum where Air Force members can engage in critical

thinking about topics fundamental to the role of aerospace power in national defense.

The other major phase of our program to promote excellence is to initiate in winter 1999/2000 a new distribution system to better reach the Air Force audience. This change conveniently coincides with the loss of Air Force publication-distribution offices and will hopefully result in copies getting into more hands Air Force wide. New systems often have initial problems to be overcome, so we ask for your help in providing feedback regarding incorrect locations or quantities via our web page's response site.

Aerospace power's larger footprint in the new millennium will demand even more of the kind of reflective and farsighted thinking that was productive in the past. This journal needs to be a vital part of that; therefore, we are "raising the standard." We hope you will also embrace that challenge. □



Ricochets and Replies

We encourage your comments via letters to the editor or comment cards. All correspondence should be addressed to the Editor, Airpower Journal, 401 Chennault Circle, Maxwell AFB AL 36112-6428. You can also send your comments by E-mail to editor@cadre.maxwell.af.mil. We reserve the right to edit the material for overall length.

RESPONSE TO COLONEL EDMONDS

In response to Col D. K. Edmonds's letter (Winter 1998) commenting on my letter (Fall 1998) that critiqued his article ("In Search of High Ground: The Airpower Trinity and the Decisive Potential of Airpower," Spring 1998) in which he quoted—I think unfairly—Carl von Clausewitz's *On War*, I think I should begin by presenting a quotation from my previous letter that Edmonds objects to: "Upon

careful examination, these points do not seem to me to be fairly based upon the actual words and intent of Clausewitz himself as stated in his work *On War*." I should stress the phrases "fairly based" and "actual words and intent."

Edmonds says I have focused "only on a narrow point in Clausewitz's writing." However, I don't think I'm being narrow when I consider interpretation based fairly upon an author's actual words and intent. I think that is how one is supposed to interpret statements.

Edmonds states that Clausewitz's "theories are open to a wide range of interpretations." But are these interpretations fair interpretations? Anyone can interpret any words any way he or she wants to, but it seems to me that interpretations not fairly reflecting the words

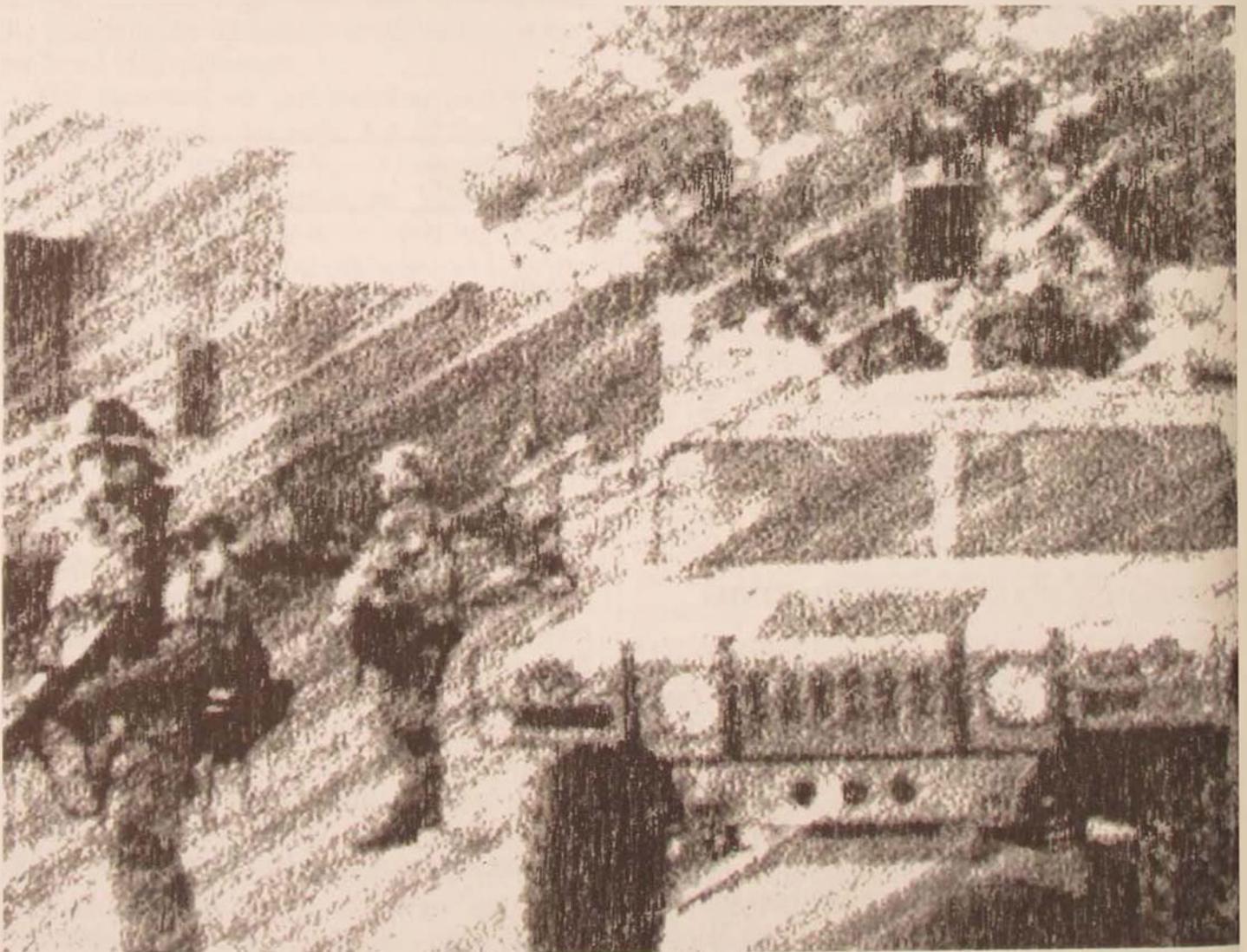
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Aerospace Power and Land Power in Peace Operations

Toward a New Basis
for Synergy

COL ROBERT C. OWEN, USAF*

IN THE WORLD of military policy and operations, peace operations are a growth industry. The United Nations (UN) activated just 13 peacekeeping operations in the 40 years between 1948 and 1988. In the last 10 years, the international body has activated or endorsed 36 others, including peace-enforcement operations in Somalia, Haiti, and Bosnia-Herzegovina.¹ The sudden expansion of peace operations is a product of collapsed economic and political systems in various parts of the world and the post-cold-war freedom of developed countries to expend economic, political, and military capital on them. And capital is what peace operations require. Besides costing billions of dollars, peace operations cost lives; over 1,580 soldiers were lost to all causes between 1948 and 1998.² Peace operations also



exert tremendous pressures on peacetime military establishments and on individual soldiers. Those human and financial costs, as well as their potential political liabilities, make peace operations a major concern for military force structure and operational planners. Since their governments choose to become involved in peace operations, military planners and leaders are obliged to develop ways to do them effectively and at minimum cost. For airmen and those who think about the utility of aerospace power, these goals naturally lead to consideration of the role of

their chosen arm in peace operations. To develop operational plans, they need to understand the absolute contribution aerospace power can make to peace operations. To make force-structure policy, they must consider the *relative* effectiveness and costs of aerospace operations in comparison to, or in conjunction with, other forms of military power, particularly land power.³ Only with those pieces of information in hand can military planners go to the government and suggest the kinds and scale of aerospace forces

*I originally presented this article as "An American View of Peace-Support Operations: A Perspective on Air Power" at the Royal Norwegian Air Force Aerospace Power Symposium, hosted by the RNoAF Academy, Trondheim, Norway, 3 February 1998. Accordingly, I would like to thank the faculty and staff at the academy for hosting me so graciously at the conference and for giving me such a fine venue to express my ideas on this important subject.



needed to best serve its commitments to peace operations.

This article presents an assessment of the relative value of aerospace forces in peace operations. This assessment, in turn, raises two subsidiary questions. First, is the utility of aerospace power, in relation to land power, increasing or decreasing? Second, how should governments take advantage of the dynamics of that relationship? By addressing the utility of aerospace power in a relative sense, rather than in an absolute one, this examination becomes a little more complicated and risky, but it also becomes more likely to produce an answer of some value to military force-structure policy. Everyone knows that military aerospace forces can contribute to peace operations in an absolute sense. That's interesting information but hardly instructive to decisions about the size and composition of either air forces or of their proportional role in the defense establishment. Only by knowing how aerospace power stacks up against land power can defense planners get into the serious business of picking and choosing force *mixes* and doctrines.

Before examining the specifics of the relationships of aerospace power, land power, and peace operations, this article begins with a partial encapsulation of the *nature* of peace operations. The purpose of this encapsulation is to provide a foundation for comparing the attributes and relationships of aerospace and land power in those operations. By suggesting that peace operations can be as much about Big Power hegemony as humanitarianism, this section aims to sharpen our understanding of why they so often involve fighting and how peace operators can apply military forces to them creatively and synergistically. Although this section can be taken as controversial, it is not digressive. Peace operations are controversial in general, and, given the presence of differing expressions of their nature and purposes, any effort to get at their operational and force-structure implications must be linked to a clear set of basic assumptions and assertions. Otherwise, the policy discussion can amount to no more than a "castle in the air."

The Nature of Peace Operations

The American joint-doctrine treatise Joint Publication 3-07, *Military Operations other than War*, defines *peace operations* as a category that "encompasses peacekeeping operations and peace enforcement operations conducted in support of diplomatic efforts to establish and maintain peace." The publication goes on to define *peacekeeping* as "military operations undertaken with the consent of all major parties to a dispute, designed to monitor and facilitate implementation of an agreement . . . and support diplomatic efforts to reach a long-term political settlement." As might be expected, the document presents *peace enforcement* as "application of military force, or the threat of its use . . . to compel compliance with resolutions or sanctions designed to maintain or restore peace and order."⁴ These are useful definitions that capture the main difference between the two types of peace-support operations: one assumes broad permission and cooperation from the "major parties" of a dispute, while the other assumes that one or more of those parties needs more forceful coercion to get in line. But a closer look at these definitions reveals that, in their careful brevity, they miss or gloss over some essential elements in the nature of peace operations that have relevance to the present discussion.

The naked reality of peace operations is that they are the consequence of decisions by powerful outsiders to *intervene* in the affairs of less well-endowed local governments, groups, and factions.⁵ However public-relations officers and pundits might wish to present peace operations, it is useful for military planners and operators to recognize their core reality. They are applications of state power to direct or facilitate the movement of the social, economic, and political affairs of others in directions that the intervening states believe they would not go without that application of power. The directions intervening states wish local affairs to go may be laudable. They may wish to prevent the dissolution of failed states, midwife the birth of new states, block genocide, or achieve other worthy objectives.



US marines in Somalia. In October 1993, US Army rangers fought a pitched battle in the streets of Mogadishu that altered US attitudes toward peace operations and Somalia.

Intervention objectives also may be self-interested, such as protecting economic interests and alliance structures or just removing awful images from the Cable News Network. Whatever the case, states intervene or, in current usage, conduct peace operations to accomplish their objectives, mainly by helping or making the “locals” behave.

I use that distinctly pejorative phrase *making the locals behave* with a purpose. I want to emphasize that, as interventions into the affairs of others, peace operations, in reality or at least in the views of some of their recipients, amount to little more than a type of continuation of Western imperialism.⁶ If that

term is too harsh for some, then peace operations also could be presented as assertions of economic, political, and moral hegemony. Essentially, they involve richer or more powerful states or coalitions accepting obligations or asserting rights to shape directly the lives and destinies of peoples and organizations that fall outside of the political structures of the intervening states. Whether the outsiders are intervening to prevent locals from behaving badly or from suffering the consequences of their own political or economic failures or bad luck, the essence of the act is the same—hegemony. For the intervention to be peacekeeping, the intervened state and/or dis-

putants must accept the consequent reduction of their sovereignty and self-reliance. If one or more of those parties does not accept the intervention or its intent, then the operation likely will become one of peace enforcement. In that case, the intervening states will have to fight to impose their visions on local circumstances—visions that may or may not even conform to those of the government or factions upon whose “behalf” the big powers are intervening.

People and some disputing factions benefit from such interventions, while others do not, and sometimes the dissatisfied ones fight.

That peace operations can be taken as a species of imperialism, particularly by their “beneficiaries,” is manifest from several perspectives. How else but as imperialism will many people perceive a national policy statement that multilateral peace operations “can serve U.S. interests by promoting democracy, regional security, and economic growth”?⁷ In the eyes of many people, even the “promotion of democracy” will appear as an assertion of cultural imperialism by developed countries seeking security by having the world conform to their ideas of political propriety. Similarly, when states bomb one faction in a civil war, both to defend the borders of a forming state and to prove to the world that their collective military and political alliances are sound, that will read to many like an act of moral and political self-interest, hegemony, or imperialism—call it what you will. We should not be surprised or dismissive, therefore, when the Serbs link UN-sponsored peace operations to Nazi conquest.⁸ Although such statements certainly reflect the Serbian government’s odious character and bombastic diplomacy, they also reveal its perception of the motives of intervening states. Inaccurate and unfair though it may be, such

a perception can have great effect on the course and outcome of a peace operation.

Thus, the value of describing peace operations as a form of realpolitik is neither to discredit them or even to address the argument of whether imperialism is right, wrong, or just an inevitable feature of the intercourse of nations. Rather, the value of such a description, assuming it is correct, lies in its support for accurate analysis of the military characteristics and strategic essentials of peace operations—and of aerospace power’s role in them. To put it bluntly, mushy descriptions of peace operations as humanitarian and neutral efforts to promote peace, stability, and motherhood don’t go far enough to explain why so many soldiers die in them or why they so strain the resources of intervening states. Understanding that *peace operation* is the current term for self-interested (even if benignly self-interested) interventions by states into the internal affairs of others does go a little further down the path toward explaining those realities. People and some disputing factions benefit from such interventions, while others do not, and sometimes the dissatisfied ones fight.

As interventions, peace operations make intervening states and their soldiers active members of local society, politics, and culture. In open war, societies focus on destroying, capturing, or threatening one another’s resources until their opponents capitulate. In peace operations, outsiders come into the life of a country by permission or force and, along with its regular citizens, take on a role in shaping its features and future. Of course, the effects of this interaction go both ways. By asserting some ownership of events in intervened states and societies, intervention states are shaped by them politically and socially, in turn. As a case in point, consider the effects on our domestic politics of the televised images of the “Market Squares of Death” in Sarajevo and of dead Americans in the streets of Mogadishu.

Interaction with intervened states and societies, of course, makes intervening states liable for subsequent events. Depending on what they have asked, helped, or forced the

factions in a conflict to do, the intervening states also may find themselves emotionally or politically vested in them in ways that make withdrawal difficult, even when the initial crisis is over.⁹ The United States could and did withdraw from Grenada quickly and easily, for example, partly because it asked the people of the country to commit to or change nothing, other than to bid farewell to the Cubans. In contrast, the Bosnian Federation and many of its citizens live and may even begin to thrive as a consequence of the UN-North Atlantic Treaty Organization (NATO) intervention, which may explain why both alliances assume a moral obligation to preserve the new state until that distant day it hopefully will stand on its own.

Also, as self-interested intrusions into local affairs, peace operations are highly unlikely to be viewed as politically neutral events, except in the eyes of the most hopeful or doctrinaire among the interventionists themselves. Despite official pronouncements that "peacekeeping . . . demands that the peacekeeping force maintain strict neutrality" and derivative statements that "peace operations interject politically neutral military forces into contested areas," real neutrality is unattainable in peace operations.¹⁰ To the point, one cannot enter a state like Somalia and interfere with the factional competition for control of the flow of foreign aid, which was the primary currency of political power, without becoming a biased actor in local politics, at least in the eyes of the factions. Experience bears this out in the rapid evolution of the UN mandates in Somalia, from humanitarian relief, to disarming the factions to secure the flow of relief, to a specific manhunt for Gen Mohammed Farah Aidid.¹¹ Likewise, no matter their self-perception, UN peacekeepers became participants in the Bosnian civil war the moment the UN passed resolutions forbidding the factions from using combat airpower and from attacking Bosnian cities. Moreover, since only the Bosnian Serbs had combat aircraft or were conquering cities at the time, the partisan and inequitable effects of the UN mandates were obvious to most people.¹² The reality is that, even in what ap-

pear to be the most humanitarian and altruistic of peace operations, soldiers keeping and, certainly, enforcing the peace will find allies among those benefiting from their intervention, and they will find enemies among those who are not.

These processes of interaction and of finding friends and enemies suggest that mission creep is inherent to and almost instantaneous in peace operations. In an analog to the Heisenberg uncertainty principle of physics, peacekeepers and peace enforcers change the circumstances in which they intervene, simply by the act of intervention itself. Missions simply will not stay put in these kinds of operations in which, in the words of one analyst, "the success of the original mission depends on picking up additional missions."¹³ The US government sent marines into Haiti in 1915 to reestablish order but found itself unable to withdraw them until 1934—and only after undertaking a large program of public works, education, and attempted cultural reengineering. To stabilize a government, the marines tried to build a nation.¹⁴ NATO entered the Bosnian conflict to underpin UN sanctions and humanitarian relief efforts. But now the alliance is engaged in a long-term presence upon which hinges the survival of the Bosnian state. In reasonable likelihood, if NATO leaves anytime soon, tens of thousands will die. To secure the safe areas, then, the intervening states have had to help rebuild Bosnia politically, militarily, and to some degree psychologically. No wonder that one student of international relations recently wrote, "To imagine that the United States can send a company or a corps into [an intervention] with a clear, finite mission statement that will not evolve takes a remarkable mind."¹⁵

Naturally, therefore, peace operations often demand the full range of the tactical capabilities incumbent in conventional military forces. In the past, peace soldiers have faced threats ranging from terrorists and guerillas to conventional land forces and even air arms. The weapons of their opponents have ranged from land mines and small arms to armored fighting vehicles, artillery, and air-



A Predator unmanned aerial vehicle supporting Operation Joint Endeavor sits in a hangar at Taszar Airfield, Hungary.

craft. Peace-force tactical operations have included the traditional ones of taking posts between warring factions, observation, patrolling, reconnaissance by land and aerospace systems, de-mining, corps of engineers construction projects, coercive confrontations, conventional offensive operations, and others. In short, peace operations are distinguished from open conflict not by the types of tactical operations undertaken but by their intent. Consistent with this view, United States Army doctrine does not discount the applicability of traditional principles of war to peace operations, although it adds several other principles to peacekeeping to reflect its focus on utilizing minimum force to restore the conditions of peace as quickly as possible.¹⁶

Because peace operations demand so much from the military, they certainly can “feel” like war, at least in terms of the resource pressures and emotional trauma they impose. As Gen Frank Kitson discovered for land forces over a generation ago, preparing officers and troops for peacekeeping requires substantial investments in education and

training, although he believed that many of the basic skills thus imparted would be transferable to conventional roles.¹⁷ But overall, units engaged in peace operations have little time or opportunity to engage in the training, battle drills, and exercises needed to keep them ready for their conventional roles. Similarly, air forces maintaining air occupations over places like Bosnia and Iraq have also discovered that the air-to-air combat and other skills of their fighter pilots quickly degrade in a regimen marked by long patrolling and minimal continuation training. Peace operations also demand much in the way of psychological stress, particularly from ground troops engaged in the inevitable processes of interacting with intervened societies, while all the time watching their backs. Recent studies, as cases in point, indicate that veterans of peacekeeping in Somalia experienced a rate of post-traumatic stress disorders similar to that of soldiers from the Gulf War—about 8 percent. Their traumas emerged not from combat but from its absence under the “nerve wracking conditions of peacekeeping [and] the need to exercise restraint in a

country full of armed bands."¹⁸ The resource pressures of peace operations can also be formidable for militaries simultaneously trying to maintain their readiness for conventional war and to sustain troop morale at a level necessary to keep soldiers from resigning en masse. Largely as an effort to balance these pressures, the chief of staff of the United States Air Force, Gen Michael Ryan, launched the Expeditionary Aerospace Force concept in August 1998. His guidance to his major commands was to develop a package of personnel policies, force-scheduling procedures, and logistics concepts to make more bearable the burdens of maintaining standing deployments.¹⁹

All these factors considered, it is reasonable to point out that peace operations have more in common with war than many people would like to admit. Their genesis lies not in the existence of tumult and tragedy in the world but in the desire of strong states to intervene. Tumults and tragedies are always with us. They become peace operations only when states find it in their interests to protect others from the consequences of their own actions, to protect weak factions from strong ones, to help or force others to adhere to moral and political norms attractive to the interventionists, or simply to get peoples and their ugly actions off television. As in the realm of war, such intrusions into the affairs of others can be causes of conflict or at least acts that make the intruders participants in conflict.

Understanding that peace operations have much to do with hegemony and conflict greatly simplifies an analytical approach to the two most important strategic questions about them. The first is, Which of the many opportunities for intervention should be taken? Just as it is in any rationalist approach to conflict in general, the basic answer to this question is, Whichever ones truly involve significant national interests and can be accomplished with a net improvement in the national conditions of the intervening and perhaps even the intervened states. This answer clearly is implied in American presidential policy, which holds that intervention de-

isions will be based on national security requirements, the scale of the threat or breach to international security, and the presence of international support for an intervention.²⁰ The devils of such a policy are in the details, of course. To intervene to achieve a net improvement in the national condition requires a clear knowledge of end-state goals and the probable outcomes of the action. End-state goals are difficult to calculate because they must accommodate, among many things, national desires to gain economic and political strength; preserve military capabilities to handle vital threats; and enhance the moral self-confidence, prestige, and alliance structures of the intervening state. At least one realist analysis of this decision process has suggested that the final answer to this question is, in essence, "hardly ever." Another has said only when "there is a genuine threat to the interests of the United States" and only when end-state goals *will not* "require a revolution in indigenous values and beliefs."²¹ In any case, before intervening, a nation should at least try to determine that the intervention truly is necessary *and* that it likely will come out of the intervention stronger than when it went in. Any less disciplined approach is the first step to strategic overreach.

The second fundamental strategic question emerging from an understanding of peace operations as actions of hegemony and conflict is, Once governments decide to intervene, how do militaries achieve national goals at least cost in blood, treasure, and heartache? Simplistically, the answer is, Through astute combinations of doctrine, preparation, and operational exploitation of existing and/or readily obtainable forces singly and in combination with one another. Concisely put, peace operations are as amenable to the logic and principles of war as they are not and, thus, are most likely to be won by intelligently employed *joint* and, hopefully, *combined* forces applied synergistically and in concert with equally astute diplomatic actions. This insight, in turn, resplights the following focal questions:

- Is the utility of aerospace power, in relation to land power, increasing or decreasing?
- How should governments take advantage of the dynamics of that relationship?

Once again, getting at this one narrow aspect of the broader problem of “fighting” peace operations requires a shift of focus from their nature to operational-level discussion of the relative roles of aerospace and land forces in such activities and then to tactical-level discussion of aerospace power’s changing role in an absolute sense.

Aerospace Power and Land Power in Peace Operations

Quick definitions of land and aerospace power will be useful here. *Power* means the same thing for both terms. Power is the ability to do work or, in the military context, to make someone or a group do things that they were not intending to do otherwise. Land power and aerospace power share the same objective, then—compelling enemies to do things—and differ only in their means and methodologies. Land forces compel enemies through maneuver, fire, and presence operations by forces that move on the surface of the Earth, or by auxiliary air arms that move above the surface but whose operations largely are oriented to the movements and positions of their parent land forces. Aerospace forces compel enemies through maneuver, fire, and presence operations by forces that move above the surface of the Earth, or by auxiliary surface forces that likewise orient their operations to exploiting the military opportunities of movement through the aerospace. In simple terms, then, air and land forces do similar things in different mediums. This simple relationship is useful because it makes comparisons of land power and airpower easier than often is understood. It is from their different mediums, and only secondarily from their derivative technologies, that each mode of fighting draws its dis-

tinct operational-level advantages and disadvantages in peace operations.

The salient advantage of land forces in peace operations is that, by operating on the surface of an intervened state, they are *there* and, compared to aerospace forces, it is difficult to extract them from *there*. As any soldier will tell you, land forces do their job most decisively in close quarters with the enemy, even if that “enemy” is an uncooperative Haitian policeman unwilling to enforce the law. So, to keep or enforce the peace, armies seek to deploy as widely as the security situation permits to engage in eyeball-to-eyeball cultural interaction with the locals. Close contact is the *sine qua non* of armies, and it gives them unequalled ability to come to grips with local conditions, distinguish between allies and enemies, and execute schemes to shape social and political developments. Soldiers walk the streets and enter buildings, sometimes without destroying them first. They talk to people, read posters, and otherwise plumb and characterize the “atmosphere” of a place. So, in peace operations, land forces seek to deploy as widely as the security situation permits. Given the capabilities of modern weapons, command and control systems, and tactical mobility platforms, intervening armies also have the ability to spread out and “cover” larger areas. Last, since armies are not easily moved out of conflict environments, their presence can be seen as, in the words of two senior American doctrinalists, “an irreducible *bonafide* of alliance commitment, especially for the nation claiming leadership of that alliance” (emphasis in original).²²

The salient *disadvantage* of land forces in peace operations is that, by operating on the surface of an intervened state, they are *there*, and, compared to aerospace forces, it is difficult to extract them from *there*. In close quarters with the citizens of foreign cultures, peacekeepers often find their duties characterized by confusion, frustration, and boredom laced with frequent moments of anxiety and fear. Soldiers in peace operations are vulnerable, as casualty figures from Somalia and Bosnia attest. Death or injury can come to them from bombs, bullets, the clubs and

knives of a mob, or a thousand other ways. And peace soldiers do become the targets of attack, particularly when their duties call on them to coerce and/or kill locals. When peace soldiers kill or are killed, the relationship between interventionist and intervened will change. Consequently, interventionist "investment" and liability may increase, and the mission likely will creep or plunge toward greater or lesser involvement. The direction of movement often is unpredictable. After 18 US soldiers died in Somalia on 3–4 October 1993, the United States began a policy shift that had it out of the country by the following March. In contrast, when the Bosnian Serbs took several hundred peacekeepers hostage to halt NATO bombing raids in May 1995, the United States cooperated with several other countries to prepare the way for a sustained air campaign against the Serbs, which came off at the end of the following August. The air campaign, in turn, opened the way for the insertion of over 20,000 peacekeepers into Bosnia that winter. In other words, armies find both *power* and *vulnerability* in close-quarters interaction with intervened societies. Close-quarters interaction gives intervention governments an indispensable ability to shape events, and it also exposes them to liability and mission creep. As many people have pointed out, these vulnerabilities can be minimized by proper education and training of troops to conduct themselves effectively in unexpected circumstances. But such vulnerabilities cannot be eliminated.²³

The salient advantage of aerospace forces is that, by operating above the surface of the intervened state, they normally are *not there*, and, compared to armies, it is easy—indeed routine—to extract them when they do overfly *there*. As any airman will be glad to tell you, the speed, range, agility, and elevation of their aircraft and space systems, combined with the unprecedented lethality of their weapons and the capabilities of their information, surveillance, and reconnaissance systems allow them to exert great effect from afar. Given time, airmen are getting ever nearer to the claim of Gen Ronald Fogleman, former United States Air Force chief of staff,

that "in the first quarter of the 21st century you will be able to find, fix or track, and target—in near real time—anything of consequence that moves upon or is located on the face of the Earth." Consequently, aerospace forces do not need emotional or physical nearness with intervened states or cultures to do their primary jobs of observing, holding at risk, or destroying their resources and people. Indeed, close contact for airmen can be counterproductive. Part of their psychological effect in peace operations has been their ability to observe and attack in something like cold blood. Because they can be nearly invulnerable to the defenses of disputing factions, airmen in modern aerospace forces have *opportunities* to time and structure their operations in ways that are systematic, unstoppable, dispassionate, and enormously useful to their governments. As Ambassador Richard Holbrooke and others have recorded, such operations had a profound psychological effect on Serbian leaders in the fall of 1995.²⁴ Such operations also can shape conditions to let ground forces spread out and do their jobs more effectively and at more bearable cost. Further, as in the case of Operation Deliberate Force, air operations often produce minimum friendly and enemy casualties, which in turn reduces the generation of overwhelming pressure to change the political cohesion and mission focus of an intervention.

As by now must be obvious, the salient disadvantage of aerospace forces is that, by operating above the surface of the intervened state, they normally are *not there*, and, compared to armies, it is easy—indeed routine—to extract them when they do overfly *there*. The distance between airmen and intervened cultures prevents them from doing some things as well as their Army brethren. Professional airmen do not look their opponents in the eye. They don't negotiate with local commanders, warlords, civil servants, or refugees. They do not watch, interrogate, or arrest people. In the first quarter of the twenty-first century, they likely will *not* be able to find, fix or track, and target all the significant things that will be *hidden* beneath the surface of the Earth or other forms of camouflage, or that

will be hidden behind the eyes of an enemy—at least not in near real time. In short, airmen have limited ability to build detailed pictures of what is going on at the human level or to shape local events or developments in positive ways, except in conjunction with activities by forces, diplomats, and nongovernmental workers on the ground.

At the core of such a strategy probably should be an appreciation that aerospace power should be the tool of first recourse in peace enforcement, while land power retains preeminence in peacekeeping and as the tool of second recourse in peace enforcement.

The ease with which political leaders can halt offensive air operations is a two-edged sword. Numerous military thinkers have pointed to on-again-off-again air operations as ineffective, even counterproductive, actions in peace operations and war. The observation is true, of course. It has also been true for land forces in cases, like the Gulf War, in which their offensives were turned off short of what hindsight now tells us would have been a better victory than the one attained. On the other hand, the knowledge that air operations could be turned off quickly, with little residual liability or vulnerability, was an important factor in NATO's decision to take offensive actions against the Bosnian Serbs in the fall of 1995. In other words, aerospace forces find both *power* and *security* in episodic interaction with intervened societies. Episodic interaction, compared to the close-quarters interaction of armies, gives intervention governments indispensable freedom to shape events at greatly reduced liability and exposure to mission creep.

In broad terms, then, the comparative utilities of land and aerospace forces in peace operations are obvious and mirror-imaged. Land forces are as good an instrument as we

have to undertake the *positive* military aspects of peace operations, such as reconstruction and confidence building. But if used to accomplish the *negative* aspects of peace operations, such as coercion and combat against factions, land forces are likely to be very expensive instruments in terms of costs, casualties, mission creep, and liability to the intervening governments and forces.²⁵ Aerospace forces, in contrast, can be used to accomplish the negative functions in ways that minimize those costs. On the other hand, their utility in the positive aspects of peacekeeping generally is limited to providing mobility, information support, and providing latent coercion to help keep disputants in line. In general, then, strategists should consider land and aerospace power as complementary tools, useful in ways that offset each other's weaknesses and maximize their strengths and combined synergy. At the core of such a strategy probably should be an appreciation that aerospace power should be the tool of first recourse in peace enforcement, while land power retains preeminence in peacekeeping and as the tool of *second* recourse in peace enforcement.

This idea that aerospace power leads in peace enforcement and that land power leads in peacekeeping commends itself on at least two accounts. First, it conforms to recent experience in Bosnia, where intervening states used aerospace power to enforce the peace and to set the conditions for a peaceful insertion of land forces. The anticipated costs and liabilities of land-power-based peace enforcement simply were not acceptable under the circumstances.²⁶ Second, a division of peace enforcement and peacekeeping duties between the land and air arms could offer an interesting opportunity to play "good-cop-bad-cop" in a peace operation. As many observers have pointed out, it is very difficult to conduct peacekeeping and peace enforcement in the same situation simultaneously. The passions and distrust engendered by peace-enforcement operations can, at least in the short term, undermine the work of peacekeepers, humanitarian relief workers, and others trying to patch things together.²⁷ It

seems reasonable to think, however, that employing airmen to beat up on the bad guys can *minimize* the souring effect of enforcement operations on relations between local disputants and peacekeepers on the ground. There is enough indication of this possibility in the Bosnian experience to suggest that the idea is worth considering. Imagine the consequences on peacekeeping in Bosnia today had NATO opted for a multidivision land campaign instead of airpower to force the Serbs back from the safe areas and to the conference table. Likewise, would Somalia have turned out differently had the interventionists maintained a primary reliance on airpower as the “*killing*” force in the hunt for General Aidid, rather than on a ground-power mix of rangers, light helicopters, special operations forces, and mechanized units? These are unanswerable questions, of course, but they do prick the imagination.

This discussion leads naturally to a shift in focus to consideration of the evolving tactical capabilities of aerospace power in peace operations. If ground power is going to pick up the slack for aerospace power in peace enforcement, we need to know where that slack begins. In his valuable work on aircraft and unconventional war, historian Philip Towle argues that aerospace power has had uneven but generally restricted success at suppressing guerilla forces or performing other internal security operations, particularly in broken, covered, and urban terrain. Success was even more elusive, Towle discovered, when air action occurred independently of cooperation with effective land forces or when its intended targets enjoyed protected sanctuaries.²⁸ Recent experience and unfolding technological developments, however, suggest that aerospace power’s ability to do many of the tactical tasks relevant to peace operations may in fact be increasing in absolute terms and in relation to the abilities of land power. Examining that proposition requires categorizing those tasks and then examining the ability of aerospace systems to do them.

Aerospace Power and Peace Operations: Evolving Tactical Capabilities

To argue that aerospace power’s tactical effectiveness in peace operations is increasing in absolute terms requires a description of the tactical tasks involved in that assessment, at least at the categorical level. Prof. Jim Corum sometime ago noted the relatively skeletal nature of American service and joint doctrines for peace operations, particularly in the cases of airpower and peace enforcement.²⁹ Recently, however, several doctrinal publications have emerged to lay out the broad missions and tasks of peace operations, although airpower and peace enforcement remain relatively undertreated.³⁰ In the case of peacekeeping, American doctrine can be described as categorizing the tasks of peace operations as

- *observation* to record and report the implementation and violations of the truce process, to include cease-fire or border violations and troop dispositions;
- *interposition* of peacekeeping forces between belligerents to establish and maintain buffer zones and to discourage border violations, infiltration, confrontations, and other truce violations;
- *patrolling* to enhance the visibility, credibility, and effectiveness of the peacekeeping operation and to supplement the observation and interposition missions; and
- *civic actions* to enhance the stability and confidence of the disputants, to include actions such as information reporting, assistance to law enforcement, provision of specialist advisors, escorting convoys, protecting economic assets, and an almost limitless list of others.³¹

These doctrine publications also assert roles in all of these tactical categories for every medium of military operations—land, sea, air, and space. Air and land forces complement one another in all areas. Naval

forces overlap with land and air in many tactical tasks, while bringing unique capabilities to the table in areas such as environmental protection, fisheries patrol and escort, and maritime patrol and inspection. Space forces contribute by providing communications, navigation, and imagery support for activities such as mapping, truce monitoring, and diplomatic negotiations.

US joint and service doctrines are less explicit and detailed for the relatively new mission of peace enforcement than they are for the more established one of peacekeeping. The keystone joint publication devotes only a half page to defining peace enforcement, and, in contrast to peacekeeping, there is no stand-alone publication for the mission.³² The absence of a stand-alone joint publication probably reflects the implicit assumption in American service publications that peace enforcement is so much like war that it can be covered as a subset of it. As suggested earlier, the United States Army assumes that peace operations largely are subject to the basic principles of war. Accordingly, its basic doctrine publication merely restates the joint definition. In its general discussion of military operations other than war (MOOTW), the Army's publication does advise that when peacekeepers are called upon to defend themselves, "the use of overwhelming force may complicate the process toward the Army's stated objectives."³³ United States Air Force doctrine manuals are even vaguer on MOOTW and peace operations. Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine*, lists peace operations in its brief discussion of MOOTW but doesn't define them. Even the new and exhaustive AFDD 2, *Organization and Employment of Aerospace Power*, scarcely mentions peace operations, even to the point of leaving them out of its discussion of "Peacetime Engagement and Crisis Response," which does include mention of topics like "Arms Control" and "Counterterrorism."³⁴

The presumption implicit in this shallow treatment of peace enforcement—that it basically is subject to the same principles and doctrines already developed for war in gen-

eral—simplifies the task of categorizing the missions of peace operations. The only mission category added by peace enforcement is

- *combat* to compel or coerce resisting factions to conform to the provisions of the truce and/or the diplomatic demands of the intervention, to include the full range of combined, joint, and service combatant actions as appropriate to the situation and the objectives of the intervention.

As this general discussion now turns to the more specific ones of aerospace power's absolute and relative roles in the tactical mission categories of peace operations, it is *not* going to discuss several issues. First, for reasons of time and security classification, the discussion cannot become a detailed effort to describe the applications of specific systems and weapons against specific tasks. Second, it is not going to devolve into a polemic about whether or not the world is moving into a chaotic era of cultural or mass conflicts that will subsume the state-based warfare of the present and the past, and incidentally render airpower an ineffective instrument of war. This latter thought, raised so strongly by Martin van Creveld, merits its own line of discourse, but one separate from this study.³⁵ Last, the remaining discussion here will not address the question of whether the current tactical advantages of aerospace power in relation to land power are likely to last for very long or will be swept away by continued technological development. One military thinker recently has suggested that the maturation of the current revolution in military affairs eventually will favor land forces over air forces, overweighing their current advantages in stealth, maneuver, and precision.³⁶ This is a particularly important and seductive issue for aerospace thinkers, but it is not immediately germane to the questions under study and will be passed over.

Two background issues *do* require mention because they apply equally to all of the forthcoming mission-area discussions. The first issue is vulnerability. Intentional vulnerability helps peacekeepers do their jobs. Often, their



Backing peace operations with force using today's versions of Teddy Roosevelt's "big stick." Left: a view of an AC-130 Spectre gunship highlights its sensors and side-firing weapons. Below: an M1A1 Abrams main battle tank, part of US Army Task Force Hawk, is loaded onto a C-17A Globemaster III for transport to Skopje, Macedonia, as part of Operation Joint Guard.



manifestation of an inoffensive, underarmed vulnerability is central to their efforts to gain credibility and the appearance of neutrality. But if peace soldiers can be rendered vulnerable, peace airmen usually are not so easily trussed for the altar of peace, as demonstrated by casualty figures. So any discussion

of the relative merits of airpower and land power must be understood against a background understanding of the advantages and disadvantages of vulnerability.

The second background issue is air mobility. As United States basic doctrine points out, airlift often is not only the fastest way to move

assets, it may be the only way to move them.³⁷ Experience suggests that this may be so for reasons of politics, security, logistical efficiency, and even the basic health of the interventionist forces.³⁸ Thus, in many applications of the mission categories discussed here, air mobility is a key enabler of the forces involved. Peacekeepers rely on airlift for secure movement between their posts and patrols and for day-to-day logistics support. Peace enforcers, particularly if they are airmen, will require both airlift and aerial refueling to get to the fight. So any assessment of the total or relative contribution of aerospace power in peace operations must include at least acknowledgement of the ubiquitous contribution of air mobility to everyone's success. Now, back to the roles of aerospace power in the mission areas of observation, interposition, patrolling, civic actions, and combat.

Observation

This one is easy, for the truly astounding advances in the ability of air- and spaceborne systems to locate, see, measure, categorize, and report are generally known. A recitation of specific systems and capabilities thus would be unnecessary and tedious. But it is worth noting that over the past 20 years, aerospace reconnaissance and surveillance systems, when used in combination, have gone a long way down the road to solving their main weaknesses—dwell time, close-in detail, and effectiveness under conditions of poor visibility in the visible spectrum. Unmanned aerial vehicles (UAV), high-endurance airborne platforms, and satellite systems, matched with modern sensors, can give military forces the ability to observe specific targets and areas for long periods of time, even continually. UAVs, by moving in close, and satellites, through high-resolution sensors, can also search and observe in great detail. Even at the commercial level, almost anyone can buy satellite imagery down to a few meters of definition. Importantly, in current peace operations, the increased quality and duration of aerospace observation comes at greatly reduced exposure and costs for peacekeeping forces. One

can survey an exodus of desperate refugees and disgruntled soldiers by exposing several peacekeeper parties to close-in danger over a period of days, or by maintaining a UAV and satellite watch. UAVs certainly are costly and currently limited in reliability, but imagine the cost advantages of replacing several manned observation posts with each one.

Clearly, though, aerospace observation systems likely will retain critical weaknesses in the foreseeable future. They still cannot see under roofs, open boxes of contraband, look into vehicles, or peer into all the other places peacekeepers must explore. Perhaps most importantly, aerospace systems cannot look into someone's eyes during an interview, meeting, or interrogation. But by gathering key information, like the existence of mass graves and the presence of factional forces in the wrong places, aerospace observation can make the job of land-based observation much easier, certain, and productive. The point here is that land observation and aerospace observation are indispensable elements of the same task of just knowing what's going on. But because aerospace observation systems can do an ever-wider range of tasks more cheaply, more safely, and often better than land systems, their role in operations and the budget must be addressed carefully.

Interposition

This one is tougher. Aerospace forces are not good at vulnerability. But part of the usefulness of interposing peacekeeping forces between belligerents derives from the vulnerability of the peacekeepers. The prospect of shooting a flesh-and-blood national of a great power may give greater pause than the prospect of shooting down an orbiting UAV—hopefully. Still, experience shows that some belligerents have shot anyway, and some have used peacekeepers as hostages or macabre political statements. Moreover, as intervening powers more frequently confront the aftermaths of failed states, or pseudostates that never quite were, it becomes more likely that they will meet groups and individuals who don't know or care about the

niceties of civilized peacekeeping.³⁹ So, if close-in observation and/or vulnerability are required, use peace soldiers. But if distant observation will do, use peace airmen.

Patrolling

To the extent that patrolling is about gathering information, then the preceding comments about observation apply. But patrolling is also about establishing control, and it often carries the possibility of confrontation and combat. Here again, peacekeepers must weigh the countervailing values of vulnerability and the advantages of air and land maneuver as mechanisms for establishing control. Air's advantages, of course, are its probably reduced vulnerability and its ability to cover large areas and revisit specific targets frequently. Combat air and patrolling air can also leverage and protect the efforts of land-based patrols, thereby allowing them to spread out and do their jobs with greater confidence and security. Air's disadvantages may be the ubiquitous one of not being able to get really close to people or to look under cover. UAVs can get pretty close, but they also become more vulnerable at the same time. Peacekeeping operators and force planners should consider, therefore, the consequences of a faction's shooting down a UAV and of the intervenor's either responding or not responding to the provocation. Providing enjoyable target practice for dolts with AK-47s is not good peacekeeping. In the final analysis, the right force-structure solution to patrolling will lead to a mixed reliance on land and air assets, with air being the option of first choice for many purposes.

Air patrolling presents an intriguing mirror image of land patrolling. No-fly zones and air embargoes could be enforced to some degree by land-based forces, possibly at reduced risk. But in comparison to those in the air, land-based patrollers would not have the ability to get close to their subject, let alone take a look into its windows and openings. Also, land-based air-patrol systems would face the classic and expensive problem of having to be everywhere at the same time with sensors and

weapons of relatively short range, compared to those carried by aircraft.

Civic Actions

The ability of airlift and aeromedical evacuation operations to sustain lives and confidence in peace operations has been well established for many years. In a sense, most humanitarian airlifts amount to low-key versions of peacekeeping, in that they help to hold at bay the fractious forces of famine, illness, and disaster. A more recent discovery coming out of the Balkans experience has been that combat air forces and space forces can contribute to the environment of stability and confidence in an intervened state, both in combat and noncombat applications. NATO's enforcement of the no-fly zone and its air attacks of 1994 and early 1995, leaky and halfhearted as they were, nevertheless helped to restrain the region's violence. Space-based detection of and subsequent publicizing of Srebrenica's mass graves and the delineation of the Bosnian Federation's new internal borders were important examples of the usefulness of that new medium. Still, civic actions overwhelmingly remain human-to-human activities. In all likelihood, the overwhelming military contribution of airpower to civic actions will be as an adjunct or support to activities by peacekeepers on the ground.

Combat

The case for aerospace forces as the lead arm in peace enforcement has already been offered. Here, the important issues are its potential for decisive intervention and methodology. At the moment, the database for the *specific* effectiveness for combat air in peace enforcement is too small to draw any real conclusions. We can only draw examples from use in the Congo in 1960-61 and in the Balkans in 1994-95. In the case of Deliberate Force in August-September 1995, air bombardment seems to have driven the Serbs back from the safe areas and to the conference table. But air was employed in conjunction with high-pressure diplomacy and major

land offensives by Croatia and the Bosnian Federation—and at the conclusion of over two years of horrible, exhausting fighting. There simply are too many unknowns in that equation to describe their relationships definitively. What we can say is that air certainly wielded substantial positive influence, from the intervention's perspective, on the outcome of the events of the moment. That air action did not solve the endemic political and social problems of the region is a weak criticism. First, the UN's stated objectives did not involve reengineering Bosnian society and politics. It just wanted them to stop slaughtering one another and start talking. Second, what was the alternative?

Governments anticipating peace interventions should take advantage of aerospace power's growing utility by determining as precisely as possible where it leads, complements, and follows in relation to land power.

The second issue, methodology, obviously is as huge as the subject of aerospace power in general. Any approach or combination of approaches that could be or have been valid in open war potentially could be valid in peace enforcement. Bosnia provides an example of the effectiveness of indirect and asymmetric attack. The intervening coalition pursued its strategic objectives of securing the safe areas and prompting negotiations through strategic attacks against forces elsewhere in the region, lines of communication, and materiel. The coalition's ultimate intent was not to interdict Serbian war supplies and forces before they reached the battlefield but to break the will of the thuggish leaders of the Serb Republic and Serbia proper. It seems to have worked. Likewise, one could easily project peace-enforcement scenarios in which the classic aerospace power missions of counterair and counterspace, interdiction, and

close air support would inflict great destruction and coercive pressure on an enemy. This particularly would be the case in pursuit of objectives that were recognized by both an intervenor and the intervened as of less-than-immediate life-or-death importance. In the context of well-conceived intervenor, such confrontations should be rare events.

This finally brings us back to answering the focal question of this study. It should be clear, first of all, that aerospace power has become a much more useful peacekeeping tool in absolute terms and, largely because of that, in terms relative to the effectiveness of land power. This is not to say that an intervention could not be effective without fully exploiting the strengths and opportunities presented by aerospace forces. But why would intervening states *not* want to exploit aerospace power, assuming they had the choice? Why pay a higher bill in treasure and close-in head bashing when it's not necessary? Second, it should be clear that governments anticipating peace interventions should take advantage of aerospace power's growing utility by determining as precisely as possible where it leads, complements, and follows in relation to land power. Basically, in situations requiring direct human contact and/or vulnerability to accomplish a specific task, land forces are the option of first choice, supported as appropriate by aerospace power. In situations requiring information, assuming the mode of gathering it doesn't matter, then land and air systems should be evaluated against one another on the basis of cost-effectiveness and the impact of their use on other intervention objectives. In situations in which confrontation or combat is at least possible and/or vulnerability is not required for the task, then aerospace forces should be the option of first choice, supported in appropriate ways by ground forces. Then, before would-be peace operators go out and buy anything, they should go through the whole drill again, this time factoring in the opportunities to get double duty from systems and forces in both wartime and peacetime missions. Simple in theory, this process of comparative force structuring obviously will be iterative and ex-

pensive, and it almost certainly will end in recommendations for complex combinations of land and aerospace forces. But no one re-

ally has a choice to do otherwise, so it is useful at least to have a methodological approach. □

Notes

1. United Nations, "UN Peacekeeping: Some Questions and Answers," September 1998; on-line, Internet, 12 January 1999, available from <http://www.un.org/Depts/dpko/faq.htm>. Also, at the time of this writing, NATO's action in Kosovo is just a week under way. Obviously, its course and outcome will have some bearing on the content and conclusions of this article—an obvious project for later research.
2. United Nations, "Fatalities by Mission and Incident Type," 16 November 1998; on-line, Internet, 12 January 1999, available from <http://www.un.org/Depts/dpko/fatalities/fatal2.htm>.
3. My decision not to include naval power in this discussion had everything to do with space available and nothing to do with the scope of naval power's usefulness in peace operations, which can be considerable. Although naval contributions to peace operations often come in the form of auxiliary land power (marines) and aerospace power (carriers), they also can come as distinctly maritime contributions, such as sanctions enforcement, blockades, shore bombardments, shows of force (presence), maritime inspections, interdictions, fisheries patrol, escort operations, and so on. These are important contributions, and I can only apologize to my naval counterparts for not having the space and expertise to expand on them here.
4. Definitions drawn from Joint Publication 3-07, *Military Operations other than War*, 1996, GL-4.
5. Obviously, not every country providing peace forces has been "wealthy and powerful" in relation to the state(s) receiving their attention. But it is difficult to see that Pakistan, Botswana, or other smaller, less economically endowed states could have mounted such operations without the initiative, encouragement, and often direct support of wealthier and larger states. Likewise, it is difficult to believe that peace operations could be mounted against mid-sized states or larger-possessing, substantial economies and military forces. The assertion here is that peace operations are possible only in the presence of substantial inequalities in power in favor of the intervening states, coalitions, or organizations.
6. Ralph Peters gives a very nice, if venomous, account of the imperialist nature of intervention in "Winning against Warriors," *Strategic Review*, Summer 1996, 12-15.
7. US Department of State, Bureau of International Organizational Affairs, *Clinton Administration Policy on Reforming Multilateral Peace Operations (PDD 25): Executive Summary*, 22 February 1996, 1, 4.
8. Richard Holbrooke, *To End a War* (New York: Random House, 1998), 151.
9. Two experienced South African commanders recently wrote that "the suffering of the people . . . and the horror of watching people die for lack of help" can tempt military personnel to step beyond their limited peace-support mandate to try to render help that they are neither funded nor authorized to give. Soldiers in peace operations must resist this temptation, they argue, and "refer requests that are outside their mandate to the UN Command Headquarters." Brig Gen H. A. P. Potgieter and Brig Gen William P. Sass, "Logistical Air Power in UNTAG, UN-AVEM II and ONUOMOZ," in Carsten F. Rnnfeldt and Per Erik Solli, *The Use of Air Power in Peace Operations* (Oslo, Norway: Norwegian Institute of International Affairs, 1997), 74.
10. Field Manual (FM) 100-5, *Operations*, June 1993, 13-0; and Col Charles H. Swannack Jr. and Lt Col David R. Gray, "Peace Enforcement Operations," *Military Review* 77, no. 6 (November-December 1997): 3.
11. Kenneth Allard, *Somalia Operations: Lessons Learned* (Washington, D.C.: National Defense University Press, 1995), 22-32.
12. For a summary of NATO's and the UN's strategic and operational relationships to the Bosnian war, see Col Robert C. Owen, "The Balkans Air Campaign Study: Part 1," *Airpower Journal* 11, no. 2 (Summer 1997): 4-24; and idem, "The Balkans Air Campaign Study: Part 2," *Airpower Journal* 11, no. 3 (Fall 1997): 6-26.
13. Lawrence A. Yates, "Military Stability and Support Operations: Analogies, Patterns, and Recurring Themes," *Military Review* 77, no. 4 (July-August 1997): 58.
14. Lt Col Thomas K. Adams, "Intervention in Haiti: Lessons Relearned," *Military Review* 76, no. 5 (September-October 1996): 45-56.
15. Peters, 15.
16. FM 100-5, 13-3 through 13-4.
17. Gen Frank Kitson, *Low Intensity Operations: Subversion, Insurgency, Peace-Keeping* (London: Faber and Faber, 1971), 165-81.
18. David Brown, "Images of War Live in Memory to Ambush Soldiers Later," *Washington Post*, 24 November 1998, 9.
19. At the time of this writing, the author is the chairman of Air Mobility Command's (AMC) EAF Integrated Product Team, working to shape AMC's contribution to the Expeditionary Aerospace Force concept.
20. *Clinton Administration Policy*.
21. Edward A. Olsen, "In Defense of International Abstinence," *Strategic Review* 24, no. 2 (Spring 1996): 58-63; and Peters, 15-16.
22. Lt Gen Paul van Riper and Maj Gen Robert Scales, "Preparing for War in the 21st Century," *Strategic Review* 25, no. 3 (Summer 1997): 20.
23. For valuable explorations of the soldier-level issues of the preparation for and execution of peace operations, see the September-October 1996, July-August 1997, and November-December 1997 issues of *Military Review: The Professional Journal of the United States Army*. On the questions of preparing soldiers to deal with new cultural environments, see Yates; and for the idea of minimizing confrontation or the appearance of confrontation, see Maj Robert C. Shaw, "Integrating Conventional and Special Operations Forces," *Military Review* 77, no. 4 (July-August 1997): 37-41.
24. Holbrooke, 147-52.
25. This is not to say that aerospace power is always going to be the surest path to minimizing the costs of an intervention to its intended beneficiaries. As the recent NATO intervention into Yugoslavian affairs on behalf of the Kosovar Albanians illustrates, aerospace power took a while to have its intended effects, giving Yugoslavian forces time to commit their bestial ethnic cleansing.

Presumably, had NATO led the attack with a powerful, combined air-land force, it could have swept through Kosovo in a matter of days, probably nipping Serbian war crimes in the bud. But building up such a force might have triggered the ethnic cleansing just as quickly as did the air attacks and before the force itself was ready to plunge into the difficult logistic and military situation on the ground. Quite possibly, then, the suffering of the Kosovars as they waited for a land-air campaign to begin could have been just as great as it was as the air campaign had its effect. Also, in the process of crushing the Yugoslavian army, such a NATO force probably would have inflicted and suffered substantial casualties. These, in turn, certainly would have changed the character and costs of the war for NATO and the alliance's liability to the Kosovar people and perhaps to occupied Yugoslavia. All this is supposition, of course, but it should illustrate the potential value of aerospace power's ability to engage fielded forces only episodically and, currently, with virtual impunity.

26. In the course of extensive interviews with principal American military leaders and diplomats involved in the Bosnian situation, the author and his team members on the Air University Balkans Air Campaign Study were told repeatedly that offensive land operations by the intervention never were a serious possibility. The Implementation Force (IFOR) did indeed enter Bosnia heavily armed and ready for combat. But it did not receive permission to enter from the intervention until it was almost certain that it would not run into any serious armed resistance.

27. See, for example, Per Erik Solli, "In Bosnia, Deterrence Failed and Coercion Worked," in Rnnfeldt and Solli, 99-101.

28. Philip Anthony Towle, *Pilots and Rebels: The Use of Aircraft in Unconventional Warfare, 1918-1988* (London: Brassey's, 1989), 2-3.

29. James S. Corum, "Airpower and Peace Enforcement," *Airpower Journal* 10, no. 4 (Winter 1996): 10-25.

30. Dr. John Hillen, "Peacekeeping at the Speed of Sound: The Relevancy of Airpower Doctrine in Operations other than War," *Airpower Journal* 12, no. 4 (Winter 1998): 6-16.

31. For details, see Joint Publication 3-07.3, *Joint Tactics, Techniques, and Procedures for Peacekeeping Operations*, 29 April 1994, 1-2 to I-4 and V-1 to V-10.

32. Joint Publication 3-07, III-13.

33. FM 100-5, 13-2.

34. Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine*, September 1997, 7-9; and AFDD 2, *Organization and Employment of Aerospace Power*, September 1998, 12. See also AFDD 2-3, *Military Operations other than War*, 5 October 1996, which includes only two very general pages on peace operations along with a reference to Joint Publication 3-07.3.

35. See Martin van Creveld, "The Rise and Fall of Air Power," *MHQ: The Quarterly Journal of Military History* 8, no. 3 (Spring 1996): 76-81.

36. Volney J. Warner, "Technology Favors Future Land Forces," *Strategic Review* 26, no. 3 (Summer 1998): 45-50.

37. Joint Publication 3-17, *Theater Airlift Operations*, 1994, I-6.

38. Potgieter and Sass, 67-68.

39. Peters, throughout.

The enemy say that Americans are good at a long shot but cannot stand the cold iron. I call upon you to give a lie to that slander. Charge!

—Winfield Scott



Space Power and the Revolution in Military Affairs

A Glass Half Full?

DR. COLIN S. GRAY and JOHN B. SHELDON*

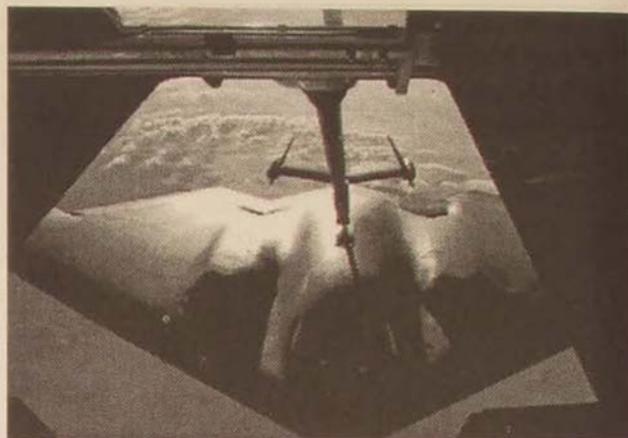
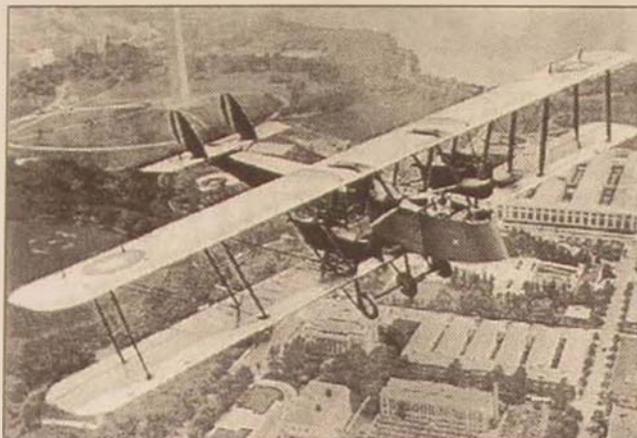


CONCEPTUALLY, SPACE power has scored more success in the last five years than in the previous 50. At least as an idea, space power has come of age in the second half of the 1990s. So

much for the good news. The less than good news is that the distance between a powerful idea and idea-as-capability can be measured in decades rather than years.¹ It is important that the control of space is recognized today as a truly vital requirement of the US armed forces. Yet, the United States to date has deployed no—repeat—no forces to effect many elements of the space-control mission.

Essentially irrelevant, but potent, controversies frequently impede the writing of innovative strategic theory with clear policy relevance. The understanding of space power has been hindered over the past 15 years by two great debates: first by the controversy about President Ronald Reagan's Strategic Defense Initiative (SDI) and more recently by the lively discussion about a revolution in military

*The authors should like to thank Ernest Moore Garcia III of the Centre for Security Studies, University of Hull, England, and Dr. James Wirtz of the US Naval Postgraduate School, Monterey, California, for their comments. We should also like to thank Dr. James M. Smith, director of the Institute for National Security Studies (INSS), and Lt Col Peter Hays, USAF, former director of INSS.



We should be mindful of, and honest about, current technological limitations but not be overwhelmed by them. On the right is a photograph taken in April 1999 showing a B-2 refueling over the Atlantic during Operation Allied Force. On the left, a Martin MB-1 flies over Washington, D.C., some 80 years previously. The MB-1 cruised at less than 100 MPH and had a range of under four hundred miles. Its maximum gross weight was a little over a quarter of the B-2's payload.

affairs (RMA) keyed to advances in information technologies. To clarify, space power *essentially* is about neither an SDI nor an RMA. The reason why this point can matter is that attitudes towards the military exploitation of an entire geographical environment should be driven neither by policy judgments on specific defense issues nor by such metastrategic preferences as presented in the RMA debate. In other words, too many people are commenting on space power when their real subjects are cold-war-era missile defenses or the wonder of technology writ large.

It is no criticism of US Space Command (USSPACECOM) to note that the command's *Long-Range Plan: Implementing USSPACECOM Vision for 2020* (hereinafter *LRP*) expresses two views of space power—one bold, the other less so. The "Summary" to the *LRP* claims only an enabling role for space capabilities: "The combined effects of the current strategic pause, the evolving space and information age, and the possibility of a Revolution in Military Affairs . . . *enabled by space capabilities*, indicate that the time is right to have an integrated LRP for space" (emphasis added).²

The "Introduction" to the *LRP*, however, stakes out a much stronger claim when it refers to "the potential for space capabilities to become a 'Revolution in Military Affairs'"³—that is to say, space power is an RMA, not

merely an enabler of an RMA. There is something to be said for both views of space power, but—with reservations—we endorse the latter, bolder view. It is regrettable, however, that the *LRP* repeats the popular error that "this type of revolution [RMA] is a fundamental change in the nature of warfare that doesn't depend solely on exploiting technology."⁴ The *LRP* is right to emphasize "operational capabilities, Concepts of Operations (CONOPS), and organization" as contrasted with technology alone.⁵ But the *LRP* is unwise to endorse the proposition that RMAs can effect "a fundamental change in the nature of warfare." War and strategy are eternal in their nature, regardless of geographies, technologies, and adversaries.⁶ Indeed, the *LRP*'s support for the fallacy that a space-enabled, *or* a space power, RMA could effect such a change in the nature of warfare tends to subvert its own sound, general argument that "early in the 21st Century, space will become another medium of warfare."⁷

In this article we build upon the excellent prognosis for space power presented in the *LRP* by consolidating bridgeheads of intellectual and policy advances, slaying some of the dragons of misunderstanding that have crept into the debate about space. The US space community would be ill advised to hitch a ride with some protagonists in the contemporary RMA debate. The concept, and the capa-

bilities, of space power are far too important to be hostage to the fate of a controversy over a possible RMA keyed to the exploitation of information technologies. It was unfortunate that the 1980s discussion of space power was dominated by attitudes towards a particular character of ballistic missile defense (BMD) in the SDI. It is scarcely less unfortunate that in the 1990s the debate over RMA largely has sidelined proper discussion of space power *as space power* (as contrasted with space power as provider of information). Space power needs protection from lobbyists for BMD and for information-led warfare.

This article puts forward the argument that what has traditionally been perceived as space power is, in fact, only the beginning of how we will use space strategically. It challenges contemporary thinking on what many have regarded the present RMA to be—namely, it is proposed that space power will be the RMA. In order for space power to reach its full potential, however, space must be recognized as a geographical environment for conflict that is, in a strategic sense, no different from the land, sea, air, and the electromagnetic spectrum (EMS). Using historical case studies of the emergence of sea power and airpower as unique and separate forms of military power, as well as stressing the eternal nature of strategy, it will show that space power is on the threshold of something much more prominent, indeed will be a form of military power analogous to land power, sea power, and airpower. It is this emergence of space power that will mark it out as an RMA.

Space Power: The Idea and the Great Tradition of Strategic Thought

Strategically, though not quite geographically, space is just another environment for conflict. The caveat with respect to geographical parallels is the evident difference in scale—the “quantity that becomes quality”—between the Earth and its atmosphere and *the remainder of the universe* (i.e., space).⁸ Notwith-

standing the vast asymmetry between the terrestrial geographical environments and space, it is not entirely obvious that “the stars” or “the heavens” have strategic significance for contemporary defense planners. Threats originating from far beyond the Earth-Moon system may appear from beyond our solar system or even from beyond our galaxy. If they do, we will be fortunate if we are able even to note the approach of such threats, let alone be equipped to see them at launch. In the long run, the very long run indeed, the security of the human race most likely will depend upon its space power. The dinosaurs faced a grim prospect between emigration and extinction and were condemned technologically to the latter. Fortunately for us, the random menace from fast-moving alien objects in space would appear to pose far more severe a threat to life on Earth than does purposeful menace from alien civilizations that would be unschooled in the niceties of the Geneva Convention. An asteroid may just terminate the human experience and settle religious arguments, but at least in principle it is detectable, trackable, and possibly divertable. By way of caveat, any animate, purposeful, alien menace that could reach Earth from another solar system, let alone from another galaxy, can be assumed to be likely to enjoy a decisive technological edge for superior strategic effect.

We raise these unusual, even extravagant-sounding, matters—asteroids and aliens—to demonstrate that we recognize fully that there is a key geographical sense in which space is unlike the bounded and more or less familiar terrestrial environments of land, sea, and air. Were this article charged with the mission of discussing “space and the human race,” then our eyes would focus on the heavens rather than on Earth. It so happens, though, that our mission is to consider space power and the RMA, with particular reference to USSPACECOM’s *LRP*.

The challenge today is to foster a prudent, strategically reliable understanding of space power. Scientists and poets are right to insist that we approach “the stars” with proper awe and respect. However, that awe and respect is

not particularly helpful when it comes to thinking and planning practicably for, say, the first 25 years of the next century. Also unhelpful in understanding space power is the opinion that space is distant (which low earth orbit is *not*) and is exotically different from the familiar terrestrial environments, hence strategically distinctive.

Regardless of its potential to provide an infinity of unimaginable wonders, space also happens to *be just another environment of human conflict*. Of course, that strategic orientation is not the whole of the space story, but then neither does such an orientation suffice to frame discussion of land, sea, air, and cyberspace (or the "infosphere"). Despite the notable conceptual advance secured in USSPACECOM's 1998 *LRP*, space power, especially in relation to policy and strategy, will probably need missionary assistance for educational purposes for many years to come. Let us identify some of our key assumptions and claims.

1. In all strategic essentials for now, space power is akin to land power, sea power, and airpower.
2. The strategic history of space power is likely to follow the pattern already traced clearly by sea power and airpower.
3. Geographically and geophysically, space is distinctive but then so is the land, the sea, the air, and even cyberspace.
4. People have only one natural environment, the land.⁹ To function at all in any other environment, people require technological support. The vacuum of space admittedly is exceptionally hostile to human life, but it does not differ in basic character from the sea and the air; all these environments can tolerate human presence only when that presence is supported by machines.
5. Because people live only on the land and belong to security communities that are organized politically with territorial domains, all military behavior, no matter what its tactical forms, ultimately can have strategic meaning only for the

course of events on land. It follows that sea power, airpower, and now space power can function strategically strictly as enabling factors. The outcome of a war may be decided by action at sea, in the air, or in space, but the war must be concluded on land and with reference to the land.

6. The logic of strategy is both geographically universal and temporally eternal. Different strategic cultures may "do it their way," consistent with the laws of physics, at least (willpower is only hot air if the engineering is unsound), but strategy and war have natures and dimensions that are timeless and ubiquitous.¹⁰
7. The unique geography of space must find expression in unique technology, operations, and tactics. That unique geography does not, however, point the way to some unique logic of strategy, let alone a unique irrelevance of strategy.

Political, legal, technological, operational, and tactical judgments continue to impede sound understanding of space power. Even when such judgments are approximately correct for today, still they can hinder clarity of strategic comprehension. For a recent example, consider the confusion that is encouraged by a strong statement by Prof. Lawrence Freedman: "The conviction that, in the future, the US will 'fight in space, from space, and into space' still has its adherents, but there is no reason to suppose that it is any more credible now than it was when first proclaimed 40 years ago."¹¹

The confusion lies with the level, or levels, of analysis merrily conflated and obscured here. In fact, Freedman stealthily piggybacks theoretical, policy, and strategic judgments onto a tactical assessment. It is one thing to notice, as does USSPACECOM's *LRP* in painless detail, that space warfare (broadly conceived) capabilities are modest today; it is quite another to pour scorn on the whole idea.¹² There are several major reasons why the era of space warfare—including fighting "in space, from space, and into space"—may

be slow to arrive, but being slow to arrive is a light-year removed from being impracticable.

Freedman's scornful rejection of space warfare is undisciplined by temporal qualification. Of antisatellite weapons, he says that "these systems are unlikely to be employable on such a scale that they become much more than nuisances."¹³ It is perhaps unfair to single out Professor Freedman for particular criticism here, especially since the study in which his unfriendly treatment of space warfare options is embedded is otherwise truly excellent. His brief analysis of the space dimension to the revolution in strategic affairs illustrates all but perfectly the structure of the problem that underpins this paper: That problem is the inability or unwillingness of people to approach space as just another geographical environment for conflict.

There is nothing about the space environment that renders it effectively beyond strategy. A problem, or perhaps opportunity, is that space forces today are technically immature. Historical parallels beckon from the maritime and air realms. In the galley era, fleets had to hug the shore, both because the oarsmen had to be watered frequently and because the stink of human waste became unbearable. In addition, the naval architecture for galley design could not overcome even a moderately turbulent sea.¹⁴ In the age of "fighting sail," wind power (as contrasted with the muscle power of the galley) liberated the fleets operationally. However, until the second half of the eighteenth century, this freedom was massively offset by the need for anti-scorbutics in the naval diet to combat scurvy and by the need for hulls protected in tropical waters against the teredo worm.¹⁵ Speculation about the efficacy of sea power in the seventeenth or early eighteenth century could have pointed to problems entirely comparable to those that Professor Freedman cites to suggest that spacecraft will enjoy a continuing sanctuary status in orbit.

The problems that ships had to overcome to free themselves from immediate dependence upon the land have been mirrored in this century by the difficulties in the development of airpower. People today who are easily

impressed with the apparent difficulty a US adversary would face in seeking to take down the NAVSTAR Global Positioning System (GPS) satellite constellation should be exposed to the history of airpower.¹⁶ There is nothing geotactically unique about outer space that renders it immune to the authority of general strategic logic.¹⁷ How could there be? The geographical, geophysical, and therefore technological *and tactical* details of combat must be unique to each environment. Nonetheless, there is a pattern common to the development of military technology in all geographies: vision, experimentation, exploration, and correction.

Consider the military effectiveness of the B-17 in Europe and the B-29 in the Pacific. The fundamental challenge to the B-17 and to its crews in the Eighth Air Force in Britain was that its design was based on an unsound theory of air warfare. The US Army Air Forces (USAAF) believed that B-17 *formations*, not individual aircraft, would be flying "fortresses"; that they could bomb accurately from altitudes above 30,000 feet (altitudes beyond the range of German antiaircraft artillery); and that their modest bomb loads, imposed by heavy self-defense systems and the fuel needed to climb to such altitude, would be offset by the anticipated marvelous performance of the Norden bombsight. Alas, the wonderful machinery of the Norden bombsight was not weather-independent in its performance. So, bombardiers who could put it into the pickle barrel when training over Texas had considerable trouble finding the right neighborhood in Europe.¹⁸ USAAF's B-29s ultimately wrought a war-winning level of devastation upon Imperial Japan, even prior to the two atomic strikes. But the B-29 could prove itself only after near-catastrophic developmental problems were overcome (very expensively) and after Curtis LeMay recognized that bombing at an altitude so high that flyers had to aim through the newly discovered jet stream was tactical nonsense.¹⁹

The technical-tactical challenges that limit the operational and strategic effect of a kind of military power—sea power, airpower, space power—eventually are overcome. This is not

to say that geographical environments are created equal; they are not. The land matters most because that is where we live. Space is geographically unique and therefore is distinctive in its technological, tactical, and operational aspects. However, that uniqueness and distinctiveness are of the character of the difference between the sea and the air, between ships and aircraft. In short, it is not obvious that the space environment is technically or tactically any more different from the sea or the air than they are from each other.

Space power, space warfare, and the geography of space are not beyond strategy. There is what one can call a "great tradition" of strategic thought that makes sense of military space behavior just as it does of military behavior in the other environments. From Sun Tzu and Thucydides, through Machiavelli, Clausewitz, and Jomini, to John Boyd and Edward Luttwak today, there is a great tradition of strategic speculation that achieves a universal and immortal relevance.²⁰ Strategic theorists cannot help being the product of their time and place—their culture, if you will—but the theorists just cited have each discerned essential features about the nature, not merely the ever-ephemeral character, of war and strategy.

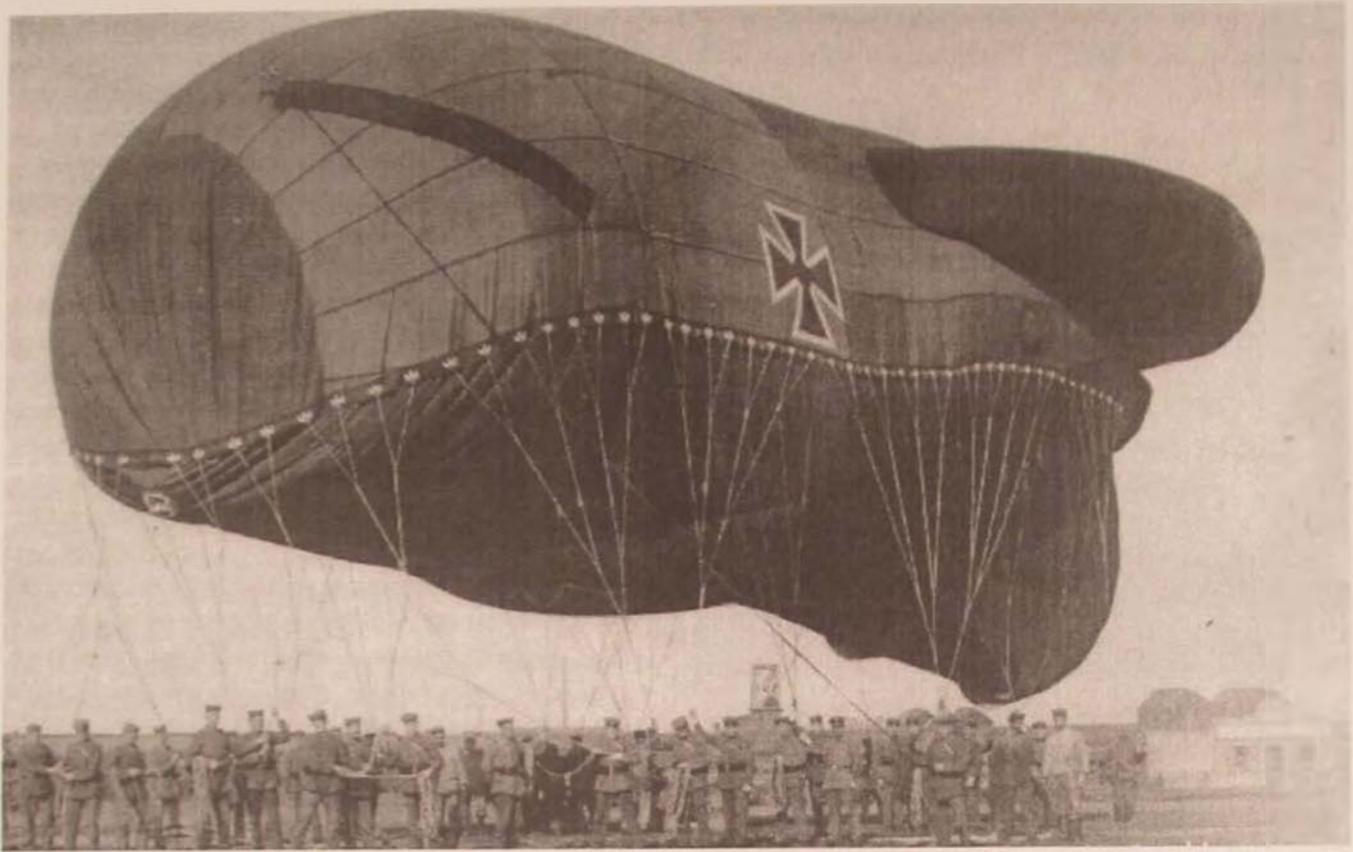
It is useful to approach the space environment for conflict in these distinctive yet complementary ways. First, space needs to be approached as *just another* generator of strategic effectiveness. In this quintessentially strategic perspective, the name of the game is to influence the course and outcome of a conflict. Land power, sea power, airpower, and space power, independently and in various interpenetrating combinations, all perform the same service: They provide strategic effect.

Second, space can be viewed as the late-comer on our block whom we will try to interpret and mold according to the ideas and systems with which we are familiar already. Much as the builders of early horseless carriages—automobiles—constructed vehicles that looked like horse-drawn carriages, only with an engine in place of the horse, so some of the pioneers of military doctrine for space have plundered the more familiar military

environments of land, sea, and air in quest of inspiration. We are friendly to such plundering—up to a point, at least. Unique though the geographies are, there is a set of military ideas that can be applied across environments, albeit taking different forms. The point should not be to look for similarities between, say, sea or air warfare and warfare in space. Rather, it is valuable to test important ideas developed for land, sea, or air war against the novel and unique challenge posed by war in space.

This is not to draw a distinction without a difference. We have just advised that it is useful and forward-looking to consider, for instance, what convoy, choke points, blockade control, and special operations might mean for space warfare. In contrast, we believe that it is not forward-looking to become preoccupied by how space warfare might *resemble* significant features of sea or air warfare. Such an unwillingness to approach space warfare uniquely *as space warfare* is encouraged by views such as that expressed recently in a study published by the US Army War College. In a generally first-rate analysis, William T. Johnsen advises that "while [outer space and cyberspace] are important, they are not yet ready to be considered components of military power in their own right."²¹ Colonel Johnsen might be correct; an approach to space power that declines to view it *jointly*, instead of regarding it hierarchically as substantially subordinate, impedes progress.

The third way to view space is as a wholly unique geographical environment that requires total respect on its own geostrategic terms. In this third perspective, we point neither to the common coin of strategic effectiveness that unites the military "output" from each geographical environment, nor to the ways in which military space may borrow from operations in other climes. Instead, we advise that, in addition to the first and second views just outlined, there needs to be space-derived tactical and operational thinking. It is possible that there literally is a geographically universal set of tactical and operational ideas for the conduct of threat and of war itself. Just possibly, every idea that the space warrior will



The changing face of battlefield air reconnaissance: a World War I observation balloon, a World War II spotter airplane, and the E-8C JSTARS. The authors note that development for military technologies in all environments has followed a similar progression of vision followed by experimentation, exploration, and correction.

need is lurking, in different guise, somewhere in the writings of Baron Antoine Henri de Jomini, Adm Alfred Thayer Mahan, Sir Julian Corbett, or perhaps Albert Wohlstetter. We elect not to pass judgment on that possibility. Instead, we recommend that—in addition to historical education in actual military experience, to inspiration from the classics of strategic theory, and to more mundane borrowing

from extant manuals of doctrine for terrestrial combat—ideas for the practice of space power should develop from the geographically unique context of space itself.

The Logic of Space Power

Continuing resistance to the strategic logic of space power today is vastly more remarkable than is that logic itself. After all, the logic of

space power is identical to the logic of military sea power and military airpower. Space power, after the fashion of BMD, suffers generically from a history of premature claims for operational maturity. If it is any consolation, the history of airpower is scarred even more noticeably with exaggerated and foolish claims.²² We would remind those of a historical turn of mind that gunpowder artillery was the coming force in land warfare for one hundred to 150 years before it finally came, definitively, in the 1490s in Italy.²³ Contemporary critics of space power have too little sense of history. Whatever wonders "the stars" hold for our future, there is a vastly nearer-term strategic logic of space power that is all but entirely comprehensible in principle today. Politics will fight for access to, to maintain vehicles in, and to operate from space for precisely the same reasons that they extended their conflicts from the land to the sea and then the air. The technological, tactical, and operational details of space warfare must be distinctive to their no-less-unique environments. The strategic logic, however, is entirely common to all geographies of combat.

Our problem with much of the current literature on space power is that it confuses tactics and strategy, as well as politics and vision. Let's look at a small but telling "historical hypothetical" parallel. In 1938, a careful, honest, but strictly nearsighted analyst could have examined the leading air forces of the world with respect to their probable efficacy in a major conflict and dismissed them as no more than supporting players. Had a great war erupted in 1938, not an entirely absurd proposition, bombers lacked navigational competence, range, and payload, while fighters lacked the ability to find bombers.²⁴ To consider effective air warfare from the standpoint of the mid- to late 1930s, one needed to postulate some new miracle ingredient. That which was glimpsed dimly at the time but which shines like a beacon in long retrospect, the missing element was competent and practical exploitation of the EMS so as to permit air interception of bombers and accurate

bombing. Radio and radar transformed air warfare.

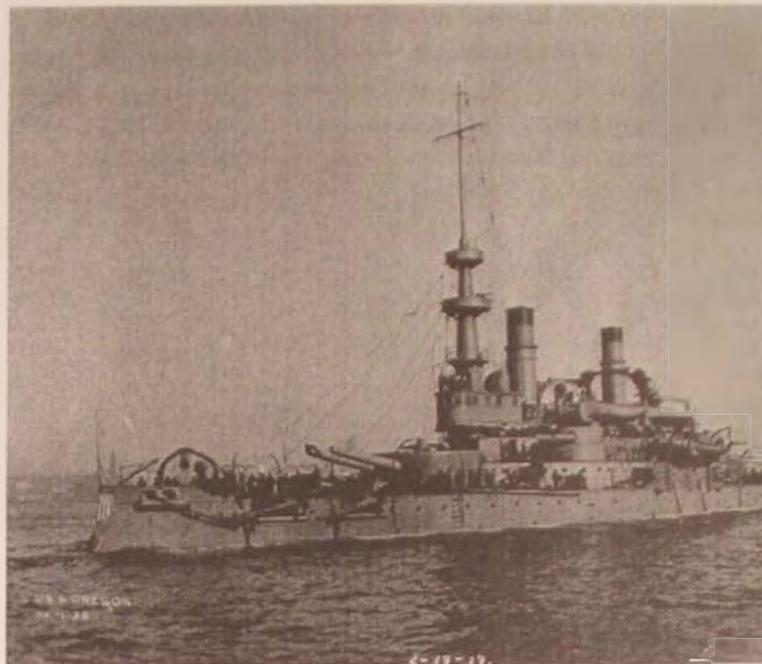
The operational freedom accorded by the wind to sailing ships was noticeably at a strategic discount until the antiscorbutic benefits of citrus fruits were recognized and systematically applied as an answer to scurvy among ships' crews. The point is that it is foolish to rest an argument about space power—or sea power, or airpower—upon undoubted, *but only contemporary*, technical and tactical (hence operational) difficulties. Provided a forward-looking argument about space power, one is not required to deny the laws of physics. It is entirely appropriate to be less than impressed by critics who cite the imperfections of current technology and tactics. Physics textbooks have a way of dating rapidly; both heavier-than-air flight and the atomic bomb were proclaimed by distinguished experts to be impossible.

If anything, space power has suffered from too much vision of the wrong kind. In the inspired words of a recent commentator, "Nothing becomes so dated as yesterday's tomorrow."²⁵ Space warfare is thus tainted with the aura of overpredicted futures. In common with airpower and BMD, space warfare has a credibility problem created by past overprediction and, inevitably, apparent underperformance. What is needed most urgently today is not so much some grand vision of space power or even some vision of America's future in space, *useful though those would be*. Instead, what we need is a relatively mundane understanding of the space environment as yet another environment for conflict. Our comprehension of space power is entirely compatible with the view advanced in US-SPACECOM's *LRP*. We are open to new science, and we expect new technology, but we do not require the invention of time machines, the reliable harnessing of antimatter, or the discovery of a new physics to thwart the force of gravity. If or when such advances are made, we will be more than delighted to accommodate them strategically.

The strategic logic of space power says that the greater our motivation to use space for military purposes, the greater must be the

motivation of our foes to deny us the ability to use space. Parallels with the maritime and air environments could hardly be clearer. Germany and the "Grand Alliance" placed different requirements upon their sea power in World War II. The Allies needed reliable use of the seas almost at will, both to bind themselves together logistically and to take the war to the continental foe. Nazi Germany had little need to use the sea—beyond the Baltic and, to a lesser degree, the Mediterranean—but she had a survival-level interest in being able to deny use of the sea to her maritime enemies.²⁶ The strategic logic of space power—following the maritime case just cited—is not a matter merely of abstract principle. That strategic logic has been created by the practice of space-system dependence by the US armed forces (and indeed by the US economy). Modern, professional fighting navies developed primarily because national economic interests had to be defended at and from the sea. By extension, as the US armed forces depend upon space systems for essential support functions (communications, navigation, reconnaissance, meteorology, and so forth), so the enemies of America's armed forces have to explore the military possibility of denying them that support.

The strategic logic is altogether inexorable. With respect to politics, technology, tactics, costs, and organization, just about everything pertaining to space warfare is eminently debatable. What is *not* debatable is a strategic logic that requires an irreversible trend towards military space exploitation to trigger programs to try to deny effectiveness to that exploitation. We are utterly unimpressed by (largely) accurate caveats that point to the *contemporary* high costs of access to orbit, the slowness of orbital transfer, and the distinctive political-ethical-(quasi)-legal regime that renders outer space different as the last "wide common" of mankind.²⁷ Space power and space warfare are coming. The only issues are how and when. This uncompromising prediction could be upset only in the unlikely circumstance that a truly political peace broke out and was sustained, on Earth. Even in that improbable event, still one might



Geography and sea power. The battleship USS Oregon made an epic voyage around South America during the Spanish-American War. She reached Cuba in time to participate in the battle of Santiago. The year was 1898, and the Panama Canal did not exist.

be anxious about the kind of futures signaled in the scenarios of the movies *Independence Day* and *Starship Troopers*. Far-fetched, even comic such movies may well be, but they can act as a reminder that we may be at peace with ourselves. But would the universe be at peace with us?

RMA's and All That

It is distinctively American to approach interpretation of the present, the future, and then retrospectively the past by means of pretentious doctrine, even ideology. The US defense community has long been vulnerable to capture by the power of big ideas and not necessarily sensible big ideas—"high concept," as they say in Hollywood. The trouble with a fashionable big idea is that it is certain to be superseded by another big idea, and so on, and so on. Although space power can be regarded as an RMA, certainly as a military-technical revolution (MTR), it is much, much more than that. Space power is an evolving physical reality; RMA's and MTR's are mere intellectual inventions that comprise only con-

structed realities. If, as Dennis Showalter suggests engagingly, "RMA has replaced TQM [total quality management] as the acronym of choice" among the US armed forces, there may, for a while, be some political value in hitching "space power" to the conceptual wagon of an RMA.²⁸ Overall, though, we advise that the enduring reality of space power would be well advised to ditch an RMA connection as rapidly as is decently possible.

One might argue either that space power is vital to an information-led RMA or that space power itself is the RMA (or MTR). Putting aside for a moment the politics of public debate, it can be unimportant how we label what is happening in the military space realm. Over the better part of 10 years, space power has changed its status in the US armed forces from one of typically "useful and important adjunct" to terrestrial forces to, at the least, "indispensable adjunct."²⁹ Putting theory, labels, and public relations entirely to one side, the contemporary reality is that the US armed forces could not prevail, even against a modestly competent foe, without the support of space systems. We could be tempted to advocate preservation, even rediscovery, of non-space-dependent options for navigation/targeting, communications, surveillance-reconnaissance, but we decline to sign on to a lost cause. For good and ill, the era of space-system dependency has arrived. It is for this reason that we insist that the United States take seriously the idea of space warfare. Early modern Imperial Japan rejected the promise in gunpowder weapons in favor of the virtue of the sword: The United States will not eschew space systems in favor of terrestrial alternatives.

The space age of conflict irrevocably has arrived. This fact would be easier to highlight were it not extant amidst a hugely confusing "noise" created by the surrounding and accompanying RMA debate. Lest we be judged "space cadets," insufficiently sensitive to what else is happening today in the strategic realm, let us advance the proposition that the maturing of space power is the real RMA.

It is not our position that space activity is the only revolutionary zone in the field of

modern conflict. But we do believe that military space is witnessing the most systemically radical and irreversible changes in military affairs of any areas plausibly relevant to this article. The great RMA debate, very largely in the United States, from 1991–98, has yielded a wide range of candidate alternatives, or complementary, "revolutions." At least eight distinctive possible "revolutions" vie for consideration. There is something to be said in favor of each of them. Some of these eight plainly are not so much alternatives as they are arguably useful distinctive lenses for viewing the same phenomena in different ways.

1. *Military Revolutions (MR)*. In the words of Williamson Murray, "We might compare them in geological terms to earthquakes. . . . Such 'military revolutions' [e.g., for Murray's examples, the creation of disciplined military power in service of newly developed nation-states in the seventeenth century, the French and industrial revolutions, and World War I] recast the nature of society and the state as well as of military organizations."³⁰ Some theorists believe that contemporary information technologies are effecting just such an MR, while others are skeptical, suggesting that "cyberspace has been oversold as a realm unduly independent of geography and institutions."³¹
2. *Revolution in Military Affairs I*. Also according to Murray, RMAs can be likened to the pre- and aftershocks that may help trigger and exploit MRs. A deep and sweeping military revolution may be encouraged by the social, cultural, and institutional innovations required to execute RMAs.³² The concept of a "system of systems" envisages,³³ in the words of *Joint Vision 2010*, achievement of a "dominant battlespace awareness."³⁴ The fog of war will not be dispelled totally, but "the combination of technology trends will provide an order of magnitude improvement in lethality."³⁵ What we label here as RMA I is the "bombs and bullets" version of informa-

tion-led warfare. The idea is that superior operational intelligence, communications, and navigation can enable the (US) armed forces to use precise bombardment to effect strategically decisive systemic shock. The practical relevance of this vision of RMA depends upon political, social, and even cultural factors that far transcend discussion of technology. Whether or not one is skeptical of the promise in the concept of a "system of systems" delivering relatively cheap, swift, and decisive military success, there can be no argument with the proposition that space systems will play a vital enabling role in this type of RMA.

3. *Revolution in Military Affairs II: Information (or Cyber) War.* The world of cyberspace breeds anticipation of virtual conflict in the form of information warfare. Information warriors will wage cybercombat—provided, that is, that they are so permitted.³⁶ It is well to ponder the implications of the following caveat suggested by Lawrence Freedman: "Even if a successful strategic information campaign could be designed and mounted, there could be no guarantee that a victim would respond in kind, rather than with whatever means happened to be available."³⁷ Such caveats aside, the growing importance of computers for almost all military activities guarantees that cyberspace must be a field for (electronic) warfare, while the machines and operations for information warfare are also bound to attract some crude, old-fashioned, physical assaults.

4. *Revolution in Military Affairs III: Airpower Is the Revolution.* Whether or not one chooses to judge the military effectiveness of (US) airpower in the 1990s so great an improvement over past performance—in World War II, Korea, and Vietnam, for example—as to warrant the label of "revolution" is a matter of taste. Benjamin Lambeth notes that "air-power proponents . . . have grown more and more inclined to argue that the ability of modern air-power to affect

land warfare has crossed a threshold in which its effects are fundamentally greater than ever before. This development, in their view, has given rise to a paradigm shift in the relationship between air and surface forces."³⁸

Strong stuff, but not wholly implausible. At last airpower has demonstrated the all but independent ability to decide which side will win conflicts waged in open terrain in permissively symmetrical, conventional ways. Nonetheless, impressive though (US) airpower has become since the days of Linebacker I and II (1972), let alone Rolling Thunder (1965–68), airpower is a candidate RMA that has been "coming" at least since 1918. This is not to demean the potency of airpower in some contexts, but its maturing is a story that has been running for so long that it cannot compete for attention as novelty with other candidate RMAs.

5. *Revolution in Military Affairs IV: Space Power Is the Revolution.* The arrival of space power in strategic history is revolutionary in rather commonsense ways in which some other contemporary trends are not. Although it is important to emphasize the broad complementarity among all the ideas itemized here, we would perform a disservice if we understated the innovation that is space power. We agree with Freedman when he writes that "there is a danger in exaggerating both the novelty of the information revolution in military affairs, and in particular the difference that information can make on its own. By itself, it does not energize, destroy, shelter or move forces, though it can provide vital support to all these functions."³⁹

Information always has been more or less available and more or less important in warfare. Armies can fight in ignorance, but they tend to perform better when reliable information—especially

when it translates as knowledge and can be used with judgment and wisdom—is at hand. The emphasis in *Joint Vision 2010* on “dominant battlespace awareness” would have appealed strongly to Sun Tzu.⁴⁰ The great Chinese military philosopher and the US military establishment today have in common an unwise faith in the attainments and value of “intelligence” in all its forms.

Unlike the systematic exploitation of space, information is a permanent dimension of war. Effective airpower also is new, but it is nowhere nearly as new as space power. Of the four RMAs that we have discussed briefly, space power is the most revolutionary. Perhaps too much “cyberexcitement,” too many debating “sidebars” about BMD, overinterpretation of “magic-bullet” airpower against Iraq, and an overload of fanciful tomorrows from the realm of science fiction have combined to dull strategic senses. Certainly, in 1971 one visionary commentator had already recognized space power as an enabler of an information-led warfare RMA. Francis X. Kane saw that space systems provided “responsiveness to decisions based on real-time data from sensors located in space; integrated operation of theater forces using a common grid; intimate awareness of changes in the physical environment; direct access to events occurring around the globe on a real-time basis; and improved effectiveness in weapons delivery resulting from our increased geodetic knowledge.”⁴¹

We recognize that space power, in common with the other three candidate RMAs, has the characteristics of an MTR about it. However, following most willingly in the steps of other scholars who have emphasized how limited can be the efficacy of technological change per se, we note—in their good company⁴²—that technology is not itself an effective weapon. For the relevant technologies to fuel something worth calling space power, there have to be mili-

tary-cultural, institutional, and doctrinal changes. The true glory of US-SPACECOM’s *Long Range Plan* is that it does not equate space power simply with technical developments.

6. *A Revolution in Strategic Affairs*. This somewhat imperial concept, advanced by Lawrence Freedman,⁴³ may yet achieve leading-edge status as the idea of choice among commentators. This concept has the obvious virtue of reminding us all that armed force and war are about much more than technology alone. Indeed, Freedman advises that “the revolution in strategic affairs is driven less by the pace of technological change than by uncertainties in political conditions.”⁴⁴ Strategy is the bridge that should cement military power of all kinds with political purpose.
7. *A Revolution in Security Affairs*. There are those among us who believe that although traditionally strategic matters, which is to say matters bearing upon the threat or use of force, certainly persist, menaces to security are taking less and less traditionally strategic forms.⁴⁵ It so happens that space power regarded totally is exceedingly relevant to problems of environmental security (e.g., information gathering in the earth sciences, as well—one day—as serious “asteroid watch” activity), but there is a popular view among scholars to the effect that military topics are of sharply declining significance for security. Large-scale interstate warfare happily is at present an endangered species of conflict, but the use of military power is anything but in decline.
8. *A Revolution in Political Affairs*. Our final candidate revolution is one that would preempt arguments advising about extant or imminent RMAs. Instead, this eighth “revolution” points to the radical shift in the international political context for the threat or use of military power. Some theorists fear that in our enthusiasm for the military value of

electronics, excitement about the apparent operational triumph of the heirs of Gen William "Billy" Mitchell, and in *our* conviction that space power is the trend that really sets these years apart, we may be missing the trends that matter most. The demise of the unlovely USSR and, as a consequence, the temporary absence of a great balance-of-power, or ideological, struggle do rather put Pentium processors, stealthy materials, and GPS satellites in the strategic shade.

Conclusions

We are in danger of being taken prisoner by our own concepts. The idea of RMAs is useful in alerting us to the probability of occasional nonlinear change. The idea becomes less useful, however, when it is allowed to transcend the category of helpful and suggestive insight and instead is employed as a grand theory to organize understanding of all of strategic history. An RMA inherently tends to bias interpretation in favor of discounting continuities; in addition, it spawns a rather incestuous debate about labels and theory. In short, scholars, especially scholars from the social sciences, are never happier than when they can debate eloquent conceptual distinctions. As a result, instead of empirical exploration guided by RMA insight, we are apt to slide into arid discussion of "What is an RMA? When is an RMA actually an MTR, or an MR, or something else?" Theorists are not inventing the influences of new information technologies and space systems; what they are inventing are ways to gift wrap those realities conceptually. Capabilities for information-led warfare down the road, pioneered conceptually by Adm William Owens,⁴⁶ among others, are a physical reality. By way of sharp contrast, an RMA is an intellectually constructed reality; it can be neither true nor false but just more or less useful. High concepts like the RMA, MR, and MTR are the playthings of intellectuals. You may find them helpful, but do not confuse them with empirical realities.

Because space is a relatively simple geographical environment compared with the sea—but especially when compared with the complexities of the land—technological advantage is at a premium.⁴⁷ Technology always matters in conflicts of all kinds in all geographies, but nowhere does it matter more than for space. Even for space, technology is only one of the many dimensions of strategy and war. Without suitable space technology we cannot operate tactically to, in, and from orbit; hence operational and strategic matters would be moot. Indeed, the quest for a financially tolerable logistics for space power remains key to the more ambitious elements of USSPACECOM's *LRP*. That granted, it is a persisting fact that war, even space war, cannot become simply a robotic fixture. Even with superior mechanics for the conduct of space warfare, everything we learn from strategic history tells us that better tools of war cannot deliver victory. Organization, doctrine, training, numbers (recall that both Clausewitz and Jomini agreed about the need to bring superior force to bear at the decisive point),⁴⁸ good statecraft, and wise generalship will all be needed if superior technology is not to be wasted. The idea of the human element in space warfare should certainly not be dismissed because of current technological and political obstacles. Nathan Goldman states that "the debate whether human presence in space is required or more cost-effective than a robotic presence is arcane, the decision has a simple conclusion: the dream of spaceflight is a human craving that an armchair presence will not fulfill."⁴⁹ We emphasize this point not out of some misguided romantic notion of a human presence in space, although to many people such notions are justification enough, but as an acknowledgment that space warfare, like war in all other environments, is a human affair. Naturally, the advantages and disadvantages of humans versus technology in space will have to be carefully considered.

Much as the nuclear era cannot be repealed by policy fiat,⁵⁰ so the emerging physical realities of space are beyond basic policy choice. We cannot choose whether or not

space power should be required. We cannot elect to reverse the technological and commercial surge of information technologies. The relevant questions are all at a lower level: who will have how much space power, of what kinds, and when? With respect to new information technology, the technical frontier is expanding more because of technological opportunity and the commercial opportunism of those who invent and refine the hardware and software than because of customer demand. The US armed forces are surfing the ever-higher waves of information power more than they are in any practical sense controlling the heights or frequency of those waves. Similarly, space is exploited for vital military and commercial functions simply because it is efficient to do so. We should worry about new vulnerabilities as we come to depend more and more upon orbiting platforms, just as we are right to be anxious about our burgeoning cyberdependence. But we have made a pact with the devil that we could not avoid. Because space power is a reality, so space warfare is an impending reality whose prospect is endorsed by all of history, as well as by the logic of strategy.

If space power is defined as *the ability in peace, crisis, and war to exert prompt and sustained influence in or from space*,⁵¹ then the key enabler for space power has to be space control. The *LRP* is exactly right when it defines space control as "the ability to assure access to space, freedom of operations within the space medium, and an ability to deny others the use of space."⁵² In World Wars I and II, the inability of Germany to challenge for sea control left her with the strategy of the weak, stealthy guerrilla war at sea by surface and subsurface raiders. In both wars, Allied sea control was a vital enabling factor for victory in war as a whole. In World War II, the Allied Combined Bomber Offensive attempted in 1942–44 to win the war by strategic air bombardment without first securing control of the air (i.e., without first defeating the *Luftwaffe*). The gods of strategy were not to be mocked; in 1943 both the USAAF by day and the RAF Bomber Command by night were de-

feated by Germany's well-integrated air defense system.⁵³

Space control is not an avoidable issue. It is not an optional extra. If the US armed forces cannot secure and maintain space control, then they will be unable to exploit space reliably or reliably deny such exploitation to others. The US ability to prevail in conflict would be severely harmed as a consequence. If you fail to achieve a healthy measure of space control in the larger of the possible wars of the next century, you will lose.

Finally, the glass of US space power is half full. USSPACECOM's *LRP* is more than adequate as an official document that attempts to meld vision, plans, and hopes. Both generally and with specific reference to particular space missions, a huge advance in understanding has been secured. At least, it is a huge advance in understanding on the part of those responsible for the *LRP*.⁵⁴ The half of the space power glass that remains empty, alas, is represented by most of the equipment, the *space forces*, needed to make space power a reliable strategic factor in future conflict. Leaving aside the controversial question of possible deployment in orbit of weapons for force application against terrestrial targets, it is not controversial to claim that the United States has an almost hollow policy on space control. The excellent discussion in chapter 5 of the *LRP* puts the best spin that it can on the subject of aspirations, intentions, and actualities, but it comprises more a statement of the problem or challenge than it does a firm commitment to secure the necessary military grip on this most essential enabler of space power.

Contrary to appearances, perhaps, this is not intended as criticism of the *LRP*. We understand that that document proceeds as far as it can, given its nature and purpose. Nonetheless, space control cannot be achieved strictly with conventional terrestrial forces, by electronic means, or by hopes and prayers. Space control, indeed space power, requires the deployment of dedicated space forces. □

Notes

1. "Policy" comprises capabilities, declarations, and action. Policy documents, vision statements, long-range plans, and the like are all useful, indeed essential, milestones on the journey to comprehensive, full-service (i.e., including weaponized) space forces for space power. Documents, vu-graphs, speeches, and so forth, however, are not synonymous with policy properly understood. To write or speak of space power is not necessarily to make it so.

2. US Space Command, *Long-Range Plan: Implementing US-SPACECOM Vision for 2020* (Peterson AFB, Colo.: US Space Command, March 1998), 141. Hereinafter *LRP*.

3. *Ibid.*, viii.

4. *Ibid.*

5. *Ibid.*

6. See Colin S. Gray, "RMAs and the Dimensions of Strategy," *Joint Force Quarterly*, no. 17 (Autumn/Winter 1997–1998): 50–54; and *idem*, *Modern Strategy* (Oxford: Oxford University Press, forthcoming 1999).

7. *LRP*, 7.

8. Useful introductions to space "basics" are Lyn Dutton et al., *Military Space* (London: Brassey's [UK], 1990), chapter 2; and John M. Collins, *Military Geography for Professionals and the Public* (Washington, D.C.: National Defense University Press, 1998), chapter 7.

9. Julian S. Corbett, *Some Principles of Maritime Strategy*, ed. Eric J. Grove (1911; new imprint, Annapolis: Naval Institute Press, 1988), 16.

10. Carl von Clausewitz, *On War*, ed. and trans: Michael Howard and Peter Paret (Princeton, N.J.: Princeton University Press, 1976), 183; Michael Howard, "The Forgotten Dimensions of Strategy," in Michael Howard, *The Causes of Wars and Other Essays* (London: Temple Smith, 1983), 101–15; and Gray, *Modern Strategy*, chapter 1.

11. Lawrence Freedman, *The Revolution in Strategic Affairs*, Adelphi Paper 318 (London: International Institute of Strategic Studies, April 1998), 52–53.

12. Freedman is especially critical of Steven Lambakis, "Exploiting Space Control," *Armed Forces Journal International*, June 1997, 42–46. Also see Lambakis, "Space Control in Desert Storm and Beyond," *Orbis* 39, no. 3 (Summer 1995): 417–33; and "The United States in Lilliput: The Tragedy of Fleeting Space Power," *Strategic Review* 24, no. 1 (Winter 1996): 31–42.

13. Freedman, 52.

14. John Francis Guilmartin Jr., *Gunpowder and Galleys: Changing Technology and Mediterranean Warfare at Sea in the Sixteenth Century* (New York: Cambridge University Press, 1974); and John H. Pryor, *Geography, Technology, and War: Studies in the Maritime History of the Mediterranean* (Cambridge: Cambridge University Press, 1988), 649–57, are useful on the realities of galley warfare. In an older classic study, William Ledyard Rodgers wrote that "the odor of a galley could be perceived a mile or more to leeward," *Naval Warfare under Ours, 4th to 16th Centuries: A Study of Strategy, Tactics, and Ship Design* (Annapolis: Naval Institute Press, 1967), 234.

15. See G. J. Marcus, *A Naval History of England*, vol. 1, *The Formative Centuries* (Boston: Little, Brown, 1961), chapter 11; and N. A. M. Rodger, *The Wooden World: An Anatomy of the Georgian Navy* (Annapolis: Naval Institute Press, 1986), chapter 3.

16. Happily, NAVSTAR GPS poses, indeed quite properly was designed to pose, truly formidable tactical challenges even to a competent spacefaring foe. (The 24-satellite constellation is deployed with four vehicles to each of six orbital planes, each inclined at 55 degrees to the equator in circular orbits at an altitude of 20,233 kilometers.) A formidable technical-tactical challenge though it may pose to those who would seek to degrade it via action against any or all of its three segments, it re-

mains only that—a formidable technical-tactical challenge. Even though it is designed to degrade under attack relatively gracefully, GPS has become so critically important to US military performance that US enemies must be extraordinarily strongly motivated to try to meet the challenge.

17. On the paradoxical nature of strategic logic, see Edward N. Luttwak, *Strategy: The Logic of War and Peace* (Cambridge, Mass.: Harvard University Press, 1987).

18. Stephen L. McFarland, *America's Pursuit of Precision Bombing, 1910–1945* (Washington, D.C.: Smithsonian Institution Press, 1995).

19. Michael S. Sherry, *The Rise of American Air Power: The Creation of Armageddon* (New Haven, Conn.: Yale University Press, 1987); and Kenneth P. Werrell, *Blankets of Fire: U.S. Bombers over Japan during World War II* (Washington, D.C.: Smithsonian Institution Press, 1996).

20. Sun Tzu, *The Art of War*, ed. Ralph D. Sawyer (Boulder, Colo.: Westview, 1994); Thucydides, *The Landmark Thucydides: A Comprehensive Guide to the Peloponnesian War*, ed. Robert B. Strassler (New York: Free Press, 1996); Niccolo Machiavelli, *The Art of War*, ed. Neal Wood (Indianapolis, Ind.: Bobbs-Merrill, 1965); Clausewitz, *On War*; Baron Antoine Henri de Jomini, *The Art of War* (1862; new imprint, Novato, Calif.: Presidio, 1992); John R. Boyd, "A Discourse on Winning and Losing," unpublished manuscript, August 1987; and Luttwak.

21. William T. Johnsen, *Redefining Land Power for the 21st Century* (Carlisle Barracks, Pa.: US Army War College, Strategic Studies Institute, 7 May 1998), 4.

22. Colin S. Gray, *Explorations in Strategy* (Westport, Conn.: Praeger, 1998), part 2.

23. Bert S. Hall, *Weapons and Warfare in Renaissance Italy: Gunpowder, Technology, and Tactics* (Baltimore: Johns Hopkins University Press, 1997).

24. Uri Bialer, *The Shadow of the Bomber: The Fear of Air Attack and British Politics, 1932–1939* (London: Royal Historical Society, 1980); Williamson Murray, *The Change in the European Balance of Power, 1938–1939: The Path to Russia* (Princeton, N.J.: Princeton University Press, 1984); and James S. Corum, *The Luftwaffe: Creating the Operational Air War, 1918–1940* (Lawrence, Kans.: University Press of Kansas, 1997).

25. Philip E. Agre, "Yesterday's Tomorrow: The Advance of Law and Order into the Utopian Wilderness of Cyberspace," *The Times Literary Supplement*, 3 July 1998, 3.

26. This strategic logic is developed in Colin S. Gray, *The Leverage of Sea Power: The Strategic Advantages of Navies in War* (New York: Free Press, 1992).

27. Alfred Thayer Mahan, *The Influence of Sea Power upon History, 1660–1783* (1890; new imprint, Boston: Little, Brown, 1918), 25.

28. Quoted in Williamson Murray, "Thinking about Revolutions in Military Affairs," *Joint Force Quarterly*, no. 16 (Summer 1997): 69–76.

29. Gray, *Explorations in Strategy*, 102.

30. Murray, "Thinking about Revolutions in Military Affairs," 71.

31. See Agre.

32. Murray, "Thinking about Revolutions in Military Affairs."

33. Adm William A. Owens, "The Emerging System of Systems," *US Naval Institute Proceedings* 121, no. 5 (May 1995): 35–39.

34. US Joint Chiefs of Staff, "Joint Vision 2010," *Joint Force Quarterly*, no. 12 (Summer 1996): 39.

35. *Ibid.*, 40.

36. The outstanding skeptical analysis is Andrew Rathmell, "Cyber-Terrorism: The Shape of Future Conflict," *RUSI [Royal United Services Institute] Journal* 142, no. 5 (October 1997): 40–45.

37. Freedman, 57.
38. Benjamin S. Lambeth, "The Technology Revolution in Air Warfare," *Survival* 39, no. 1 (Spring 1997): 65–66.
39. Freedman, 50.
40. "Joint Vision 2010," 39.
41. Francis X. Kane, "Space Age Geopolitics," *Orbis* 14, no. 4 (Winter 1971): 913.
42. In particular, see the case studies in A. J. Bacevich and Brian Sullivan, eds., *The Limits of Technology in Modern Warfare*, forthcoming.
43. Freedman.
44. *Ibid.*, 76.
45. See David A. Baldwin, "Security Studies and the End of the Cold War," *World Politics* 48, no. 1 (October 1995): 117–41; and Barry Buzan, Ole Weaver, and Jaap de Wilde, *Security: A New Framework for Analysis* (Boulder, Colo.: Lynne Rienner, 1998).
46. Owens, 35–39; and Stuart E. Johnson and Martin C. Libicki, eds., *Dominant Battlespace Knowledge*, rev. ed. (Washington, D.C.: National Defense University, Institute for National Strategic Studies, April 1996), 1–14.
47. "Other things being equal, the simpler the environment in which war is waged the greater the advantages offered by high technology." Martin van Creveld, *Technology and War: From 2000 B.C. to the Present* (New York: Free Press, 1989), 272.
48. Clausewitz, 204; and Jomini, 70.
49. Nathan C. Goldman, *Space Policy: An Introduction* (Ames, Iowa: Iowa State University Press, 1992), 146.
50. Whatever our policy choices over nuclear weapons, we cannot abolish knowledge of the fact that we have made these weapons work.
51. This is a direct adaptation of the definition of *land power* provided in Johnsen, 6. We judge this somewhat "borrowed" definition to be good enough for now, though not so good as to foreclose on useful redefinition in the future.
52. *LRP*, 19–20.
53. See Stephen L. McFarland and Wesley Phillips Newton, *To Command the Sky: The Battle for Air Superiority over Germany, 1942–1944* (Washington, D.C.: Smithsonian Institution Press, 1991).
54. USSPACECOM's *Long-Range Plan* would be more persuasive still were it written with explicit reference to some well-respected text or texts on the subject of space power. As of today, there is literally no extant major book or study of strategic theory that seeks to explain how space power "works." The military space literature on hand tends to be narrowly focused on matters of arms control, BMD, antisatellite (ASAT), or other particular issues. Some years ago, one of us wrote, "Where is the theory of space power?" Colin S. Gray, "The Influence of Space Power upon History," *Comparative Strategy* 15, no. 4 (October–December 1996): 307. Even a weak theoretical work on space power could serve a really useful purpose.

What our sword has won in half a year, our sword must guard for half a century.

—Helmuth von Moltke



Warden and the Air Corps Tactical School

What Goes Around
Comes Around

MAJ HOWARD D. BELOTE, USAF*

*What has been will be again,
what has been done will be done
again; there is nothing new
under the sun.*

—Ecclesiastes 1:9

BETWEEN 1926 AND 1940, officers at the Air Corps Tactical School (ACTS) created the theory and doctrine which would undergird the air strategies practiced in World War II. The "Bomber Mafia," which included Robert Olds, Kenneth Walker, Donald Wilson,

*The author would like to thank Dr. David R. Mets, professor of technology and innovation at the School of Advanced Airpower Studies, Maxwell AFB, Alabama, for his editorial advice and encouragement.

Harold Lee George, Odas Moon, Robert Webster, Haywood Hansell, Laurence Kuter, and Muir S. Fairchild, sought to answer two basic questions of airpower theory. In the words of Lt Col Peter Faber, they asked, "What are the vital elements of an enemy nation's power and how can airpower sufficiently endanger them to change an opponent's behavior?"¹ To answer those questions, ACTS theorists portrayed nation-states as interconnected economic systems containing "critical points whose destruction will break down these systems" and posited that high-altitude precision bombing could effect destruction sufficient to achieve strategic objectives.²

As examples of war-tested, uniquely American airpower theory, ACTS and Warden merit special examination. Interestingly, despite the 50 years separating their development, the theories have much in common in context and content.

Similarly, in the late 1980s, Col John A. Warden III developed the theoretical basis for the successful air strategy used in the Gulf War. Before the war, he wrote *The Air Campaign: Planning for Combat*, a balanced study of why and how to achieve air superiority. After becoming director of Checkmate, a Pentagon air strategy think tank, Warden focused on the strategic use of airpower. He created his "five rings" model and based Instant Thunder, Desert Storm's air operations plan, on it. Warden subsequently promulgated his ideas in essays such as "Air Theory for the Twenty-first Century" and "The Enemy as a System,"³ which, like ACTS theory, depict strategic entities as definable systems with centers of gravity whose destruction can influence the system as a whole.

As examples of war-tested, uniquely American airpower theory, ACTS and Warden merit special examination. Interestingly, despite the 50 years separating their develop-

ment, the theories have much in common in context and content. To demonstrate these similarities, this article compares and contrasts the history, central ideas, and assumptions of the theories. It then highlights their common strengths and weaknesses. Finally, those parallels are used to suggest lessons for twenty-first-century airpower thought.

Background of the Theories

Historically, the two theories developed in similar contexts. As Faber notes, the ACTS theorists wrote to create a central role and mission for the fledgling Air Corps. Rapid demobilization after World War I had left the Air Service "chaotic, disorganized, [and] tangled," lacking both the equipment needed for training and "coherent theory, strategy, and doctrine upon which airmen could base the future development of American airpower."⁴ Without such a working theory, airpower was likely to remain subordinate to Army traditionalists, who considered airplanes as a tool of the corps commander. Under Army control, airpower would be used primarily for observation and artillery spotting—certainly not for the strategic bombing concepts promoted by radicals like Billy Mitchell. Facing that threat, ACTS theorists posited a decisive strategic role for the precision bomber.

Similarly, John Warden wrote to fill a void in airpower discourse and to counter a trend of increasing subordination to the Army. Following the development of the atomic bomb, airmen left theory to civilians like Thomas Schelling and Bernard Brodie and tended to concentrate on technological issues. The airmen appeared content with Brodie's observation that nuclear weapons made Giulio Douhet relevant, and they sought new and better ways of delivering atomic devastation to the enemy. However, when war experience in Korea and Vietnam proved that strategic bombing was insufficient, the focus gradually shifted from strategic to tactical airpower.

Faced by the Soviet threat during the 1970s and 1980s, American air leaders let the



ACTS bomber advocates included Harold L. George (left), Haywood "Possum" Hansell (above), and Laurence Kuter (below).

Army take the lead in developing doctrine. The result was the doctrine of AirLand Battle, and the Air Force accepted a supporting role. In *The Generals' War: The Inside Story of the Conflict in the Gulf*, Michael R. Gordon and Bernard E. Trainor note that in 1990 the commander of Tactical Air Command, Gen Robert D. Russ, and Lt Gen Jimmie Adams, Air Force deputy chief of staff for plans and operations, "believed that the Air Force's main role was to support the Army."⁵ Warden, however, found both the old nuclear doctrine and the new supporting, attrition-based scheme "too limiting" and set out to prove that airpower, precisely directed against centers of gravity, could coerce political concessions from an enemy. In suggesting that airpower could dominate a conflict, Warden received the same cold shoulder the ACTS theorists had gotten 60 years earlier. His boss, General Adams, let Warden know that "his theorizing was radical."⁶





ACTS theory put to practice: a B-17 formation over Schweinfurt, Germany, 17 August 1943.

Interestingly, these contextual similarities—filling a theoretical gap while trying to avoid subordination to ground forces—gave rise to similar theories. Both ACTS and Warden used metaphors to describe, in Faber's words, "the vital elements of an enemy nation's power." Both theories focused on the enemy's will and capability to fight and portrayed states as closed systems that can be disrupted or paralyzed by destroying key targets. Finally, both theories prescribed courses of action based on similar assumptions. Examination of the central propositions of these theories will show that, despite some differences, the "industrial web" and the "five rings" are kindred spirits.

Core Propositions

Central to the ACTS theory was the notion that economic destruction would lead to social collapse and enemy capitulation. ACTS theorists described enemy systems variously as a "precision instrument," "wispy spider's web," or "tottering house of cards."⁷ Haywood S. Hansell fleshed out the argument as follows:

1. Modern great powers rely on major industrial and economic systems for production of weapons and supplies for

their armed forces, and for manufacture of products and provision of services to sustain life in a highly industrialized society. Disruption or paralysis of these systems undermines both the enemy's *capability* and *will* to fight [emphasis in original].

2. Such major systems contain critical points whose destruction will break down these systems, and bombs can be delivered with adequate accuracy to do this.
3. Massed air strike forces can penetrate air defenses without unacceptable losses and destroy selected targets.
4. Proper selection of vital targets in the industrial/economic/social structure of a modern industrialized nation, and their subsequent destruction by air attack, can lead to fatal weakening of an industrialized enemy nation and to victory through air power.⁸

The "fatal weakening" resulting from these attacks against enemy capability and will was so important that it precluded using bombers in any other role. Kenneth Walker set forth an "inviolable principle": The bomber must only fly against "vital material targets" deep in the enemy heartland and never in Army support.⁹ To do otherwise would be to squander the bomber's power.

To focus the bomber's power appropriately, the ACTS theorists sought to identify those critical points that would bring down the enemy system. Harold Lee George first suggested that by attacking "rail lines, refineries, electric power systems, and (as a last resort) water supply systems . . . an invader would quickly and efficiently destroy the people's will to resist."¹⁰ Robert Webster and Muir Fairchild refined George's list of "will" targets. They focused specifically on "national *organic systems* on which many factories and numerous people depended" [emphasis in original].¹¹ According to Hansell, organic systems included production and distribution of electricity, fuel, food, and steel; transporta-

tion networks; and certain specialized factories, especially those producing electrical generators, transformers, and motors.¹² Despite a lack of economic intelligence—theorists identified the foregoing systems by studying the United States—ACTS predicted victory for those who followed the “industrial web” prescriptions.

Roughly half a century later, John Warden applied a new metaphor to the ACTS vision of the enemy as a system. Fortified by his knowledge of military theory—specifically, that of J. F. C. Fuller—and modern communications technology, Warden followed a traditional practice and likened the enemy system to the human body. Rather than an amorphous “web” or “house of cards,” Warden described an enemy (indeed, every life-based system) as an entity with a brain, a requirement for “organic essentials,” a skeletal-muscular infrastructure, a population of cells, and a self-protection mechanism. He arranged these components into the now-familiar model of five concentric rings, with each ring dependent on the ones inside it. Warden’s major addition to ACTS theory—the brain, or leadership ring—controlled the entire system. If the center ring could be killed (Fuller’s “shot through the head”), or isolated by severing communications links, the entire system would crumble.¹³

Just like the ACTS theorists, Warden focused on the enemy’s will and capability to fight. “It is imperative,” he argued, “to remember that all actions are aimed against the mind of the enemy command or against the enemy system as a whole.” Furthermore, “when the command element cannot be threatened directly, the task becomes one of applying sufficient indirect pressure so that the command element rationally concludes that concessions are appropriate, realizes that further action is impossible, or is physically deprived of the ability to . . . continue combat.”¹⁴ If unable, then, to attack the center leadership ring directly, Warden recommended attacks on organic essentials such as power production and petroleum—precisely the targets identified by ACTS. He proposed that damage to organic essentials could lead

to “collapse of the system” or “internal political or economic repercussions that are too costly to bear”¹⁵—in other words, to the “fatal weakening” suggested by ACTS. Finally, just as the ACTS theorists refused to squander bombing on Army support operations, Warden emphasized that “engagement of the enemy military . . . should be avoided under most circumstances.” Fighting an enemy’s military “is at best a means to an end and at worst a total waste of time and energy” [emphasis in original].¹⁶

In essence, Warden just updated ACTS theory. The major thematic difference between the theories is the addition of a new “vital center”—the leadership ring—and two new destructive mechanisms to influence that center of gravity: *decapitation* and *parallel war*. Nuclear strategists coined the first term to describe the killing or isolation of enemy leaders; Warden created the second to describe the overwhelming-force strategy to use when the leaders were unreachable. A “death of 1,000 cuts” would suffice to collapse an enemy system whose center ring was protected, just as ACTS proposed to disrupt the industrial web. Technology improved the execution of the strategy, however, allowing airmen to inflict those cuts nearly simultaneously. Warden noted that Desert Storm air forces “struck three times as many targets in Iraq in the first 24 hours as Eighth Air Force hit in Germany in all of 1943.”¹⁷

Underlying Assumptions

Given the similarities in context and content that connect these bodies of airpower thought, it should not be surprising to discover that they rest on similar assumptions. Most importantly, they presuppose a rational actor, or, to use Graham Allison’s term, *Model I enemy*. Warden proposed that “enemies, whether they be states, criminal organizations, or individuals all do the same thing; they almost always act or don’t act based on some kind of cost-benefit ratio.”¹⁸ Faber made the same observation about ACTS, whose theorists overlooked the fact that an

enemy might operate based on “potentially obscure organizational, bureaucratic, or emotional” Model II/III factors.¹⁹ Faber also pointed out that ACTS theory rested on a “mid-Victorian faith in technology” and “wrongly assumed that revolutionary bomber-related technologies would produce almost ‘frictionless’ wars.”²⁰ Warden echoed this faith, consigning friction to the Napoleonic era. In Warden’s combat equation, modern airmen could ignore morale (and friction, a morale-related factor) because physical factors \times morale = outcome. When physical factors approach zero due to technologically superior attacks, output of the enemy war machine will be zero, regardless of morale factors—and friction is therefore irrelevant.²¹

Clearly, these assumptions lead to problems. Due to its simplicity, a rational-actor model cannot adequately describe or predict the behavior of many state and nonstate actors. Faber, for example, asks, “Is it not possible . . . that a state might continue to struggle—at higher costs—to demonstrate its resolve in future contingencies?”²² If a strategist cannot determine how an opponent will react to pressure—if the Model I analysis is

faulty—then he cannot effectively target the opponent’s will or force him to change his mind à la Warden and ACTS. A belief in frictionless war seems fraught with peril, as well. Gordon and Trainor devote a full chapter to describing numerous instances of friction in the Gulf War; Lt Col Barry D. Watts uses an entire book to show how twentieth-century warfare is characterized by friction. “The very structure of human cognition,” he concludes, “argues that friction will continue to be the fundamental atmosphere of war.”²³ These flawed underlying assumptions cast doubt on the validity of both theories and suggest additional questions. Do the ACTS and Warden theories share other flaws? If they do, are they relevant to airpower strategists in the coming years?

Holes in the Logic

The theories do, in fact, contain additional related flaws that highlight lessons for future strategists. Faber characterizes these flaws as the “three pathologies” of airpower theory. One of the pathologies is an overreliance on



Photo courtesy of Lt Col Mason Carpenter.

Precision weapons technology catches up with the ACTS theory.

metaphor in place of logical argumentation.²⁴ ACTS theorists and Warden provided little evidence to support their “web” and “body” analogies. Warden merely rearranged a tabular presentation of system components into rings and claimed—without empirical data—that the diagram proved “several key insights,” namely that the rings were interdependent, the center was most important, that the military was merely a shield for the others, and effectiveness lay in working inside-out vice outside-in.²⁵ Warden also failed to provide proof that a nation-state, like a body, could be killed through decapitation. Similarly, the ACTS theorists described an economic “house of cards” using a sample size of one—the American economy of the 1930s.

Critiquing Warden, Dr. Lewis Ware notes that such unsupported metaphors are inadequate as analytical instruments. Their “arguments rest on principled belief rather than on reason, and principled belief—however powerful or well intended—is by definition not susceptible to rational explanation.”²⁶ Faber points out that, unlike a human body, a society can substitute for lost vital organs; he further notes that metaphor-based theories have led to faulty employment of airpower in war because they fail to see that conflict is nonlinear and interactive.²⁷ The message for strategists is clear: Examine theoretical metaphors carefully. Ensure that verifiable cause-and-effect relationships exist between the parts of a metaphor that provide its explanatory power, especially if the metaphor is used to plan an air strategy. Finally, remember that enemies react. Decision makers should not expect an Iraqi-style rollover.

ACTS and Warden share Faber’s second “pathology” as well: They both “made a fetish of quantification and prediction in war.”²⁸ As Faber notes, the ACTS instructors who wrote Air War Plans Division—Plan 1 calculated precisely how to defeat Germany: 6,860 bombers attacking 154 target sets would produce victory in six months. Likewise, Warden claimed that “with precision weapons, even logistics become simple. . . . [S]ince we know that all countries look about the same at the strategic and operational levels, we can fore-

cast in advance how many precision weapons will be needed to defeat an enemy.”²⁹

Political scientist Robert Pape has highlighted the problem with such quantification. Strategists who rely on predictions like the forecasts cited above confuse combat effectiveness with strategic effectiveness. Operators should be concerned with the first, which concerns target destruction, while strategists and commanders must focus on the second and ask whether or not said destruction achieves political goals. Strategists cannot allow a quantitative focus to obscure their understanding of the human interaction that constitutes both war and politics. Despite Warden’s claims to the contrary, technology has not invalidated Clausewitz; war is still unpredictable.

The unwavering devotion with which ACTS theorists and Warden clung to the aforementioned “pathologies” highlights their susceptibility to Faber’s final pathology. Faber notes that “air theorists sought to develop hoary maxims that would apply to all wars, regardless of time and circumstance. The ACTS ‘Bomber Mafia,’ for example, adopted ‘a Jominian, mechanistic view of war—a view of war as a mathematical equation whose variables can be selectively manipulated to achieve success.’”³⁰ Warden’s previously cited “outcome” equation and his claim that the five rings are “general concepts not dependent on a specific enemy” suggest that he also believed in a universally applicable strategic formula. Both theories, however, ignore the role of historical, cultural, and moral context, and that limits their universality.³¹ More importantly, their claims of universality have led to widespread skepticism.

Arguably, that skepticism underlies the current battles over airpower’s role in joint doctrine. Gen Ronald R. Fogleman has said that, due to the claims of airpower visionaries, “we found ourselves in a position where there were a lot of unfulfilled promises and false expectations relative to what airpower could and could not do.” He further admonished airmen not “to let our enthusiasm for our primary mediums of operations blind us to the advantages that can be gained by using air-

power in support of land and naval component objectives."³² He suggested that airmen are partly to blame for current interservice battles. In other words, the adherence of air theorists to "hoary maxims" has hampered the development of joint doctrine. Future air strategists can alleviate that problem by claiming less universality for airpower ideas.

Both theories lay on questionable assumptions about enemy rationality and technology's ability to overcome friction, and both fell prey to Faber's "pathologies" of airpower theory—overreliance on metaphor and quantification, and a Jominian claim to universality. In the final analysis, however, both worked.

The Bottom Line

Do these pathologies inherent in the ideas of ACTS and Warden invalidate the theories? No. Warden critic Lewis Ware admits that Warden's "reductionism has immense practical value for the successful prosecution of an air action."³³ Col Richard Szafranski is more blunt: "Purism matters less to action-oriented people than the verifiable consequences of action. . . . Try as critics might, they cannot eradicate the objective reality of the Desert Storm air battles. They worked."³⁴ Similarly, after a long trial and midcourse adjustments, ACTS theory succeeded. By late 1944, attacks on fuel production and transportation nearly prevented German forces from flying or driv-

ing at all. Szafranski's critique of Warden applies equally to ACTS: Each "dares to offer us a map for air warfare. Its imperfection does not erase its utility. . . . [If] 'bold ideas, unjustified anticipations, and speculative thought are our only means . . . we must hazard them to win our prize.'"³⁵ ACTS theorists and John Warden provided frameworks for winning air campaigns.³⁶ Despite their common flaws, the theories provide valuable understanding of air warfare and starting points for further theoretical development.

In the 1920s and 1930s, ACTS theorists proposed an answer to the "two basic questions of airpower theory": (1) What are the vital elements of an adversary's power? (2) How can airpower influence them? Writing to prevent a subordinate role for airpower, the ACTS instructors suggested that nations could be coerced or destroyed by precision bombing of their "industrial web." In the 1980s and 1990s, John Warden updated ACTS theory. He wrote in a similar context, added a leadership ring to the economic target list, and echoed ACTS's claims about precision. Both theories lay on questionable assumptions about enemy rationality and technology's ability to overcome friction, and both fell prey to Faber's "pathologies" of airpower theory—overreliance on metaphor and quantification, and a Jominian claim to universality. In the final analysis, however, both worked. Air strategists can, therefore, learn much from the shortcomings and strengths of the airpower theories of the Air Corps Tactical School and Col John Warden—and future theorists have therein a ready-made, battle-tested foundation for shaping the aerospace power of the next century. □

Notes

1. Lt Col Peter Faber, "Competing Theories of Airpower: A Language for Analysis," paper presented at the Air and Space Power Doctrine Symposium, Maxwell AFB, Ala., 30 April 1996. Available on-line from <http://www.airpower.maxwell.af.mil/airchronicles/presentation/faber.html>.

2. Lt Col Peter Faber, "Interwar US Army Aviation and the Air Corps Tactical School: Incubators of American Airpower," in Col Phillip S. Meilinger, ed., *Paths of Heaven: The Evolution of Airpower Theory* (Maxwell AFB, Ala.: Air University Press, 1997), 217.

3. Col John A. Warden III, "Air Theory for the Twenty-first Century," in Karl P. Magyar, ed., *Challenge and Response* (Maxwell AFB, Ala.: Air University Press, 1994), 311–32; and "The Enemy as a System," *Airpower Journal* 9, no. 2 (Spring 1995): 40–55.

4. Faber, "Interwar US Army Aviation," 185.

5. Michael R. Gordon and Bernard E. Trainor, *The Generals' War: The Inside Story of the Conflict in the Gulf* (Boston: Little, Brown and Co., 1995), 79.

6. *Ibid.*

7. Faber, "Competing Theories," 1–2.
8. Quoted in Faber, "Interwar US Army Aviation," 217.
9. *Ibid.*, 219.
10. *Ibid.*, 194.
11. Hansell, quoted in *ibid.*, 219.
12. *Ibid.*
13. Warden, "Air Theory," 311–32; and "The Enemy as a System," 40–55. For Fuller's influence on Warden, see Lt Col David S. Fadok, "John Boyd and John Warden: Airpower's Quest for Strategic Paralysis," in Meilinger, 361.
14. Warden, "The Enemy as a System," 49.
15. *Ibid.*
16. Warden, "Air Theory," 317–18.
17. *Ibid.*, 324. Of course, there are other differences between the theories; for example, ACTS assumed total war with maximum destruction, while Warden foresaw limited war with minimum collateral damage—another update which reflected better technology and, perhaps, the "CNN factor." These differences are peripheral, however.
18. *Ibid.*, 314.
19. Faber, "Interwar US Army Aviation," 221. See also Graham Allison, *Essence of Decision: Explaining the Cuban Missile Crisis* (Boston: Little, Brown and Co., 1971), for discussion of Models I, II, and III (Rational Actor, Organizational Process, and Bureaucratic Politics) analyses.
20. *Ibid.*, 220. ACTS instructors did, in fact, include "fudge factors" in their calculations, but they turned out to be far too small.
21. Warden, "The Enemy as a System," 42–43.
22. Faber, "Interwar US Army Aviation," 221.
23. Lt Col Barry D. Watts, *The Foundations of U.S. Air Doctrine: The Problem of Friction in War* (Maxwell AFB, Ala: Air University Press, 1984), 93.
24. Faber, "Competing Theories," 1–2.
25. Warden, "Air Theory," 315–17.
26. Dr. Lewis Ware, "Ware on Warden: Some Observations of the Enemy as a System," *Airpower Journal* 9, no. 4 (Winter 1995), 92.
27. Faber, "Competing Theories," 2.
28. *Ibid.*, 1.
29. Warden, "Air Theory," 327–28.
30. Faber, "Competing Theories," 1; internal quotes from Col Thomas A. Fabyanic, "War Doctrine and the Air War College—Some Implications for the U.S. Air Force," *Air University Review* 37, no. 2 (January–February 1986).
31. See Faber, "Competing Theories," 1; and Ware, 91, on the lack of contextual understanding of ACTS and Warden, respectively.
32. Gen Ronald R. Fogleman, "Aerospace Doctrine—More Than Just a Theory," keynote address to the Air and Space Power Doctrine Symposium, Maxwell Air Force Base, Alabama, 30 April 1996. Available on-line from <http://www.airpower.maxwell.af.mil/airchronicles/presentation/doctrel.html>.
33. Ware, 89.
34. Col Richard Szafranski, "The Problem with Bees and Bombs," *Airpower Journal* 9, no. 4 (Winter 1995): 96.
35. *Ibid.*, 97. Szafranski attributes the internal quotation to Karl R. Popper as cited in Timothy Ferris, ed., *The World Treasury of Physics, Astronomy, and Mathematics* (Boston: Little, Brown and Company, 1991), 799.
36. It is true that the Gulf War theater planners in the "Black Hole" made substantial additions to Warden's original scheme; they certainly deserve credit for their contributions to airpower theory and coalition victory.

Nobody is driven into war by ignorance, and no one who thinks that he will gain anything from it is deterred by fear.

—Hermocrates of Syracuse



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Man's Place in Space-Plane Flight Operations

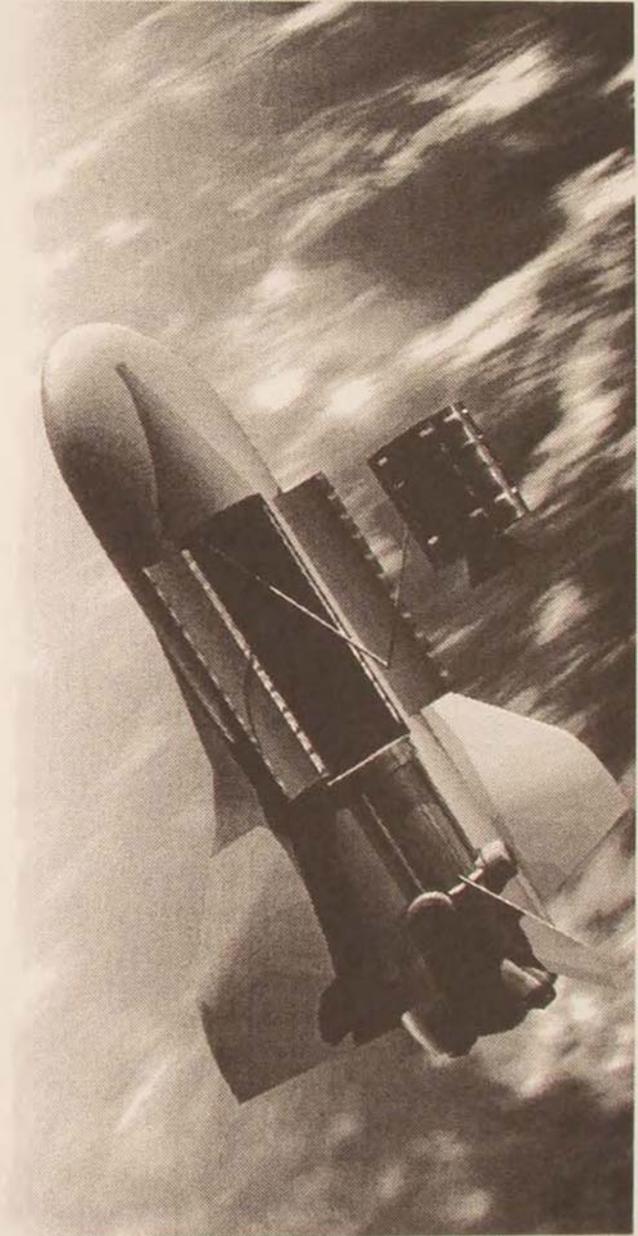
Cockpit, Cargo Bay, or Control Room?

MAJ DAVID M. TOBIN, USAF*

The military potential of manned spacecraft may remain an unresolved question for a long time.

—Maxime Faget

THESE WORDS, written by one of the National Aeronautics and Space Agency's (NASA) founding fathers and a driving force behind America's first manned space program (Project Mercury), were prophetic considering the United States Air Force's renewed interest in "space-plane" technology during the last decade of the twentieth century. Consider, for example, the *Spacecast 2020* study published in 1994,¹ which envisioned "a squadron of rocket-powered transatmospheric vehicles . . . capable of placing an approximately 5,000-pound payload in any low earth orbit or delivering a slightly larger payload on a suborbital trajectory to any point in the world."² This was followed in 1995 by the *New World Vistas* study,³ which recommended "establish[ing] the technical feasibility of an unrefueled global-range aerospace plane to perform reconnaissance and strike functions anywhere on the globe."⁴ Finally, in June 1996 the *Air Force 2025* study⁵ accomplished by Air University included a "single stage space plane"⁶ among the top 10 systems that would best ensure continued US dominance of air and space into the next century. Although each of these studies used different



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terminology—transatmospheric vehicle, aerospace plane, and multipurpose transatmospheric vehicle—they all clearly referred to the same basic capability. This article uses the nomenclature *military space plane* (MSP) for the reusable, hypersonic, aerospace vehicle envisioned by these long-range studies.

Research Objectives

The Air Force has not yet engaged in a rigorous discussion of whether an MSP should be configured to carry a crew. When broached, the question is usually posed in oversimplified terms: "Should an MSP be manned or unmanned?" The overall goal of this article is to open the discussion of this complex issue by putting it in a more proper perspective. The three specific objectives are to

1. Demonstrate the lack of consensus in the manned versus unmanned space-plane debate by summarizing the existing literature and contrasting the supporting evidence from each viewpoint.
2. Approach the problem from a different perspective by considering an entire spectrum of man-machine interface (MMI) possibilities for MSP operations. Viewed in this context, the presence or absence of a man on board is the output of a structured design analysis and not an a priori design requirement.
3. Use this new approach to conduct a preliminary MMI analysis to answer the question posed by this article's title: Does man belong in the MSP cockpit, cargo bay, or control room?

To meet these objectives, the next section builds a foundation for MSP system requirements by reviewing current Air Force space operations doctrine. After that, the manned-versus-unmanned space-plane debate is summarized to include a sampling of existing space-plane concepts with widely varying thoughts on how man should (or should not) be used in their operation. The article's focus

then shifts away from the manned-versus-unmanned paradigm towards an entire spectrum of man-machine interface possibilities. A structured process for selecting an MMI design is identified, and existing data on the performance of humans in space is presented to provide insight to the results of this process for an MSP. Finally, key findings and recommendations are summarized to include one depiction of how man may ultimately be integrated into an operational MSP system.

Military Space-Plane Mission Requirements

Before assessing the proper place for humans in an MSP, it is important to understand current USAF space operations doctrine. A general understanding of the four mission areas prescribed by this doctrine is necessary for the mission-to-task analysis presented later. A brief sketch of "draft" MSP system requirements is also provided.

Space Operations Doctrine

Space force operations, according to Air Force Doctrine Document (AFDD) 2-2, *Space Force Operations*, are categorized in four mission areas: Space Control, Application of Force, Enhancing Operations, and Supporting Space Forces.⁷ Space Control, achieved via counterspace missions, is the means by which use of the space environment is assured to friendly forces and denied to enemy forces. Offensive counterspace missions deceive, disrupt, deny, degrade, or destroy enemy space forces by targeting the enemy's space, ground, or communications link nodes. Defensive counterspace missions protect our own space forces.⁸ Application of Force is defined as "attacks against terrestrial-based targets carried out by military weapon systems operating in space."⁹ Although we do not currently possess this capability, developments in technology and national policy may change this situation in the future. Enhancing Operations encompasses "those operations conducted from space with the objective

of enabling or supporting terrestrial-based forces."¹⁰ This mission area accounts for most of today's space operations to include navigation, communication, surveillance and reconnaissance, missile warning, and environmental sensing. Finally, Supporting Space Forces operations "deploy, sustain, or augment on-orbit spacecraft, direct missions, and support other government or civil organizations."¹¹ Common examples include both space lift and on-orbit satellite operations (e.g., telemetry, tracking, and control). Other Supporting Space Forces missions made possible by reusable launch vehicles include retrieving spacecraft so they can be refueled and repaired or even maintaining spacecraft on orbit to extend their useful life.

MSP Requirements

To support these four mission areas in the future threat environment, Air Force Space Command (AFSPC) has drafted Mission Need Statement (MNS) 001-97, "Tactical Military Operations in Space," which proposes "a new, reusable, launch-on-demand, multipurpose military space system designed for tactical space operations, called the Military Spaceplane."¹² Near-term (three to six years) MSP requirements focus on "defensive counter-space to protect existing assets" (Space Control), and "limited on demand Force Enhancement (surveillance and reconnaissance)."¹³ Medium- to long-term (six to 18 years) requirements include space superiority; space surveillance and space object identification (Space Control); navigation support, intelligence, surveillance and reconnaissance, meteorology and theater/national missile defense (Enhancing Operations); and the deployment, repair, refueling, and servicing of satellites (Supporting Space Forces).¹⁴ Draft MNS 001-97 also refers to the need "for rapid, global precision strike to augment conventional delivery systems" (Application of Force).¹⁵

The draft system requirements document for an MSP¹⁶ specifies a variety of man-machine interface requirements for an MSP flight ve-

hicle. Consider the following three specific requirements from this draft:

The Military Spaceplane System should accommodate male and female crew members of no less than 100 pounds and no more than 240 pounds and a height of no less than 60 inches and no more than 76 inches.¹⁷

The Spaceplane . . . shall be capable of autonomous execution of preprogrammed missions with or without a crew onboard.¹⁸

The flight crew shall be able to direct the Spaceplane either from onboard the Spaceplane or from the ground or support vehicles via a virtual crew interface. This capability shall be provided with or without a crew onboard.¹⁹

The first two passages require an MSP to operate in both the "manned" and "unmanned" modes. The third, which refers to a "virtual crew interface," implies that other options exist—an observation that will be explored later. However, it is not yet clear whether these requirements are valid or even appropriate—issues that will also be addressed later. But before pursuing these ideas, the next section investigates the insidious manned-versus-unmanned space-plane debate present in the current literature.

The Current Debate: Manned versus Unmanned

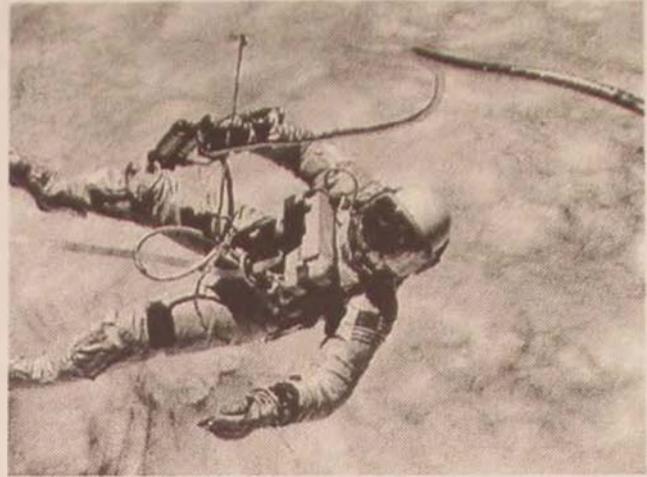
The argument for putting a human operator on board a space plane is mostly qualitative. It centers on the fact that man's cognition, judgment, and experience provide an inherent flexibility to react to unanticipated events that cannot be matched by machines.²⁰ Although few human beings would take exception to this view, it is difficult to quantify its benefit. "There is no way that a price tag can be placed on such characteristics as flexibility or serendipity²¹ because the essence of these attributes is the ability to capitalize on the unanticipated or unknown."²² On the other hand, the argument against having a human operator on board is primarily quantitative. Proponents of unmanned systems quantify their support in terms of lower costs (since the system need not achieve a "man-rated" reliabil-

ity), increased payload capability (since the crew and their life-support systems can be replaced with payload), and less risk to human life. Of course, neither of these arguments is iron clad. To illustrate this, a more detailed breakdown of each side's case will be presented according to specific parameters common to any engineering trade study—namely, cost, safety, technology, and program risk. A few other issues will be highlighted as well.

Cost. With the possible exception of a space plane's weight, whether or not it has a human operator on board is the overriding determinant of its cost.²³ For example, cost estimates of the Skylon space-plane concept suggest that man-rating the vehicle will increase development costs by 50 percent.²⁴ Existing data from commercial airliners suggest that 25 percent of development costs go towards cockpit design.²⁵ Unmanned space-plane advocates also suggest that the complexity of an integrated cockpit design can only inflate operating costs. Since "servicing activities become more complex to ensure that the crew compartment and vehicle are safe for the next mission,"²⁶ direct operating costs increase.

Proponents of manned space planes have a different set of cost figures. The Sanger space-plane designers estimate the per-flight cost of their manned configuration is only 10 percent higher than their unmanned configuration.²⁷ Since the MSP vehicle itself will have to "survive" each sortie, flight profiles and design considerations will keep G-load, thermal environments, and other stress factors within reasonable bounds. In other words, the basic MSP design philosophy will be inherently consistent with man-rating considerations.²⁸ Additionally, unmanned vehicles have hidden costs for autonomous or remote guidance and control systems that may exceed the cost of outfitting the vehicle for a crew.²⁹ Finally, the cost of installing and operating telemetry, tracking, and control (TT&C) sites erodes any cost advantage of unmanned systems even further.

Safety. From a space-plane flight crew's perspective, the risk to human life is certainly minimized by an unmanned vehicle configu-



NASA photo

The first US "space walk." Astronaut Edward H. White II, attached by an umbilical and tether line to Gemini 4, floats in space. Extravehicular activities (EVA) were an essential buildup in NASA's manned space program.

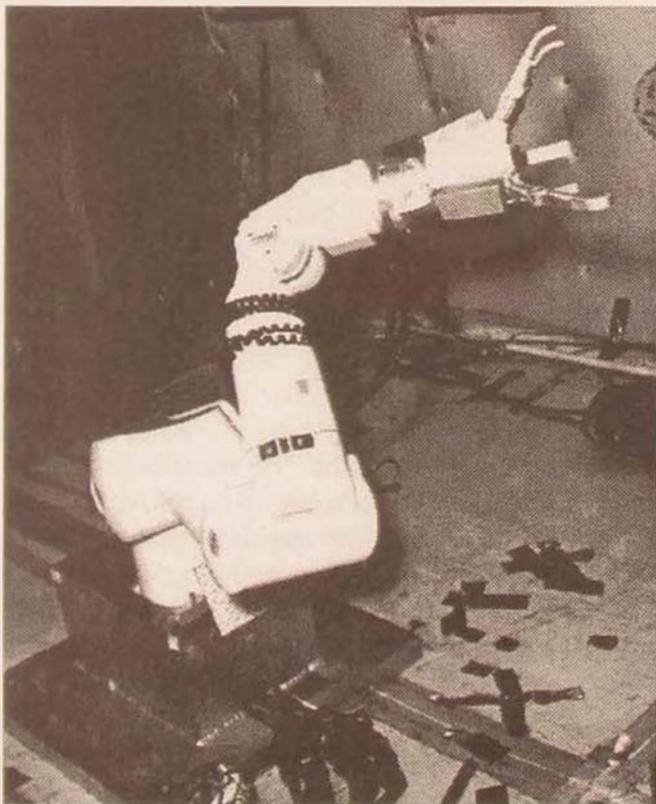
ration. But what can be said about the risk to the civilian population beneath the vehicle's flight path?

Proponents for a manned system say this is where the flexibility of a human operator is vital. According to a study done on the X-30 (a national aerospace plane [NASP] technology demonstrator), a pragmatic MSP flight-test program will require a multitude of alternate landing sites throughout the continental United States (CONUS) to permit safe vehicle recovery if problems occur. "Because of numerous factors (weather, energy state, required test conditions, telemetry coverage, etc.), these recovery bases may not always be the same and, therefore, the (vehicle) must be designed to be capable of recovery into any base/lakebed with a long enough runway. Recovery from orbit will require similar landing flexibility."³⁰ Manned space-plane advocates suggest it would be cost prohibitive to outfit every alternate landing site with the specialized equipment necessary for either a remotely controlled or fully autonomous landing. Finally, current regulations prohibit flight of unmanned air vehicles outside restricted airspace without a "safety chase." Obviously, no aircraft exists that could chase an MSP.

Unmanned space-plane advocates counter these assertions. First, the technology exists to

use Global Positioning System (GPS) signals for a precision approach to any runway with a minimum amount of specialized equipment.³¹ (If GPS is jammed during hostilities, backup navigation aids could be planned for at a minimum number of contingency landing sites.) Additionally, the requirement for a chase aircraft is simply an example of regulations lagging behind technology. Since the laws of the land (not the laws of physics) determine safety chase regulations, they can be changed as technology and risk dictate.³²

Technology. Unmanned launch vehicles and unmanned spacecraft have dominated military space operations for nearly 40 years. Commercial airliners use GPS integrated navigation systems and automated flight controls to fly to their destinations and land safely. According to a recent article on cockpit automation published in *Design News*, "artificial intelligence and decision-aiding programming [will] turn the pilot's job into that of a



A robotic arm using its own vision-guided intelligence system, grabs a ball "floating" in microgravity aboard NASA's KC-135. The tests demonstrate that autonomous robots can use computer vision to guide robotic manipulation of objects.

flight supervisor," and even military fighter aircraft will "evolve into unmanned vehicles."³³ The growing USAF interest in unmanned air vehicles (UAV) such as Predator and Dark Star supports this prediction.

Proponents of manned spaceplanes are more skeptical of artificial intelligence technologies. Their pragmatic outlook is summarized in this passage:

In spite of rapidly increasing cockpit automation, it is expected that airliners will require pilots for the foreseeable future. Unpiloted airplanes to date have fallen short of safety standards required for a Certificate of Airworthiness. It therefore seems prudent to assume that an early spaceplane designed for flight safety will need to be piloted.³⁴

Program Risk. Two arguments suggest unmanned systems will have the overall lower program risk. First, since it is generally believed that billions of dollars³⁵ will be needed to develop an MSP system already challenged with technological obstacles, adding upwards of 50 percent to the development costs to "man-rate" the vehicle³⁶ would make the program unexecutable in any conceivable budget environment. Second, assuming subscale technology demonstration vehicles are part of MSP development, they will almost certainly be unmanned since manned vehicles do not scale down easily. If this is the case, many technical issues (e.g., command and control) as well as legal issues (e.g., overflight of populated areas) would be solved out of necessity. Therefore, many criticisms of the unmanned approach could be worked out over the life of the program.³⁷

However, proponents of manned vehicles point to empirical data that suggests technology demonstration vehicles must be of sufficient scale to accommodate an onboard pilot. Consider NASA's X-1 through X-29, which had a cumulative loss rate of only one vehicle per 140 sorties.³⁸ Compare this to various unmanned drones and cruise missile test programs, which exhibited loss rates from about one vehicle in 10 sorties to one vehicle in four sorties.³⁹

An MSP Could Provide for Both Manned and Unmanned Operations. If a crew station can be inserted into the payload section, it may be possible to fly an MSP in either mode. "For crewed missions, a capsule is serviced off-line from the launcher . . . and then inserted into the next vehicle just like cargo."⁴⁰ Although the added design complexity of a bimodal configuration would certainly have its own costs and issues to be reckoned with, this proposal appears worthy of further consideration and study.

An MSP May Transition between Manned to Unmanned Operations during Development. There are four reasons why MSP flight operations might transition from manned for flight test to unmanned for operational missions. First, it is prudent to "expect the unexpected" during test flights, and this is precisely the environment where an onboard operator is the most beneficial. Second, obtaining government permission to let an unproven, unmanned million-pound vehicle fly over populated areas may be difficult.⁴¹ Third, the manned test flights could collect the hypersonic aerodynamic data required by fully autonomous flight control systems without relying on these same control systems to collect the data. (Such data is difficult to model and predict using only computers and wind tunnels.) Finally, after the vehicle's reliability has been proven during flight test, most operational missions could be flown unmanned to maximize payload capability.⁴² A number of current space-plane concepts, including Sanger, Delta Clipper, and Blackhorse, have proposed this strategy.

Interestingly, the Skylon space-plane design team proposed the exact opposite strategy. They suggest early prototypes should be unmanned to make the program affordable. Only when the vehicle technology matures should manned operation be attempted.⁴³

Manned Systems May Be Less Vulnerable to Hostile Attack. The presence of a human on board a military space platform may add to its self-protection capability.

The presence of humans provides a deterrent. A satellite in orbit, no matter how expensive, is



Above: The Mars Surveyor 2001 Lander is scheduled to land in early 2002. Hazardous or long-duration missions have always favored unmanned solutions, but air and space crews are not yet in any danger of extinction. Below: The Global Hawk UAV flies over Edwards Air Force Base, California, during its first flight.



just a piece of machinery. Nations don't go to war over machines. But put one seemingly insignificant soldier, sailor, or airman on that machine, and suddenly national sovereignty is threatened.⁴⁴

Man in Space Has Historical Precedence. The primary objective of NASA's manned space-flight programs from Project Mercury through the space shuttle was to put man in space, so unmanned alternatives were never even considered. Since the MSP will satisfy war-fighting requirements, comparing it to manned NASA programs is inappropriate.

Ironically, most of the literature surveyed for this study made almost no mention of one of the most important considerations of all—performance.⁴⁵ This suggests a significant

gap in the current debate and helps illustrate one of its major shortcomings. Therefore, it is time to proceed beyond the simple manned-versus-unmanned paradigm to explore other possibilities.

The Man-Machine Interface Spectrum

There is no such thing as an unmanned system: everything that is created by the system designer involves man in one context or another.

—Stephen B. Hall

Man-machine interface designs are not limited to the two extremes of 100 percent manual and 100 percent automatic. Using NASA's 1984 study of the human role in space (THURIS) as a guide, this section identifies seven possible MMI modes for space system operation, presents a generic MMI selection algorithm, and makes a preliminary assessment of whether an MSP can benefit from on-board human participation given the mission requirements previously outlined.

The Human Role in Space Study

The THURIS study was designed to (1) investigate the role of humans in future space missions, (2) establish criteria for allocating tasks between men and their machines, and (3) provide insight into the technology requirements, economics, and benefits of humans in space.⁴⁶ By identifying common space-vehicle tasks, baselining human performance capabilities, and accounting for cost and technology factors, the researchers provided both a logical framework to attack the MSP man-machine interface problem as well as specific findings that provide insight to man's utility on board an MSP flight vehicle.

Defining the MMI Spectrum. The THURIS study identified seven MMI modes, spanning a "spectrum" from direct manual control to

completely autonomous operation. Table 1 lists these modes and provides an example of each. Since most complex systems perform a variety of functions, it is not surprising that some employ multiple MMI modes. For example, the space shuttle ascends to orbit using an autopilot monitored by the astronauts (supervised, on board). Once it is in orbit, it uses the Remote Manipulator Arm (teleoperated) to deploy satellites that are later retrieved by pressure-suited astronauts attached to manned-maneuvering units (supported). During the final approach and landing phase, the pilot "flies" the shuttle not unlike a glider (manual), but has a number of sensors and instruments to assist him (augmented).

A Generic MMI Selection Process. To select from these seven possible MMI modes, the THURIS study identified the algorithm shown in figure 1. This conceptually straightforward algorithm considers performance, cost, schedule, and technology risk to arrive at a baseline MMI design. Four observations concerning figure 1 are worth mentioning.

First, performance consideration is an integral part of the process. In the manned-versus-unmanned debate, performance considerations were notably absent. Second, since the four space operations mission areas may require different functional tasks, it is conceivable that different missions will be best suited to different MMI modes. Third, although conceptually simple, an MMI selection process will require a great deal of effort to execute fully. Engineering trade studies, modeling and simulation efforts, and detailed cost estimates will all be needed. Finally, it is important to recognize the output of this selection process is one of the seven predefined MMI modes shown in table 1. Whether or not man ends up on board the flight vehicle is a by-product of this selection. This is in contrast to the conventional approach where the vehicle is either manned or unmanned as an a priori requirement.

Generic Space Tasks Identified in THURIS. By analyzing six space systems (ranging from manned space stations to unmanned satellites), the THURIS study concluded "the

Table 1
The Spectrum of Man/Machine Interface (MMI) Options

MMI Mode	Description	Example(s)
Manual	Unaided human operation	"Seat of the pants" piloting
Supported	Requires supporting machinery or facilities	Pressure suits; manned maneuvering units
Augmented	Amplification of human sensory or motor capabilities	Electro-optic sensors (amplify sensory capabilities); power tools (amplify motor capabilities)
Teleoperated	Use of remotely controlled sensors and actuators allowing humans to be removed from work site	Remote manipulator systems
Supervised (on board)	Replacement of direct, human control of system operation with computer control under human supervision. Human supervisor on board vehicle	Shuttle guidance, navigation, and control (GNC) system (monitored by astronaut)
Supervised (from ground)	Same as above, but human supervisor is on ground	Expendable launch vehicle GNC system (monitored by ground controller)
Independent	Self-actuating, self-healing, independent operations with minimal human intervention. (Requires automation and artificial intelligence)	Deep space probes

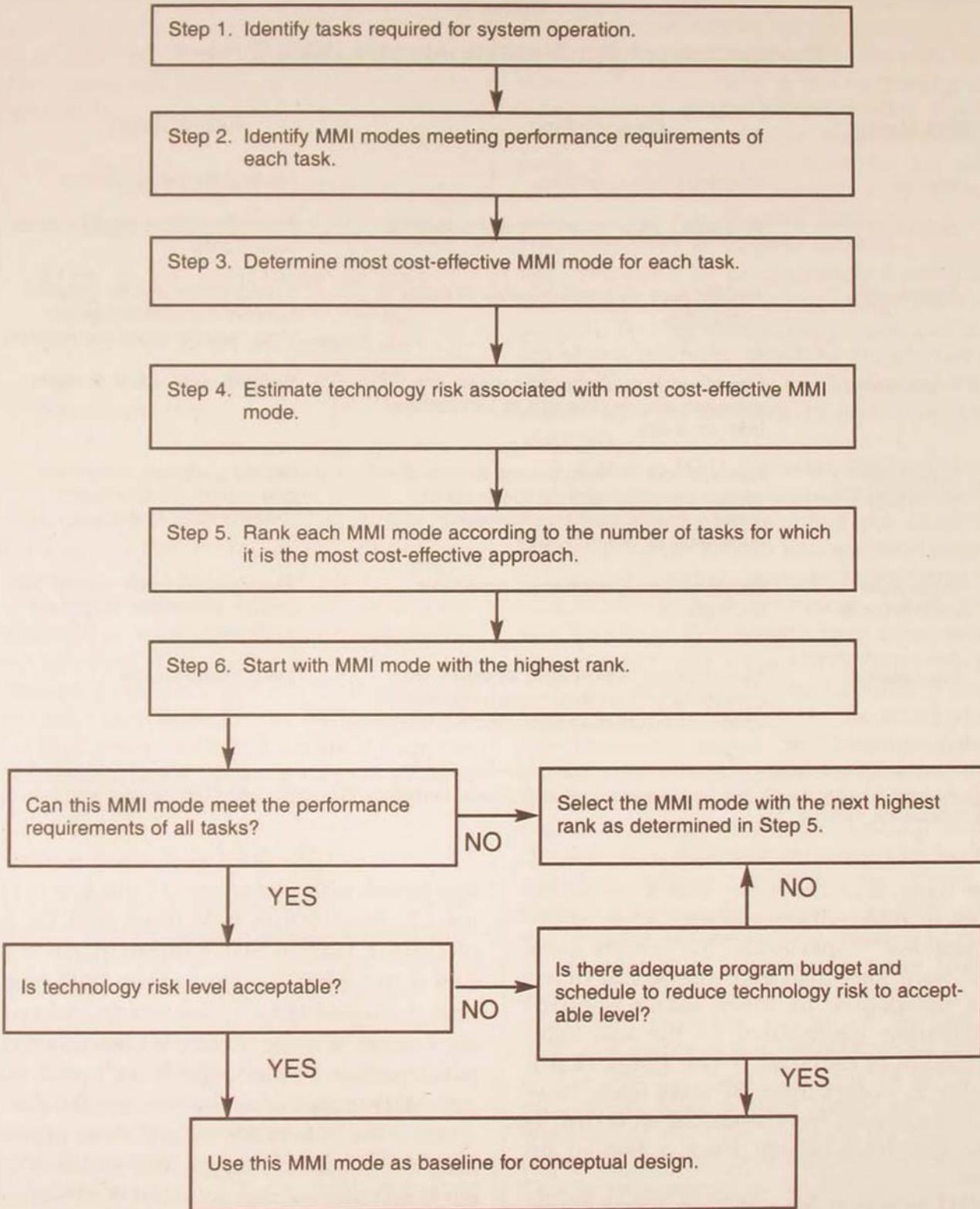
Source: Adapted from Stephen B. Hall, ed., *The Human Role in Space: Technology, Economics, and Optimization* (Park Ridge, N.J.: Noyes Publications, 1985), 2.

same basic activities were found to be required in different operations and in different missions."⁴⁷ Specifically, 37 "generic space tasks" were identified and assessed to determine the degree to which man's onboard participation contributed to the successful completion of each task.⁴⁸ The result, shown in table 2, orders these 37 tasks from those that most benefit from a human on board, to those that least benefit from a human on board.

MMI Selection for a Military Space Plane: A Preliminary Analysis. Consider figure 1 as a function that maps a task (input) to a specific MMI mode (output). Viewed together, tables 1 and 2 estimate this very same function when you realize that they "correlate" (in a concep-

tual sense) with one another from top to bottom! In other words, tasks listed near the top of table 2 (where man's onboard participation is "essential") will map into MMI modes near the top of table 1. Conversely, tasks near the bottom of table 2 (where man's onboard participation is "not significant") will map into MMI modes near the bottom of table 1.

More fundamentally, table 2 alone provides insight to whether or not an MSP stands to benefit from having a man on board at all—as long as "generic" tasks can be extrapolated from the previously described MSP mission requirements. Since some tasks (such as mission planning, launch, midcourse flight, and vehicle recovery) will be common to all MSP mission



Source: Stephen B. Hall, ed., *The Human Role in Space: Technology, Economics, and Optimization* (Park Ridge, N.J.: Noyes Publications, 1985), 21.

Figure 1. A Generic MMI Task-Allocation Process

Table 2
Benefit of Man's Participation in Space Activities

No.	Generic Space Task	Overall Benefit from Man's Onboard Participation	Comments
1	Problem Solving/ Decision Making	Essential	Man essential by definition
2	Implement Procedure/ Schedule	Essential	Activity dependent on man's participation by definition
3	Define Procedure, Schedule, Operation	Essential	Wholly dependent on man's intellectual activities
4	Apply/Remove Biomedical Sensors	Essential	Cannot easily be automated
5	Handle/Inspect Living Organisms	Essential	Activity cannot be automated in most cases.
6	Surgical Manipulations	Essential	Activity not appropriate for automation
7	Precision Manipulation	Most often Essential	Man's manipulative skills cannot be duplicated by automatic devices.
8	Connect/Disconnect Electrical Interfaces	Beneficial to Essential	Typical utilization of man's basic capabilities
9	Connect/Disconnect Fluid Interfaces	Beneficial to Essential	Typical utilization of man's basic capabilities
10	Gather/Replace Tools & Equipment	Beneficial to Essential	Man can vary tool selection with respect to task.
11	Release/Secure Mechanical Interface	Beneficial to Essential	Exemplary utilization of man's capabilities in space activities
12	Replace/Clean Surface Coatings	Beneficial to Essential	Infrequency of activity negates automation.
13	Replenish Materials	Beneficial to Essential	Degree of benefit is dependent on nature of task.
14	Display Data	Beneficial to Essential	Man important in selection of data to be displayed
15	Information Processing	Beneficial to Essential	Essential interaction between man and computer
16	Detect Change in State or Condition	Beneficial to Essential	Strongly dependent on characteristics of activity
17	Inspect/Observe	Highly Beneficial	Man's selective observations superior to automated monitoring
18	Adjust/Align Elements	Beneficial	Most alignment operations within man's capabilities

Table 2—Continued

No.	Generic Space Task	Overall Benefit from Man's Onboard Participation	Comments
19	Deploy/Retract	Beneficial	Seldom repeated activities are poor candidates for automation.
20	Measure (scale) Physical Dimensions	Beneficial in Some Cases	Man is best alternative in some situations.
21	Position Module	Beneficial in Some Activities	Man's benefit highly dependent on type of activity
22	Remove Module	Beneficial for Some Activities	Man's benefit highly dependent on type of activity
23	Remove/Replace Covering	Beneficial for Some Activities	Man's benefit highly dependent on type of activity
24	Pursuit Tracking	Could be Significant	Dependent on specific tracking task
25	Transport (loaded)	Dependent on Specific Task	Characteristics of tasks can vary extensively for this activity.
26	Transport (unloaded)	Dependent on Specific Task	Characteristics of tasks can vary extensively for this activity.
27	Activate/Initiate System Operation	Not Significant	Automatically activated systems will predominate.
28	Allocate/Assign/Distribute	Not Significant	Primarily automated operations
29	Communicate Information	Not Significant	Communication links established automatically
30	Compensatory Tracking	Not Significant	Highly dependent on nature of tracking task. Nullifying error signal can be automated.
31	Compute Data	Not Significant	Man's role in data computation is negligible.
32	Confirm/Verify Procedures, Operations	Not Significant	Man would usually function in a "back-up" role.
33	Correlate Data	Not Significant	Man would usually function in a "back-up" role.
34	Deactivate/Terminate System Operation	Not Significant	Automatically deactivated systems will be the norm.
35	Decode/Encode Data	Not Significant	Basic computer function
36	Plot Data	Not Significant	Primarily a computer function
37	Store/Record Element	Not Significant	Man's participation of benefit only in isolated cases

areas, let's begin by categorizing these in terms of the "generic" tasks shown in table 2.

Mission Planning involves defining procedures, schedules, and operations (task 3) and making decisions about targets, trajectories, and other mission-specific variables (task 1). When a military commander decides to launch an MSP sortie (task 1), he or she will issue an order to implement predefined procedures, schedules, and operations (task 2). As shown in table 2, man's participation in all these tasks is "essential," but they are all performed before the MSP ever leaves the ground.

Man's role changes significantly after launch. The predominant MSP task throughout launch, midcourse trajectory execution, and recovery is staying on a preplanned trajectory.⁴⁹ This explicit guidance function is fundamentally a compensatory tracking task (task 30). Throughout the mission, subsystems and payloads will be activated and deactivated (tasks 27, 34), sensor data will be processed and computationally manipulated (task 31), commands will be uplinked and mission data will be downlinked (task 29), and sensor data will be recorded for post-flight analysis (task 37). According to table 2, man's onboard role in all these tasks is "not significant." UAVs, expendable launch vehicles, and on-orbit satellites are all consistent with this assessment.

But what happens if the MSP encounters an unplanned event such as a subsystem failure, hostile attack, or forced change in landing site? Deciding on an appropriate course of action (task 1) will most certainly require human intervention—although from where is not yet clear. The probability of an unplanned event occurring, its impact on the mission, and man's ability to affect the outcome depend on a wide range of factors. These include the specific MMI mode implemented, the reliability and maturity of the MSP system, and the fidelity of its environmental and threat models. These issues are beyond the scope of this preliminary assessment and can only be resolved by a more detailed analysis, such as outlined in figure 1.

Other MSP tasks will be peculiar to individual mission types. For example, if kinetic

energy munitions are used, application of force and space control missions will require weapons released from a mechanical interface (task 11). Although table 2 defines man's involvement in this task as "beneficial to essential," many examples exist to suggest this assessment is not applicable to all cases. Reentry vehicle release from the upper stage of an intercontinental ballistic missile (ICBM) is a case in point. And even in the F-16, where a human pilot is present, the actual weapons release task might be categorized as teleoperated⁵⁰ or supervised,⁵¹ but certainly not manual (see table 1).

No hardware need be deployed in such enhancing operations missions as photoreconnaissance and communications support. While precision alignment of optics, sensors, and antennae might be required (task 13), man's participation may not necessarily be "beneficial" as shown in table 2. Even now, there are scores of unmanned remote-sensing and communications satellites with very precise pointing and attitude control requirements that do not require a man on board for successful operation.

Supporting space-forces missions is a different story, however. Looking beyond the simplest case of space lift to more aggressive missions involving repair, refueling, and retrieval of on-orbit satellites, many challenging tasks are envisioned. Repair missions will require inspection of damaged components (task 17) and precision handling of tools and equipment (tasks 7, 10). On-orbit refueling will require connection/disconnection of fluid interfaces (task 9) and materials replenishment (task 13). Satellite retrieval will require positioning objects precisely enough to secure a mechanical interface (task 11). In each of these tasks, man's onboard presence is either essential or beneficial. Therefore, complex supporting-space forces missions will definitely benefit from, and may in fact require, onboard human operators.

One final comment on space control is in order. As has already been discussed, destructive space-control missions that deploy hard-kill projectiles may benefit little from onboard human operators. However, disruptive

space-control operations are different. These missions may require close inspection (task 17), precision manipulation (task 7), and physical disruption (tasks 8, 9, 11). Resembling supporting space forces more than application of force, disruptive space-control missions may also require on-the-scene human intervention.

In summary, this intuitive (but preliminary) MSP task analysis has led to some interesting insights. It suggests an onboard human operator may be required for most supporting space forces and some disruptive space control missions. On application of force, enhancing operations, and destructive space-control missions, however, the value added by a man on board is far less certain. The implications of these findings on MSP operating concepts and program-development strategies will be explored further in the final section.

Conclusions and Recommendations

A military space plane could play a key role in helping the United States Air Force transform itself from an air force into an aerospace force. Many long-range studies have concluded a reusable, hypersonic vehicle operating in both the air and space media should be developed to ensure our space dominance in the twenty-first century. The purpose of this essay has been to investigate just one part of MSP development—the concept for man's participation in MSP flight operations.

The Old Paradigm: Manned versus Unmanned

The current literature focuses primarily on only two man-machine interfaces: manned and unmanned. The manned argument centers on the fact that humans provide flexibility to deal with unknown and unplanned situations. The more quantitative unmanned argument focuses on the decreased cost of not having to man-rate the vehicle and the performance advantages of not having to lift the mass of the crew and their life-support systems to orbit. Other factors such as tech-

nology readiness, program-development risk, and flight safety are not so clearly resolved. The expert opinions, supporting data, and logical development presented by each side are equally compelling. Considering the body of literature surveyed, this debate is stuck at an impasse.

A New Approach: The Spectrum of MMI Options

What each side fails to acknowledge, however, is that man-machine integration is not limited to only two design options. We must progress beyond the old paradigm of manned versus unmanned and focus instead on the degree of man's involvement in space-plane operations. There are many possible man-machine interface options, and man has a key role to play in each of them. Whether piloting an MSP from its cockpit, monitoring mission operations from its cargo bay, remotely controlling its flight from a ground operations center, or simply pushing a button to initiate an otherwise autonomous mission, man *will* be a part of space-plane flight operations.

Determining which of these roles man will play requires a detailed engineering analysis integral to the baseline design of an MSP system. Mission requirements must be broken down to their most elementary level tasks. For each task, MMI modes capable of meeting the stated performance requirements should be ranked according to cost. A structured analysis can then be completed to determine the optimal MMI solution for the system as a whole—based on performance, technology, cost, risk, and schedule considerations. A conceptually straightforward selection process was presented, but the messy details of working through this process remain to be accomplished.

One very important aspect of this MMI selection process needs to be emphasized. Simply stated, the optimum man-machine interface type is a design solution of, not a requirement for, the MSP vehicle. Therefore, MSP mission-need statements and system requirements documents should avoid specifying any particular MMI implementation. Instead, detailed mission performance requirements should be identified and prioritized. As currently envi-

sioned, the MSP will be a "multirole" platform, satisfying all four space mission areas. Since different tasks are needed to satisfy each of these mission areas, the optimum MMI modes for each could also be different.

Cockpit, Cargo Bay, or Ground Control?

This study has suggested that application of force, enhancing operations, and destructive space-control missions will benefit little from man's "hands-on" participation. This assessment is supported empirically by a variety of existing aerospace systems, to include expendable launch vehicles, unmanned satellites, and ICBMs. On the other hand, aggressive supporting space forces missions, such as repairing and refueling on-orbit satellites and "disruptive" space-control missions, could benefit greatly from man's on-site participation. These missions rely more on the precision handling, close inspection, problem solving, and ingenuity that only man can provide.

These results suggest an MSP that can be implemented in two phases. A first-generation MSP could function without a man on board—but whether it operates autonomously or under the close supervision of ground controllers remains to be seen. This first-generation MSP could execute at least a portion of all four space-mission areas. It could overfly any point on the planet to deliver a strike payload or conduct a reconnaissance mission. On a counterspace mission, it could destroy hostile satellites using kinetic-energy projectiles or directed-energy beams. As a reusable launch vehicle, it could perform a simple yet critical space support mission—satellite deployment.

Many factors support the development of a first-generation MSP without men on board. First, it could satisfy the near-term mission requirements—surveillance/reconnaissance and defensive counterspace—as well as perform at least a limited role in all four space-mission areas. As the less expensive alternative, it stands a greater chance of being funded. Finally, the absence of a crew, their life-support equipment, and a dedicated cockpit help reduce the vehicle's operating weight. Given the

technical challenges involved with single-stage-to-orbit flight, any opportunity to reduce the vehicle's mass is advantageous.

But how will the more complex space-control and supporting space-forces missions be performed if they require direct manned intervention? The answer may reside in a second-generation MSP upgrade: an optional "crew support module" installed in the payload bay. This module could carry humans to orbit where they would operate outside the confines of the MSP using space suits and manned maneuvering units. This would afford their uniquely human talents such as problem solving, close inspection, and precision handling the maximum freedom of maneuver to accomplish these more demanding missions.

Inserting a crew-support module into the payload bay would eliminate the need to develop a totally unique MSP for crewed operations. Integration of the module to the baseline MSP would be simplified because the mission focus of the men on board will be external to the vehicle—either on the friendly satellite to be serviced or the hostile satellite to be disrupted. In fact, any effort to turn the crew-support module into a "cockpit" could significantly increase the cost and complexity of the module itself (since additional controls and displays would have to be added) and the baseline MSP (since multiple control and feedback paths would have to be incorporated). Although having the capability to manually "fly" the MSP using onboard controls sounds appealing, the costs and benefits of doing so need to be considered carefully.

In closing, this study has proposed a new perspective from which to approach the manned-versus-unmanned space-plane problem. Even though the applicability of its specific findings should be tempered by the preliminary nature of the MMI analysis conducted, some interesting insight has been achieved. Clearly, man will play an active role in MSP flight operations, and there could never be a truly unmanned space plane. But for most missions, the appropriate place for humans appears to be on the ground in the control room. Stated more generally, these

findings suggest man-in-the-loop does not necessarily require man on board.

On those missions that do require human intervention in orbit, man might be most valuable operating out of a crew-support module installed in the cargo bay, with his attention focused more primarily on the external environment. Extrapolating this finding

to more general terms suggests a highly provocative question: Are manned vehicles necessarily piloted vehicles? Our ability to satisfactorily answer this question will depend on our technology. But our willingness to just explore the possibility will depend more on our organizational culture. □

Notes

1. *SPACECAST 2020* is an Air University study published in 1994 that identified high-leverage space technologies and systems that would best support the war fighter and could be fielded by the year 2020. An on-line version can be found at www.au.af.mil/Spacecast/Spacecast.html.

2. Air University, *SPACECAST 2020*, vol. 1, *Operational Analysis* (Maxwell AFB, Ala.: Air University, 1994), appendix 8, 65.

3. *New World Vistas*, a USAF Scientific Advisory Board study to search for advanced air and space ideas, was published on 15 December 1995—the 50th anniversary of the first USAF Scientific Advisory Report: *Toward New Horizons*. The *New World Vistas* summary volume is at <http://web.fie.com/htdoc/fed/af/sab/any/text/any/vistas.htm>.

4. Air Force Scientific Advisory Board, *New World Vistas: Air and Space Power for the 21st Century*, attack volume (Washington, D.C.: USAF Scientific Advisory Board, 1995), ix.

5. *Air Force 2025* identifies concepts, capabilities, and techniques needed for the United States to remain a dominant air and space power in the twenty-first century. See *Air Force 2025* (Maxwell AFB, Ala.: Air University Press, 1996), n.p.; on-line, Internet, 23 September 1996, <http://www.au.af.mil/au/2025>.

6. *Ibid.*

7. Air Force Doctrine Document (AFDD) 2-2, *Space Operations*, 23 August 1998.

8. *Ibid.*, 8–10.

9. *Ibid.*, 11.

10. *Ibid.*

11. *Ibid.*, 12.

12. AFSPC MNS 001-97, "Tactical Military Operations in Space," draft (version 5.9), November 1997, 4.

13. *Ibid.*, 3.

14. *Ibid.*

15. *Ibid.*, 1.

16. Maj Ken Verderame and Maj Andrew Dobrot, "System Requirements for a Military Spaceplane," draft (version 1.0), MSP Program Office, Air Force Research Laboratory, Kirtland AFB, N.M., April 1997.

17. *Ibid.*, 9.

18. *Ibid.*, 21.

19. *Ibid.*

20. Lt Col Joseph A Carretto, USAF, "Military Man in Space—Essential to National Strategy," Research report no. NDU-ICAF-95-S3 (Washington, D.C.: Industrial College of the Armed Forces, 1995).

21. The cited reference defines *serendipity* as "the capability of making unexpected discoveries by accident."

22. Air Force Space Command study, "The Utility of Military Crews in Space" (draft), 1985, in Theodore Wierzbanski, *Manned vs. Unmanned: The Implications to NASP*, AIAA-90-5265

(Orlando, Fla.: AIAA Second International Aerospace Planes Conference, 1990), 10.

23. Russell J. Hannigan, *Spaceflight in the Era of Aerospace Planes* (Malabar, Fla.: Krieger Publishing Co., 1994), 229.

24. Richard Varvill and Alan Bond, "Skylon: A Key Element of a Future Space Transportation System," *Spaceflight* 35, no. 5 (May 1993): 164.

25. Mark Gottschalk, "Computers Take over the Cockpit," *Design News* 51 (4 November 1996): 98.

26. Hannigan, 108.

27. *Ibid.*, 132.

28. *SPACECAST 2020*, vol. 1, section H, appendix C, H 40–41.

29. Wierzbanski, 9.

30. *Ibid.*, 7.

31. The space maneuver vehicle, an experimental vehicle built for a military space-plane technology program office by Boeing/North American, has an autonomous landing capability using differential GPS. This capability was successfully demonstrated in August 1998.

32. The flight-test program for the X-33, an unmanned reusable launch vehicle being developed by NASA and Lockheed Martin, calls for suborbital flights between Edwards AFB, California; Michaels AAF, Utah; and Malmstrom AFB, Montana. In addition to developing and maturing space-plane vehicle technologies, the X-33 program may also dictate a modification of federal aviation regulations.

33. Gottschalk, 90, 94.

34. David Ashford, "The Potential of Spaceplanes," *The Journal of Practical Applications in Space* 6, no. 3 (Spring 1995): 224.

35. A 1994 OUSD/A&T report, "Space Launch Modernization Plan," estimated space-plane development costs between \$6–20 billion. According to Maj Ken Verderame at the MSP Program Office, recent estimates are closer to \$2 billion for one sub-orbital concept-demonstration vehicle and one orbit-capable space plane.

36. Varvill and Bond, 164.

37. The X-33 may be a case in point (see endnote 32).

38. Jay Miller, "The X-Planes, X-1 to X-29," in Wierzbanski, 10.

39. Wierzbanski, 9.

40. Hannigan, 108.

41. Again, the NASA X-33 may break new ground in this area that would benefit future military space-plane flight testing (see endnote 32).

42. *Ibid.*, 228.

43. Varvill and Bond, 164.

44. Carretto, 27.

45. Performance was usually addressed only in terms of throw weight (or payload fraction) for space-lift missions.

46. Stephen B. Hall, ed., *The Human Role in Space: Technology, Economics, and Optimization* (Park Ridge, N.J.: Noyes Publications, 1985), v.

47. *Ibid.*, 4.

48. *Ibid.*, 22 (fig. 18).

49. All current space launches follow preplanned trajectories into predefined orbits. Even aircraft air-to-ground strike missions are planned using defined ingress routes, target-attack headings,

and egress routes. Therefore, both space launches and aircraft missions have "trajectories" that are defined in terms of time and space.

50. An example is the CCIP (continuously computed impact point) delivery mode.

51. An example is the CCRP (continuously computed release point) delivery mode.

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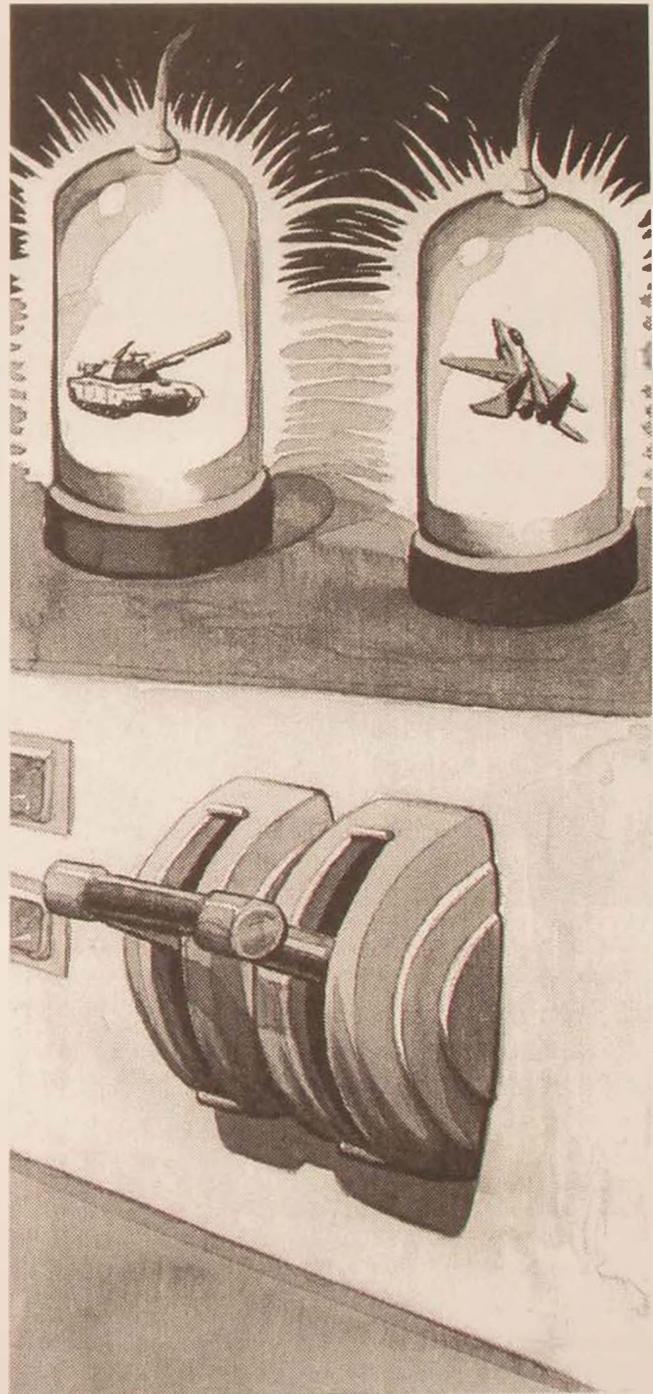
The advertisement features two book covers. The left cover is titled "Architects of American Air Supremacy" and shows portraits of General Hap Arnold and Dr. Wolfgang von Kármán. The right cover is titled "The Paths of Heaven: The Evolution of Airpower Theory" and features a stylized figure of a pilot. The background of the advertisement includes a silhouette of a space shuttle and a view of the Earth from space.

Fusing Airpower and Land Power in the Twenty-First Century

Insights from the Army after Next

LT COL ANTULIO J. ECHEVARRIA II, USA

THE US ARMY'S "Army after Next" (AAN) project recently concluded the second of its annual tactical/operational-level war games (TWG). The AAN TWG, a vital part of the Army's future-warfare laboratory, provides a tool for evaluating and refining AAN tactical and operational concepts.¹ The AAN's exploration of future warfare thus far suggests that a number of nascent technologies will present opportunities as well as challenges for the cooperation of air, land, sea, and space systems in the twenty-first century. For example, by 2020, precision-weapon systems will have so expanded in range that the tactical deadly zone may extend to two hundred kilometers. This zone may include not only precision and area-fire weapons located in urban centers and other complex terrain, but also space-based lasers, satellites, unmanned aerial vehicles, and a host of electronic weaponry. One can achieve a fairly formidable defense-in-depth, for instance, by positioning such systems in a manner that ensures interlocking fires throughout the depth of the defensive zone. What tomorrow's maneuver forces may encounter, therefore, is a World-War-I-style defense with interlocking fires but on a much larger horizontal and vertical scale. Indeed, the state of internetted information systems by 2025 will make activating such a defense much easier. One may also reasonably expect that even relatively poor nations will have the ability to erect some form of this internetted defensive zone. Furthermore, because in this highly lethal environment the fog and friction of war will not disappear—and may even increase—military personnel are likely to fight under conditions more psychologically



and physically demanding than in the past. What's more, real-time information may induce political leaders to delay or change their decisions in response to the continuous flow of data received from the combat zone. Hence, future political objectives may become just as fluid as future tactical situations. Successful military operations in such an environment will require an exquisite level of precise yet flexible synchronization among land, air, sea, and space systems.² This article argues that such synchronization—particularly as regards the fusing of airpower and land power—is a historical imperative revalidated by insights derived from the AAN's most recent TWG.

The Historical Imperative

Efforts to use air systems for the benefit of land maneuver date back to the employment of lighter-than-air balloons for reconnaissance and observation purposes in the late eighteenth century. By the early 1880s, France and Germany had developed permanent balloon units for aerial reconnaissance. Despite a great deal of optimism about the ways that aviation would revolutionize modern warfare, the anticipated "conquest" of the air took longer than expected. Not until 1900 did Count Ferdinand von Zeppelin successfully fly a gas-powered airship across Lake Constance; three years after that, the Wright brothers succeeded in flying a heavier-than-air aircraft. European general staffs, contrary to popular myth, displayed keen interest in powered air vehicles almost from their inception.³ Aircraft appeared to provide a means of bypassing the deadly zone—an urgent problem for the era's military theorists—to acquire intelligence about the enemy's defenses and possibly to strike at his capital—then considered the heart of his will to resist. However, parliaments and war ministries, concerned with minimizing development costs and prioritizing competing defense requirements, initially doled out funds only parsimoniously for the new systems.⁴ Interest in military aviation nonetheless grew rapidly

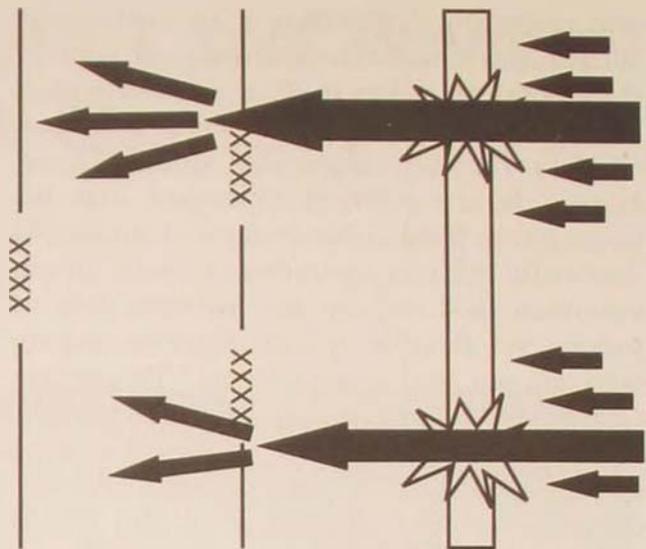
in the half decade before the Great War. German investment in fixed-wing aircraft, for example, increased over 720 percent (from 36,000 to 25,920,000 reichsmarks) between 1909 and 1914. By the outbreak of World War I, the anticipated missions associated with military aviation included strategic, operational, and tactical reconnaissance; artillery observation; air-to-air combat; combat against ground troops; destruction of enemy installations; liaison missions; and troop transport.⁵

Throughout World War I, air arms played an increasing role in land and naval combat. German reconnaissance aircraft were extremely significant during the Battle of Tannenberg, in which the Russian Second Army was encircled and destroyed. As Gen Paul von Hindenburg, the German commander, later testified, "Without the airplane, there is no Tannenberg." Likewise, intelligence delivered by the British and French air arms literally made possible the "Miracle of the Marne" that saved the British and French armies on the western front in 1914.⁶ German use of massed, radio-equipped aircraft for close air support proved highly effective during the campaigns of 1917 and 1918, both in defensive and offensive roles. By the end of the war, modern air services had sunk a number of warships, submarines, merchant ships, and patrol boats; and navies had developed the capability to launch aircraft from sea vessels—the forerunners of aircraft carriers. In addition, intermediate- and long-range interdiction operations and strategic-bombing attacks were under way but proved less effective than hoped, due primarily to technological limitations and an armistice that arrived six months earlier than strategic planners had anticipated. Improved anti-aircraft systems had made such attacks costly, even at night, and civilian populations had learned rather quickly to adjust to the idea of aerial bombardments.

During the interwar period, aviation, surface maneuver, and communication technologies matured considerably. Blitzkrieg theory, in fact, exploited this new confluence of technologies by integrating close air support, artillery fires, and ground maneuver

into a focused attack aimed at breaking through an opponent's defenses and disrupting his lines of communications and supply (fig. 1). The psychological shock of such an attack was supposed to cause the defender's resistance to collapse suddenly. By comparison, strategic-bombing theory, which emerged at about the same time, maintained that airpower had revolutionized warfare. The so-called true believers—Giulio Douhet in Italy, Hugh Trenchard in Britain, and Billy Mitchell in the United States—advocated bypassing the methodical carnage traditionally associated with land combat to bomb an opponent's population centers until he submitted (fig. 2). Thus, blitzkrieg and strategic bombing both sought to bring about an adversary's psychological collapse. Of course, the fundamental difference between the two lay in their "reach." On the one hand, blitzkrieg focused on delivering an operational knockout blow (through corps or army level) because that was about as far as motorized columns and support elements could penetrate in a single attack. On the other hand, modern air forces could range to strategic distances and return in the same day. In each case, lethality served merely as a means to achieve decisive effects within the all-important human dimension of warfare.

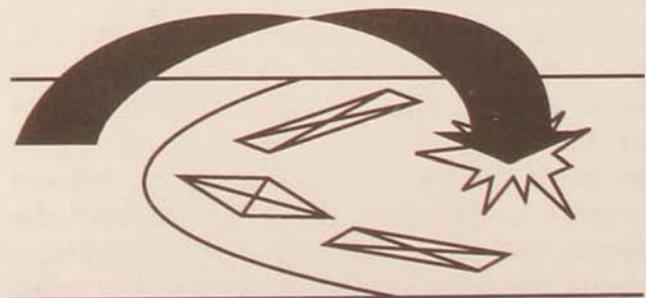
Blitzkrieg-style air-land cooperation helped generate a whirlwind of victories in both Europe and the Pacific during the early years of World War II. As the war continued, however, armies learned to cope both intellectually and emotionally with the focused lethality and heightened operational tempo that such cooperation produced. Victory then required the deliberate annihilation of the enemy's armed forces. Likewise, strategic bombing failed to live up to prewar expectations. The bombing of major cities and industrial centers proved to be a necessary but not a sufficient cause for victory. The Allies' powerful air arms achieved a high degree of lethality (e.g., Tokyo, Hamburg, and Dresden) but could not sustain the tempo necessary to create a decisive, war-winning effect.⁷ Each bombing mission required enormous numbers of aircraft and ordnance, which in turn



- Concentrated Air, Artillery, and Ground Attacks at Decisive Points
- Rapid, Operational-Level Penetration
- Resultant Psychological Collapse/Physical Isolation of Opponent

Figure 1. Blitzkrieg Theory

worked to reduce the frequency with which one could execute the missions and all but prevented the carrying out of multiple raids simultaneously. Until US aircraft dropped atomic bombs on Hiroshima and Nagasaki—President Truman's "rain of ruin" from the air—long-range bombing technologies were not sufficient to break an opponent's will to



- Avoid Opponent's Land and Sea Forces
- Attack Heartland: Cities and Industrial Centers
- Break Opponent's Will through Moral Effect of Bombing

Figure 2. Strategic-Bombing Theory

fight.⁸ Ironically, the very destructiveness and escalatory potential of these weapons of mass destruction precluded their use in subsequent wars.

In the years following World War II, operational-level air-ground cooperation both made and lost progress. On the one hand, it contributed to rapid victories in the Arab-Israeli wars (1948, 1956, 1967, and 1973), the Falklands (1982), Panama (1989), and the Persian Gulf (1990–91), demonstrating in the process that the principle of air-ground cooperation remains valid.⁹ On the other hand, the sheer multiplication of a combat force's "moving parts" over recent decades has complicated the planning process beyond reasonable limits; the time required to think through and coordinate an air-ground operation has increased dramatically.¹⁰ At the same time, civil wars, insurgencies, and terrorist activities, which have grown more frequent since 1945, reveal the limitations of both blitzkrieg-style warfare and strategic air attack, both of which seek to end wars quickly and decisively. Neither approach has been particularly successful at resolving protracted, internecine, or civil wars.

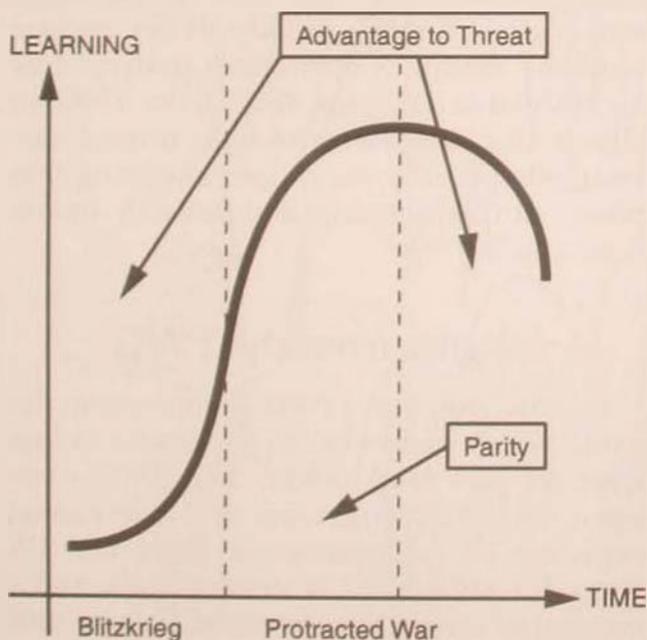


Figure 3. Emotional and Intellectual Learning Curves

Such conflicts generally involve not limited aims—such as collapsing an opponent's will to resist—but unlimited ones like political genocide. The centers of conflict themselves tend to remain highly dispersed and deceptively diffused. Under such conditions, time often benefits the less technologically sophisticated adversary by allowing him an opportunity to move along his intellectual and emotional learning curves. The learning curves of the more technologically sophisticated opponent, however, begin to level off and decay as his understanding gives way to confusion (fig. 3).¹¹

Recent debates over whether airpower or land power is the truly decisive arm have missed the significance of the air-land imperative.¹² Every conflict since the classical age has been unique, requiring equally unique combinations of land, naval, and (later) airpower to meet political aims. Decisive victory has come not from the mere destruction of an opponent's material by air, land, and sea systems but from a combination of tempo and lethality sufficient to defeat an adversary's will to fight and to preempt his learning curves. Furthermore, arguments claiming that close-in fighting is a thing of the past ignore a modern adversary's capacity for employing an asymmetric strategy that nullifies the advantages of long-range, precision strike.¹³ If twenty-first-century information technology is actually capable of producing a revolution in military affairs, that revolution must include the ability to wage war without resorting to linear, sequential campaigns.¹⁴ If it does, airpower and land power must fuse in order to execute simultaneous, highly precise tactical-, operational-, and strategic-level air-ground attacks throughout the new global theater (fig. 4). Well-timed, precisely disposed attacks of this sort can take place over large areas without diluting decisive effects and, in fact, may offer the best means for achieving decisive results—even in situations like Vietnam, Bosnia, and Kosovo, in which violence can be highly dispersed and annoyingly diffused.



- Preempt Opponent's Learning Curves
- Focus on Will to Fight
- Optimize Tempo and Lethality

Figure 4. Simultaneous Operational and Strategic Attack

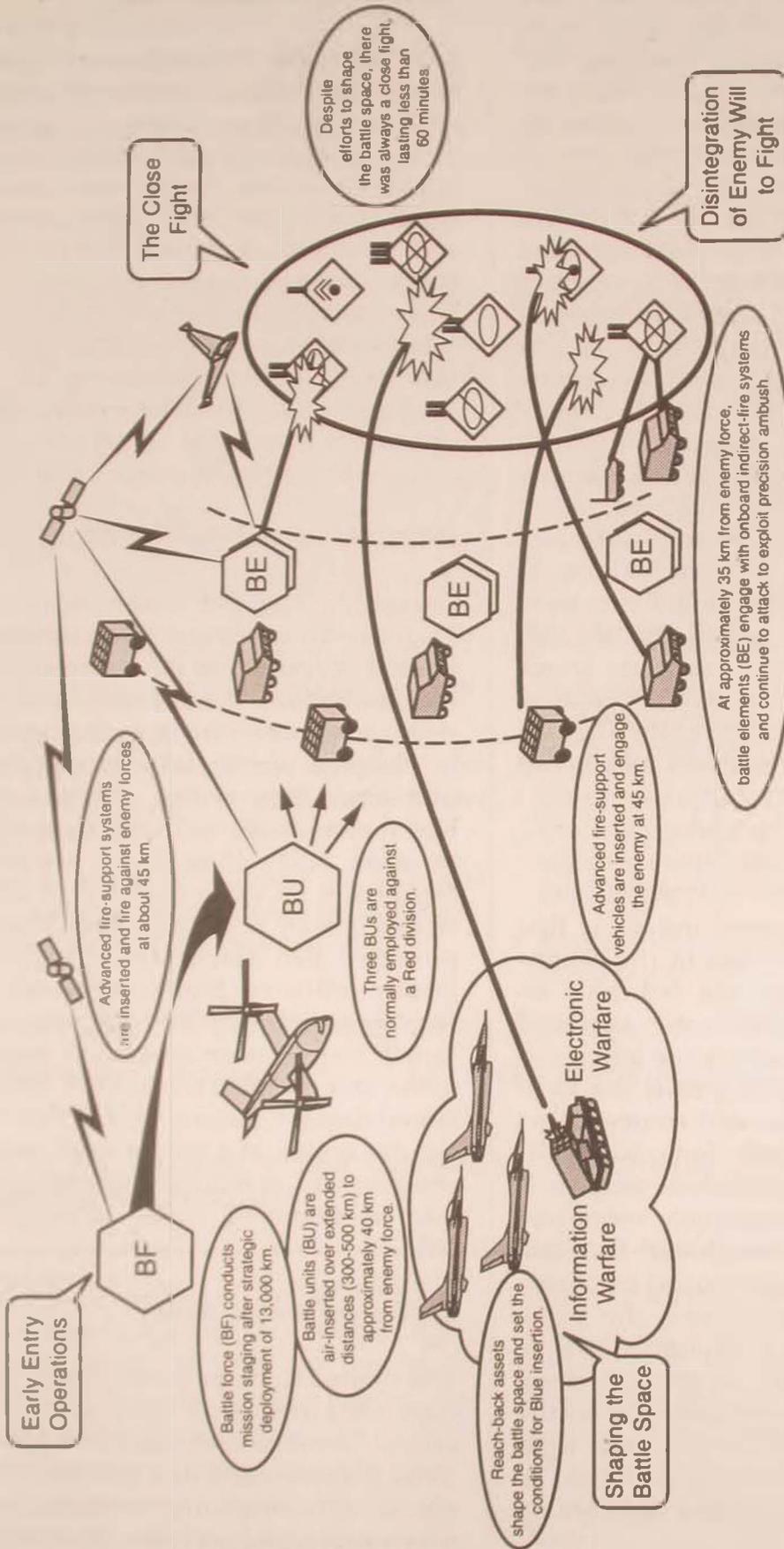
AAN Battle Forces and Operational Concepts

Because they are still under development, AAN battle forces and operational concepts are continuously changing. At the time of the TWG, AAN battle forces were roughly the size of a contemporary brigade (three thousand to five thousand soldiers) and consisted of 50–60 various kinds of unmanned aerial vehicles, 20–30 advanced attack airframes capable of moving the bulk of the battle force over strategic distances, 30–40 armored reconnaissance vehicles, and 30–40 armored fighting vehicles equipped with direct and indirect firing systems. For purposes of command and control, the battle force is divided into three battle units, which are in turn divided into six battle elements. By design, all battle forces are able to conduct combat operations for up to a week without resupply. Their speed, low profile, and organic firepower enable them to maneuver rapidly through gaps in an enemy's defensive zone to strike and, if necessary, to seize several of his major centers of resistance simultaneously, thereby encouraging the collapse of his will to resist. Their aim is to exploit knowledge and speed to create more challenges than the enemy can counter.

AAN operations typically begin with preparatory activities of forward-stationed and special-operations forces who gather regional intelligence and coordinate with the host nation to accommodate the arrival of the battle forces. Coordination with the host nation is particularly important for establishing reliable, long-term protection of logistical and support areas. At the same time, air, space, and information and electronic warfare systems begin shaping operations to set the conditions for victory. In the meantime, battle forces begin strategic deployment, either with organic assets or with the support of airlift and sea-lift assets or some combination of the three. Most of the mission planning is conducted en route. Once the battle forces are in-theater, planning is finalized and they dispatch their units, which are air-inserted over distances of three hundred to five hundred kilometers to arrive within 40 kilometers of the enemy force. Three battle units normally deploy against an enemy division. They execute a precision ambush against key targets, using indirect fires launched from remote rocket pods at a range of up to 45 kilometers. The battle elements then deploy and move in closer to the enemy, continuing the fight as necessary with organic direct and indirect fire systems until the enemy is completely destroyed or his resistance collapses. During the TWG, in almost all cases, the close fight proved necessary, despite the use of overwhelming firepower during shaping and ambush operations (fig. 5).

Insights from the TWG

Results from the TWG demonstrate the continued relevance of the imperative to fuse airpower and land power. The TWG drew upon the collective tactical and operational expertise of representatives from the US Army, US Air Force, US Marine Corps, and a number of other Department of Defense and civilian agencies—in total, over 150 personnel. It took place over two weeks, the first week consisting primarily of several train-up



Using Precision and Tempo to Create More Challenges Than the Enemy Can Counter

Figure 5. Typical Battle-Force Tactics (From Training and Doctrine Command [TRADOC], "Tactical Wargame Report," draft, 1998)

vignettes to acquaint the players with Red and Blue capabilities and the second week consisting of two vignettes involving full-service participation. The scenario called for the employment of a joint and combined force against an aggressor in Southwest Asia who had violated the territory of a neighbor state and was determined to defend his gains. Blue units included AAN-era light and heavy battle forces, a Marine task force, a carrier battle group, several Army XXI divisions, and a number of host-nation (circa 2010–15) divisions. Red forces consisted of several heavy divisions equipped with 2020-era technology that gave them a slight edge over host-nation and Army XXI units. A learning curve was clearly at work for each side, as evidenced by dramatically different outcomes of the two vignettes. In the first, Red fought Blue to a standstill because Blue forces were committed piecemeal. But in the second, Blue conducted a simultaneous attack throughout the depth of Red's defensive zone and achieved decisive results (fig. 6). Insights from the TWG fall into four broad categories.

Joint to Interdependent

The TWG's most important insight is that successful military operations in the twenty-first century will require the judicious orchestration of all assets within the combined joint task force. The greater speed and reach of the battle force only heightens the need for tactical-, operational-, and strategic-level synchronization. The battle force is not designed to function as a stand-alone weapon. It employs a number of nonorganic assets, particularly in the form of "reach-out" fires and air support, to achieve operational successes. As one of the vignettes showed, the battle force can perish quickly if committed prematurely or used improperly. Future conflict resolution and termination require not only the ability to assign the right force to the right mission at the right time, but also the fluid interoperability of every available war-fighting system.

Synchronizing for Decisive Victory

Even with the advantages of twenty-first-century information technology, achieving decisive victory will prove difficult against an adversary capable and determined to *preempt* our actions rather than merely react to them. During the first vignette, Red aggressively targeted and destroyed a number of battle-force airframes as they arrived at the fight piecemeal. In so doing, Red effectively preempted Blue's subsequent operations. In the second vignette, Blue used every dimension of his available combat power to strike a single paralytic blow designed to knock Red off balance and to preempt further aggressive actions on his part.

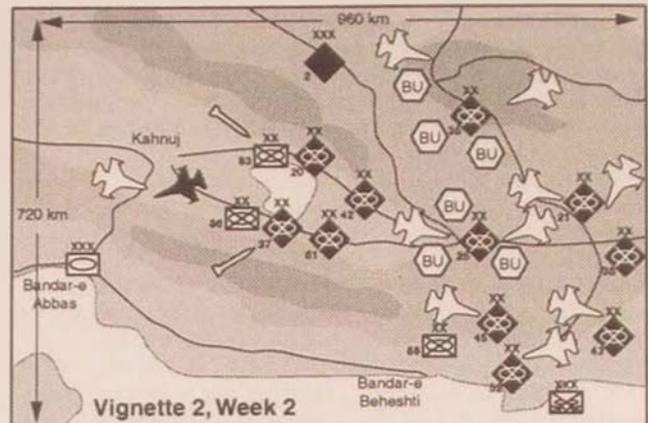
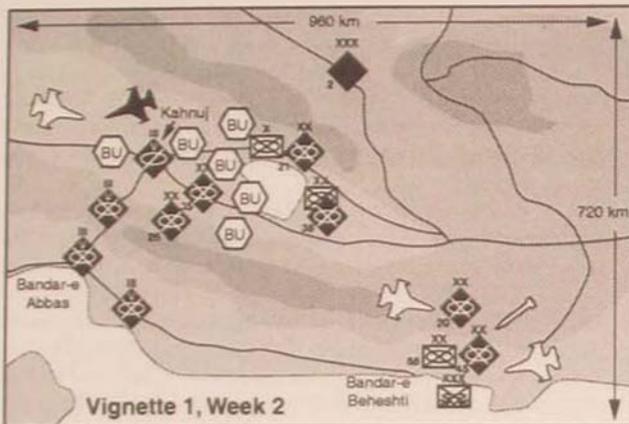
Complex Terrain and Nonlethal Weapons

Complex terrain will present significant challenges to the execution of rapid, decisive air-ground operations in the twenty-first century. As history shows, the difficulty of ejecting, destroying, or otherwise neutralizing an enemy in complex terrain increases exponentially with time. Even during the train-up week, Red forces always occupied complex terrain to offset Blue's long-range, precision-strike capabilities. As a consequence, civilian populations quickly became human "shields" that protected Red anti-air assets, which in turn greatly restricted Blue's air-ground maneuver. Nonlethal weaponry may offer a way to rapidly overcome an adversary's resistance in urban and complex terrain with minimal collateral damage. Future AAN TWGs will examine this option as a means to augment lethal weapons and to maintain operational tempo over an extended, highly urbanized battlefield.

Logistics and Strategic Reach

The desired strategic reach of the battle force depends a great deal upon achieving a successful "revolution in military logistics." The TWG demonstrated that the difficulties associated with sustaining combat operations over a prolonged period of time and across a

- Blue (white images) defined the Red force (black images) as the *center of gravity* and attacked it with the *direct approach*, while Red defined the Blue battle force as the *center of gravity* and attacked it with the *indirect approach*.
- Blue set terms for tactical engagements by first attacking *functions* (command and control, air defense, and fire support) and then attacking *forces*.
- Blue attempted to *arrange operations* into a continuous flow from deployment to engagement to *termination*.



- Red was able to retain initiative and *balance*.
- Blue's *operational reach* was inhibited by the distance to the intermediate support base (ISB) and the lack of lift aircraft.
- Blue did not fully *anticipate* the timing of Red's actions and could not set and maintain the *tempo* of operations.
- Blue attacked Red forces *simultaneously* and *in-depth*, throwing off Red's *balance* by creating more demands than Red could counter.
- Blue dominated the enemy by *leveraging* combat power across all dimensions, which clearly resulted in a *balance* in the mix and application of force.
- Blue relocated its ISB to improve its *operational reach*.

Termination is achieved through *disintegration*—the effects of the combined application of attrition, maneuver, and cybershock.

Figure 6. The Essence of the Operational Art Endures (From TRADOC, "Tactical Wargame Report," draft, 1998)

broad and deep theater of war will likely remain significant. Perhaps not surprisingly, fuel remains a critical issue for the battle force, even with systems that are lighter, less bulky, and more fuel-efficient. As history shows, the greater the capabilities of a particular system, the more it is asked to do. Research centers across the globe are currently

studying alternative fuel and propulsion systems in the hope of radically reducing the cumbersome logistical tail still required by land-power systems.¹⁵ Even if such advances are successful, however, AAN battle forces, by design, will make use of strategic airlift and sea-lift capabilities of the Air Force and the Navy whenever possible.

The vision of AAN is a force capable of executing operational maneuver over strategic distances and of winning quickly and convincingly under a variety of conflict situations. Such a force not only will increase the range of crisis-response options available to the Na-

tional Command Authorities, but also will bring us closer to realizing a historical imperative. Fully realizing that imperative, however, will depend upon how well the services work together to fuse airpower and land power. □

Notes

1. Also, an annual strategic war game provides insights relevant to the politico-military level of war. Robert B. Killebrew presents a comprehensive view of the AAN mandate and process in his "Learning from Wargames: A Status Report," in *Landpower in the 21st Century: Preparing for Conflict* (Carlisle Barracks, Pa.: US Army War College, 1998), 199–212.

2. Brig Gen Edward T. Buckley Jr. and Lt Col Antulio J. Echevarria II, "Strategic Preemption," *Military Review*, March–April 1998, 10–14. See also Training and Doctrine Command (TRADOC) Pamphlet 525-5, *Force XXI Operations*, 1 August 1994; *Knowledge and Speed: The Annual Report of the Army after Next* (Washington, D.C.: Chief of Staff of the Army, July 1997); and *Beyond Knowledge and Speed: The Army of 2025* (Washington, D.C.: Chief of Staff of the Army, November 1998).

3. See John H. Morrow Jr., *The Great War in the Air: Military Aviation from 1909 to 1921* (Washington, D.C.: Smithsonian Institution Press, 1993); Robert Wohl, *A Passion for Wings: Aviation and the Western Imagination, 1908–1918* (New Haven, Conn.: Yale University Press, 1994); and Lee B. Kennett, *The First Air War, 1914–1918* (New York: Free Press, 1991).

4. Ironically, while one aeronautical record after another was broken between 1905 and 1913, airships and fixed-wing aircraft had difficulty meeting design specifications laid down by military procurers in Europe and the United States. Morrow; and Kennett.

5. James S. Corum, *The Luftwaffe: Creating the Operational Air War, 1918–1940* (Lawrence, Kans.: University Press of Kansas, 1997), 17, 22.

6. *Ibid.*, 23.

7. The Tokyo raids took place from 1942 to 1945. One particularly intense period of bombing during May 1945 produced 125,000 casualties. The bombing of Hamburg (1943) took place over four months and caused 90,000 casualties. The controversial bombing of Dresden (1945) occurred over three months and generated 80,000 casualties.

8. The bombing of Hiroshima and Nagasaki produced 220,000 casualties within three days and helped convince the Japanese emperor to surrender.

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

10. During the Gulf War, for example, air targeting required a 72-hour planning cycle, which made it extremely difficult to attack mobile targets. See Michael R. Gordon and Bernard E.

Trainor, *The Generals' War: The Inside Story of the Conflict in the Gulf* (Boston: Little, Brown, and Company, 1995).

11. Such was the case with the analytical approach and strategic theories of Secretary of Defense Robert McNamara during the Vietnam conflict. As the war dragged on, US citizens lost faith in the military's ability to win it on favorable terms and at an acceptable cost.

12. Examples of these highly controversial arguments are too numerous to list. For a sample of those that focus on the future relevance (or prevalence) of strategic bombing, see Daniel T. Kuehl, "Thunder and Storm: Strategic Air Operations in the Gulf War," in *The Eagle in the Desert: Looking Back on U.S. Involvement in the Persian Gulf War* (Westport, Conn.: Praeger, 1996); Thomas A. Keaney and Eliot A. Cohen, *Revolution in Warfare? Air Power in the Persian Gulf* (Annapolis: Naval Institute Press, 1995); Lt Col John F. Jones, "Giulio Douhet Vindicated: Desert Storm 1991," *Naval War College Review* 45 (Autumn 1992): 97–101; Col Phillip S. Meilinger, "Giulio Douhet and Modern War," *Comparative Strategy* 12 (July–September 1993): 321–38; and Col Everest E. Riccioni, "Strategic Bombing: Always a Myth," *US Naval Institute Proceedings* 122 (November 1996): 49–53.

13. For an example of such an argument, see Richard P. Hallion, "Airpower and the Changing Nature of Warfare," *Joint Force Quarterly*, Autumn/Winter 1997–1998, 39–46.

14. Mark J. Conversino, "The Changed Nature of Strategic Air Attack," in *Landpower in the 21st Century*, 173–86, makes a persuasive argument for a new paradigm of strategic air attack and for retention of strategic strike capability.

15. On the need for a revolution in military logistics, see Yves J. Fontaine, "Strategic Logistics for Intervention Forces," in *Landpower in the 21st Century*, 129–46. Despite the advantages of computer automation and fast sea lift, the transportation and tracking of logistics within the US military need improvement. See David G. Harris and Richard D. Stewart, "US Surge Sealift Capabilities: A Question of Sufficiency," in *Landpower in the 21st Century*, 111–28; and Stephen B. Harris and David M. Keithly, "21st-Century Logistics: Joint Ties That Bind," in *Landpower in the 21st Century*, 147–59. Further solutions are offered by Jeanette K. Edmunds, "Organizing Logistics for Peace and War: The Necessity of a Trained Joint Logistics Support Command Headquarters," in *Essays on Strategy XIII*, ed. Mary A. Sommerville (Washington, D.C.: National Defense University Press, 1996), 221–54; and James W. Dowis, "American Global Logistics and Peace Operations," in *Essays on Strategy XIII*, 255–88.



Never mistake motion for action.

—Ernest Hemingway

The New American Security Force

COL JOHN A. WARDEN III, USAF, RETIRED*

Editor's Note: The following article by John Warden is the christening piece for APJ's new "Vortices" section. As indicated in this issue's editorial, Vortices is an area for opinion pieces that may be controversial and will hopefully spur further dialogue. In order to promote beneficial critical thinking yet protect its neutral position, APJ reminds readers with a clear disclaimer that ideas put forth in Vortices and elsewhere in the journal are authors' work/opinions only and are not "endorsed" by APJ. Warden's argument about a new security force is designed to make readers think and hopefully respond. Very well known as an author and strategist, most specifically for his role in Desert Storm planning, Warden here launches into new strategic concepts intended to leverage acquisition lessons and information technology in fielding and fighting a future aerospace force. We look forward to the winter issue of APJ, in which another noted expert will provide Vortices a response to this article. Along that same line, the other Vortices piece in the current issue is a response to our thought-provoking lead article by Col Rob Owen.

THE WORLD IS radically different today than it was 10 years ago: we live in an ultra-fast-time world where the geopolitical environment is without precedent in human history and powerful new technologies are appearing at an accelerating rate. Great new companies are born daily, and old-line companies that want to survive are re-creating themselves to realize the opportunities of the next century. It is now time for the United States to make similar changes in its military forces.

Over the next few decades, the United States will need to solve a number of security problems with significant military content that are not predictable in time, place, or specifics. Their unpredictability means that the nation must develop the ability to solve security problems (including peace-keeping and humanitarian relief) without knowing exactly what they will

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be. Fortunately, we know what some of the characteristics of the solution ought to be: solutions must be very fast in order to reduce to the minimum the damage that an aggressor might inflict or reduce to the minimum the human suffering associated with a war or a disaster; solutions must be precise in concept and execution; and the cost in money and lives must be acceptable. If the United States wants to protect itself and its interests, it must forge a military force specifically designed for a fast-time world and one that can give very high probabilities of success in defense and offense.

Revolutionary changes in the geopolitical and technological environment alone should drive revolutionary changes to the American military. On top of these changes, however, are two additional factors that dictate the need for new thinking: (1) domestic political pressure for superb military capability at a reasonable cost and (2) an expanding economy that will make it very difficult to man American military forces at current manpower levels. The combination of all four factors makes radical change imperative.

Rarely, if ever, in human history has a nation had such an opportunity to give itself substantially more security at an affordable price. The United States today can build a security force with the following characteristics:

- A force that capitalizes on unique American strengths in technology, organizational flexibility, and individual agility.
- A force that keeps up with and actually spurs the pace of technological progress.
- A multipurpose force that can defeat the most potent aggressors, separate third-party combatants, and provide relief to disaster victims.
- A force that combines so many different types of offense and defense that it presents an overwhelming challenge to potential aggressors.
- A force able to accomplish its objectives (from the defeat of enemies to disaster relief) with minimum loss of life, with low risk of failure, and at a fraction of the time and expense required today.
- A force that is so palpably effective that many would-be aggressors simply decide that aggression is too dangerous.
- A force that costs less while providing more security.
- A force that creates the future rather than reacts to it.

The prescription is not an evolutionary approach to security; rather, it is the logical outgrowth of the information age and the military technological revolution. It is a prescription for the first military force in history designed specifically to impose systemwide shock on an opponent in a time period measured in hours, while making very low loss and casualty rates a primary design feature of the force and its components. It also will be the first force in history that will have an opportunity to conduct a technological offensive which will define the future of warfare—and thereby reduce its likelihood.

An important aspect of the consulting services my company provides is to help corporations and organizations rethink their basic strategy. The process we use is very straightforward. We ask them to paint a compelling, measurable picture of the future they intend to create, find the key centers of gravity in the systems (their company, their market) they need to change, develop the campaigns to alter the centers of gravity, and decide how they intend to terminate phases and products. What follows is a “future picture” for that part of American security which involves military forces. A future picture is like a beacon; it tells you where you want to end up, but it doesn’t tell you the details of how you are going to get there. The focus of what follows is a security future picture and some ideas as to some of the campaigns that may be necessary to achieve it. I fully expect vigorous debate on these ideas. The debate will be most useful if it follows the construct outlined above. Is the future picture a good one? If not, what should it look like? After these crucial questions are addressed, then we can debate the validity of the campaign ideas. What we must avoid, however, is starting from the assumption that what we have is ipso facto ideal and requires only marginal change to adapt to a new world. The biggest single error that countries and organizations make in crafting strategy is failure to define the future picture. Let’s not make that error.

A Revolutionary World

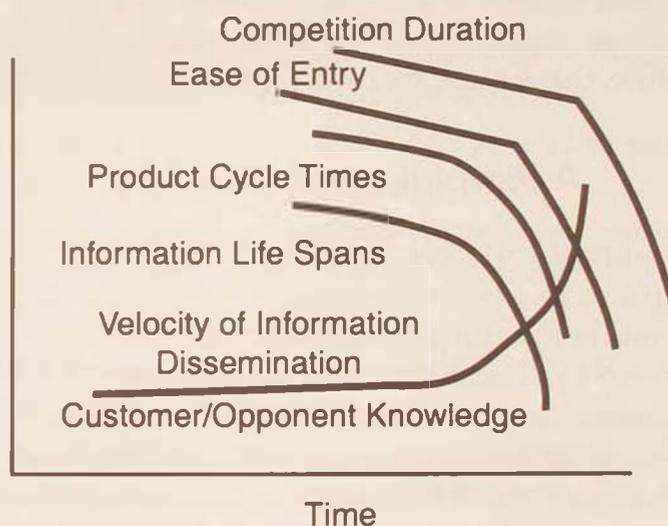
We are in what is almost certainly the most revolutionary period in the history of mankind. Success in this revolutionary world requires a revolutionary approach to problems, revolutionary thinking, revolutionary agility, and revolutionary velocity (table 1). These are the characteristics of today’s best companies—those that have created extraordinary value and wealth in remarkably little time. Unfortunately, these are not the characteristics of today’s American military forces. Indeed, it wasn’t necessary—in yesterday’s world. In tomorrow’s it is, for if the United States doesn’t choose to use the technological high ground, someone else will. Guaranteed. Several aspects of this revolutionary period are worth examining in a little more depth, for they are at once the drivers of change and the vehicles to do it.

Table 1
Success in the Revolutionary World

Revolutionary Period
Revolutionary Thinking
Revolutionary Agility
Revolutionary Velocity

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In the age of the information revolution, ideas and information move quickly—so quickly that information and ideas lose their value and impact rapidly as large numbers of people and organizations attempt to counter or transform the ideas for their own ends. In this kind of environment, hoarding information is counterproductive—success goes to the people who can exploit ideas with rapidity. The speed of information dissemination is directly linked to collapsing cycle times of products (fig. 1). Illustrative of the trend is Michael Dell's comment that his company (Dell Computer Corporation) keeps a maximum of eight and one-half days of parts inventory; to keep more would be to risk technological obsolescence. The information revolution also makes it easy for new entrants in any field of competition. For example, Amazon.com entered the bookselling world without any of the normal accouterments of the trade and did so with paralyzing speed and economy. Old skills and assets no longer provide the defense against penetration they once did. Of great interest, the duration of competitions—whether military, political, or commercial—is falling. The time available to win is shockingly short.

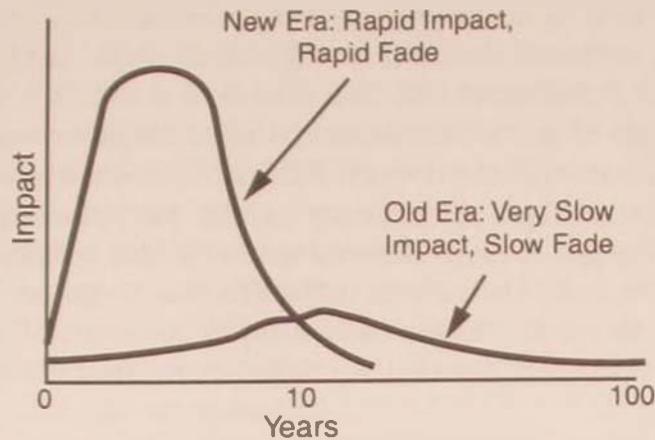


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Figure 1. The Information Revolution

In the old days, a new technology normally took a long time to be employed on a sufficient scale to have a general impact, and by the time it was having a general impact, the likelihood that any given country or company would enjoy exclusive benefits was quite small. In today's world, the situation is different: a new technology can have a huge general impact in a short period, and one company—or country—can reap the rewards (fig. 2). In the military sphere, the F-117 stealth fighter is an excellent example. It went from concept to fielded squadron in about five years at a remark-

ably low cost. When it made its first major public combat debut in the Gulf War, it not only shocked Iraq but also made every air defense system in the world obsolete.



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Figure 2. Impact of New Concepts

The Acquisition and Employment Concept Challenge

War is likely to be a much different thing in the future—especially for the United States—than it has ever been. The world almost certainly learned a lesson from Iraq's disastrous encounter with the United States (a lesson reinforced by the Serbia experience in the spring of 1999): whatever you do, don't put a big, expensive, slow-moving army in the field. Instead, bring strategic pressure on your enemies with ambiguous threats or actions that complicate the decision of the United States to intervene. If you must act overtly, do it very quickly to present a *fait accompli* and then ask for negotiations. By definition, you cannot execute a *coup de main* and achieve a *fait accompli* with a land invasion. The invasion itself is too slow, cumbersome, and obvious; and even if successful in itself, it leaves the invader hopelessly vulnerable to a power like the United States that is able and willing to seize air supremacy and attack the invader strategically. If you do decide to take on the United States, you simply cannot hope to beat it in the field militarily; instead, you must figure out a way to attack one of its centers of gravity—perhaps an indirect attack on the people or an attack that causes lots of financial loss. In short, the Newtonian, Clausewitzian concept of the battlefield itself has become an anachronism.

The United States, then, must find ways to attack the enemy's core systems in order to produce very rapid direct-system effects. Of course, these attacks will necessarily aim for near-total avoidance of civilian—and maybe

military—casualties and even much in the way of unintended property damage. To carry out system attack with impunity, the United States will need a panoply of weapons guaranteed to thwart any attempt at defense. Likewise, it will need a great variety of weapons if some of them are to be appropriate for attacking an enemy tomorrow about whom we know nothing today. To the extent that some agreement exists that the world in front of us is different, we need to see if our force structure and thus our means of acquiring it are consonant with the times.

In the long years of the cold war, we tried to engineer our force structure so that it was just sufficient—just sufficient to deter nuclear war, just sufficient to create enough uncertainty on the part of the Soviets that they would hesitate to begin a conventional war, and just sufficient to avoid losing territory in Central Europe but not sufficient to go on the offensive. We were able to adopt this historically unique approach because we had but one enemy to concern us and we believed we had measured that enemy adequately.

But now we are in the midst of the information revolution and in a world dominated by the superiority of the offense—and we can project this revolutionary period well into the next century. In this world, relying on a policy of reacting only to an identified threat as the basis for our force structure may be disastrous. We no longer have the luxury of depending on a rather sluggish Soviet Union to give us a measured threat. Instead, we have to consider any of a variety of almost two hundred nations and perhaps an equal number of powerful nonstate groups—which have four hundred or more agendas and four hundred or more ideas about how to fight. How could we conceivably be ready either offensively or defensively if we rely on reaction in this kind of environment? The United States must simply abandon its old threat-driven force-structuring system.

Let's remind ourselves of a couple of threat-driven systems currently in some stage of acquisition. The C-17 program, begun in the early 1980s, was in large part driven by the perceived necessity to get 10 army divisions in 10 days to Europe in order to counter a Soviet ground attack in Central Europe. Delivery of the C-17 to the Air Force started in the mid-1990s, nearly two decades after planning for it first began and at least a half decade after its *raison d'être* had disappeared. Although we are certainly finding good uses for the C-17, it is highly unlikely that it is the plane we would have requested and developed in 1995 for first delivery in 1999. In other words, long acquisition cycles guarantee technological and concept obsolescence in a fast-time world.

To cite another example, in the early 1980s, US intelligence organizations postulated a follow-on to the Soviet Flanker and Foxhound fighters. Our response, initiated in the mid-1980s, was to start work on the Advanced Tactical Fighter program—now known as the F-22. This aircraft, specifically designed to fit North Atlantic Treaty Organization shelters and operate over Central Europe, may become operational 20 years after the

program started—and will be a weapon system designed to counter the kind of technology and warfare we could envision 15 years ago that the relatively slow-moving Soviets might have developed by the turn of the century. As a contrast, Boeing made a corporate decision in 1990 to build an innovative large transport. The result? In 1995 the Boeing 777 flew successfully and entered service with major airlines the following year.

The United States is dominant militarily in the world today—and the primary reason it is dominant is that it has precision weapons, the ability to find targets for them, and the wherewithal to deliver them cheaply and rapidly. Without these attributes, the United States has no decisive advantage over most opponents. Although we need to improve precision in a variety of ways, including all-weather capability and precision of effect, the improvements we make are likely to be modest as opposed to the four-order-of-magnitude change since the B-17s of World War II. In the area of weapons delivery, we are likewise far ahead of the rest of the world, largely because of our stealth capability. Clearly, though, we cannot assume continued ability to penetrate defenses with impunity. (Witness the loss of an F-117 in the Serbian war.) Barring substantial improvements of our delivery capability, we will soon find ourselves unable to use our precision weapons as effectively and cheaply as will be required. Should this happen, we will lose our offensive superiority and be unable to further our interests proactively. What then?

The New American Security Force—Details

The answer is simple: there should not be a “what then?” Our objective should be to expand the lead we have over the rest of the world throughout the next century. By doing so, we will do more for world peace than any nation has ever been able to do. We must develop and field new systems rapidly—but in numbers just sufficient to force potential enemies to devote impossible efforts to defense or simply abandon military provocation. In other words, we become the threat. Instead of following our old practice of developing a new offense or defense in response to someone else’s developments—a concept institutionalized in the acquisition milestone process—we become the threat and force everyone else to react to us. We should define and create the future we want—not wait to become the victim of someone else’s future. So the question is not how technology will shape the US military but how the US military will use technology to shape the future we have chosen.

Central to the new approach is rapid development and fielding of small numbers of highly productive, revolutionary platforms, techniques, and weapons. The goal is to see at least one new system fielded each year at the end of a one-to-three-year development cycle. With a new air, space, land, or sea system appearing every year, potential enemies will find it nearly impossible to develop workable defenses. More particularly, defense against the New American Security Force in operation will be stunningly

difficult because many different types of systems coming from a variety of directions, altitudes, speeds, and spectral characteristics overwhelm the defense. Because the force is built around weapons with precision of impact and precision of effect, within 10 years of the time the New American Security Force is adopted, American security forces will be able to impose strategic, operational, and tactical paralysis on an Iraq-sized enemy in less than 30 hours from a cold start in the United States with little or no unintended, irreversible destruction. The largest conceivable enemies would suffer the same consequences in two to three days.

The New American Security Force needs little in the way of overseas basing and has no requirements for forward logistics depots. It puts very few people at risk while carrying out its operations because it is a highly capital-intensive force that has done away with platforms and organizations dependent on masses of people for success.

By the time the new program has been under way for 10 years, US capability will have increased by an order of magnitude—and the security budget can fall by about 20 percent in constant dollars. Some people may think that this is an impossible strategy in a low-budget world. But is it? It is impossibly expensive only if we are stuck with cold war ideas on quantities. For example, we have just over 60 F-117s, but the world must react to those F-117s just as much as if we had many hundreds; in the new age, remember, effect on the opponent comes from precision, not numbers. Our problem, though, is that the world has had over 10 years to evaluate the F-117; it is (was) only a matter of time until someone learns (learned) how to deal with an aircraft born in the infancy of the computer age. Our answer must be an “F-118,” maybe a little more stealthy but, more importantly, something that operates in a significantly different speed and altitude regime—in a regime where the defenses developed against the F-117 are unlikely to be effective. How many F-118s do we need? Not many—maybe a squadron or two—because the world must react more to a couple of these squadrons than it reacted to thousands of F-4s or F-16s, which depended on numbers for their success. How many different types should we have in the inventory? A lot and all radically different—maybe 10 to 15 substantially different air/space/information-war platforms in the Air Force, for example, each occupying a unique niche. The other services should have a comparable mix of platforms. Imagine trying to defend against this kind of force!

This new strategy is a technological offensive. We should plan to develop and field a squadron equivalent of a new weapon system every one to three years for most systems. Small numbers are relatively cheap—if we start out with the idea of producing only small numbers and then throwing the jigs away or converting them to something else. Think about how cheap the very fast, low-number F-117 program was. Fast means huge savings in program costs. Small quantities mean we don't need the huge infrastructure requisite for long production runs that almost always

demand the potential for unrealistic surge rates. Small and fast mean lower program costs, which in turn mean less congressional concern with excesses and profiteering. Finally, a new system every three years or so means that lots of companies, perhaps somewhat more agile and leaner than today's behemoth defense contractors, will have frequent opportunities to win an F-117-sized contract. Of great importance, under the new approach, many companies that will provide revolutionary systems will have never previously sold a thing to the government!

A quick review of the F-117 program is illustrative—in part because just 60 airplanes have had an impact beyond anything in our experience. In November 1978, the Air Force asked the Lockheed Skunkworks (subsequent to a proposal from the Skunkworks itself) to build five full-scale development and 15 production aircraft. The first flight was in June 1981, and the first unit was ready to fight in October 1983. The flyaway cost was \$43 million each, compared to the \$50 million for the F-15E a few years later. The latter was just a variant of the F-15 air superiority fighter and was a linear improvement to the F-111, which first saw service in the Vietnam War. The F-117 was a killer application (in today's high-tech parlance) that would make everybody's air defense system obsolete. Where do you want to put tomorrow's dollar?

We really can do things quickly and cheaply, and we have done it many times in the past even before the F-117—well before we had available to us the powerful tools of computer-aided design and manufacture, which in turn allow the paperless planning that is key to fast cycle times. Examples include the U-2 program that was eight months from inception to first flight and the very high-tech SR-71 program that went from a Central Intelligence Agency idea in 1957, to manufacturing go-ahead in January 1960, to first flight in April 1962. Initial operational capability (IOC) was in November 1965—in other words, five years from the time the Skunkworks got the order to IOC. The cost was \$100 million (then-year dollars) for the first five and for a capability still unmatched almost 40 years later! A final example is the Minuteman I, our first solid-propellant intercontinental ballistic missile, which went from a request for project funding in January 1959 to IOC in December 1962.

Short-cycle programs are really inexpensive when measured against their impact; every one of the Lockheed projects was cheap—and they were also quite cheap when compared with most other major traditional programs. In today's world, time is what costs money. The history of short-cycle programs in military and commercial spheres indicates that it is possible to field a very effective new weapon system—if the numbers are kept small—for \$2 to \$15 billion. Keep in mind that these dollars buy a fielded military capability!

By having small contracts (\$2 to \$15 billion) with a maximum duration of five years, many nontraditional firms will enter the security business. This will increase competition, innovation, and the quality of products, as

well as provide significantly more opportunity than the once-a-generation big contracts that have recently become a way of life.

It is imperative to realize that we are in an era of rapid change; if a semiconductor company were to buy a chip-fabrication machine and claim it was going to use it for the next 30 years, everyone would laugh and short the company's stock. Yet, that is exactly what the US government is proposing for virtually every one of its planes, ships, and tanks.

Some readers will take issue with the idea that we need new platforms. They will argue that new weapons and software are quite adequate and that we can continue to use existing platforms for decades to come. In my view, there are disqualifying objections to this approach. First, an aircraft like the F-22 will fly at exactly the same speed and have close to the same range and cargo capacity 30 years from now. That means that all potential opponents will have years to develop defenses against a relatively fixed physical platform. It means that 30 years from now, we will still have to find bases within the F-22's refueled radius, that it will still take x hours to get to a target area—after deployment to a forward base—and so on. It means that we won't build anything new because we have so much money "sunk" into the old system. It means we become prisoners of the past. If there were a compelling reason to freeze ourselves, or if we didn't have the capability to achieve regular order-of-magnitude increases in capability, and if we knew what the future was going to be, then a 30-year airplane might make sense. In reality, it doesn't, and the cost—in dollars, opportunity, and risk—to make large numbers of 30-year airplanes is simply prohibitive. Let's create the future, not adapt to it defensively.

It seems hard to argue that there are technical barriers to building new systems every one to three years. Some people might think that supportability is an issue, but, in fact, if we apply the kind of Six Sigma quality process that Motorola and Texas Instruments use, there is no reason to assume that things will break very much.¹ High breakage rates were really a function of an attrition-war approach to maintainability—build a lot, buy a bunch of spares, and overwhelm the problem with numbers. Look at the in-commission rates for the F-117s during the war—well over 80 percent.

How about training and employment? Won't that be a nightmare? Not really—because we will build new systems using the hardware equivalent of the Windows computer-operating system; if you know how to do Windows, you can manage the basics of almost any program, even if you have never seen it before. In other words, the what and how of a new system become transparent to the operator. Now think about it from the standpoint of the operational-level commander. Would you not like to have available to you 10 or 15 radically different systems with which to attack or defend an opponent about whom you may know nothing until days or hours before

hostilities erupt? Or would you rather be stuck with just one or two types of systems for which you know the enemy has had years to plan a defense?

All of this is doable—from a technical and operating standpoint. But is it politically feasible? Yes—if it becomes a national strategy orchestrated from the White House and supported by the American people. We make it national policy by convincing the president and the Congress that it not only makes eminent sense for the country but also is politically attractive. The administration frees itself from the need to defend a program that may have started four or five presidents back for reasons which have become obscure. Congress sees lots of smaller contracts going to companies in many areas of the country instead of one or two big contracts a generation going to one or two states. And projects get finished while the majority of congressmen who originally voted for them are still in office; at least a third of the Senate would not have run for reelection. Consider how much stability this adds to funding! Business people are thrilled by it because it reopens the game to those who have not been traditional big-production-run defense contractors. The American people like it because they see results—spectacular results—frequently. Everybody is a winner, as contrasted to the present system in which very few win and in which excitement is notably absent.

Opposition to the New American Security Force will be fierce—just as the opposition has been to every new military concept and idea. The Army resisted the repeating rifle and machine gun; the Navy fought the move away from sailing ships; the last combat horse-cavalry regiment survived in the United States until 1943; the Air Force resisted the change from propeller to jet propulsion; and every service and command fights desperately to prevent reductions in personnel or budgets. Many people will argue that a conservative approach to security affairs is necessary. They are right—except in today's world, the conservative approach is the high-velocity approach, not the slow-change methodology of yesterday. The New American Security Force will also certainly require radical restructuring of the acquisition community—including wholesale elimination of those parts created to manage cold war affairs.

Our technological offensive strategy allows us to exploit the technology and integration with which we excel. It means that potential enemies will face multifaceted problems that make defense next to impossible. It means that we will always have a system in operation which is near state-of-the-art—not exactly the case with 20-year programs today. Finally, we can have an affordable program even in an era when defense budgets may revert to their historical levels in the United States of 1.5 to 2 percent of the gross domestic product. Very simply, high tech, done right, is cheap—far cheaper than the low-tech attrition-war equipment that is now such a large part of our inventory. Thus, we can have a very large standing Air Force, even today, if we measure size in output terms—effect on the

enemy—rather than measure size from inputs like numbers of aircraft, tons of bombs, and so on.

Military Services in the New American Security Force

In the New American Security Force, most of the services will be radically different. They will be much smaller in terms of personnel and much more powerful in their ability to affect an opponent or succor the afflicted in a disaster. The following points illustrate what each might look like if the next administration aggressively pursues this strategy:

- *The Army:* By 2010 the Army becomes a fast, shock-exploiting force that no longer needs heavy tanks and artillery although as a transition measure, heavy equipment remains in the Guard and Reserve. Its total active personnel falls by about half, but by 2010 it is able to employ significant power from the United States within about 30 hours.
- *The Marine Corps:* The Marines remain essentially the same size but acquire new high-tech systems in small numbers for specific applications. The corps provides a hedge in the event labor-intensive forces are unexpectedly needed and is the key force for emergency non-combatant evacuation operations.
- *Special Operations Forces (SOF):* The organization and structure of SOF do not change appreciably. SOF continues its highly specialized concentration on dealing with small problems that require on-scene, precision human intervention.
- *The Air Force:* By 2010 the Air Force sees its ability to affect an enemy increase by more than an order of magnitude while its total inventory of manned combat aircraft drops to about one-third of today's numbers. At the same time, however, its high-end unmanned aerial vehicle numbers climb from none today to over one hundred. Its platform emphasis is on very high speed, duration, and range, as well as very high productivity. Similarly, active space forces play a substantially larger role with the advent of offensive and defensive space-based weapons (which will require policy changes that are probably inevitable in any event). The number of people in the Air Force drops considerably, but those who remain are far more productive because they have better tools. Beginning with the advent of the new combat systems, the Guard and Reserve take over about one-third of the new systems as they are produced, with the exception of the new bombers, and the Guard and Reserve are integrated with the active wing in much the same way they are in transport wings today. Land-based nuclear missile forces phase out by 2006 as the conventional force is able to impose any desired degree of damage on an opponent.

In the unlikely event of a need to drop a nuclear weapon, either stealthy, long-range, high-speed bombers or Navy sea-launched ballistic missiles will be available.

- *The Navy:* In the New American Security Force, the Navy eliminates its large-deck carriers. A platform created prior to World War II to make up for the short range of attack aircraft is no longer needed when land-based aircraft and space-based weapons have ample range to reach any area. As a transition measure, however, the Navy keeps its small-deck carriers to support Marine Corps operations. While the Navy is reducing its dependence on labor-intensive big-deck carriers, it fields a new ship design a year (with five to 10 ships in each class) for high-speed, stealthy operations against enemy and criminal shipping. The new ships have only a fraction of today's manning but are far more effective because of their range, speed, low visibility, and precise weapons. Every couple of years, the Navy also fields a new submarine that is more lethal and more productive from a manpower standpoint. The new surface ships and submarines are all equipped to carry state-of-the-art unmanned aerial vehicles with a variety of tasks. As with the new air and space vehicle program, the new ships are not prototypes for a new class of mass-produced ships; rather, they are unique vehicles designed to capture the very latest technology in weapons, materials, propulsion, and computational power.
- *Less traditional missions:* All components will have a role in separation of third-party combatants, illumination operations (a new form of information warfare), disaster relief, and suppression of weapons of mass destruction. In each of these, however, the emphasis will be on getting the job done with capital-intensive equipment that requires little or no ground infrastructure in the target area.
- *Weapons programs:* The weapons-acquisition process will be similar to the platform-acquisition process, in that the goal is to produce a small number of radically new weapons frequently. These programs will be lean and mean because they will not need floor space and supporting infrastructure to turn out industrial-age quantities of munitions. Good exchange will exist between the weapons programs and the platform programs—something that is difficult today because of the decades-long development times for platforms. These lengthy development times virtually guarantee that both weapons and platforms will be far behind what is technologically possible.² With short cycle times (one to three years) for platforms and even shorter cycle times for weapons, it will be feasible to optimize weapons for platforms and vice versa, depending on where the relative advantages are. In addition to rapid development of lethal weapons (albeit with accelerating precision of effect as well as precision of impact), the new program will also develop nonlethal weapons. The latter will have great utility in dealing with third-party problems and will provide the United

States with a politically usable preemption option. In addition, the new program will accelerate the development of energy weapons for defense and offense. We also will see development of disaster-relief “weapons,” ranging from food to medicine to shelter, that can be delivered from a variety of aerial platforms having primary combat duties. Never again will we encounter the absurd situation we faced in Kosovo, where we could drop lethal bombs but could do nothing to help the population until hostilities ended.

- *Performance:* The primary measure of a force structure is how quickly it can impose strategic and operational paralysis on an opponent. This is not to say that imposition of strategic and operational paralysis is sufficient in all cases; it does say, however, that once an opponent is in a state of paralysis, he becomes rather easier to manage than when he is active. We know from historical experience that a military organization above a tactical level loses its ability to function operationally when it suffers rapid losses of its communications, supplies, transport, and major weapon systems. In the Gulf War, Gen Norman Schwarzkopf took the very conservative position that a 50 percent attrition imposed on the Iraqi army in Kuwait would render it ineffective, and he decided not to begin ground operations until he reached that number through aerial attack. We don't have as good a feel for what percentage of strategic targets needs to be hit, but the very conservative assumption that 90 percent would put any organization out of business seems more than reasonable. By 2010 the New American Security Force will be able to impose these losses on an Iraq-sized opponent in just over 24 hours from a cold start and without deployment—and do the same thing to another opponent 24 hours later, and so on. In other words, the New American Security Force concept solves the multiple contingency problem with almost no added cost. Speed and range are cheap when measured against what they provide and against what they free you from doing.

In addition to hardware, significant organizational change will be necessary to allow the United States to operate in a fast-moving, information-age world. These changes will extend well beyond the Defense Department (whose name itself should change), but let us confine ourselves at this point to addressing military organization. First, the president is appointed by the Constitution as the commander in chief. For most of our nation's history, at least two military officers—experts in the business of force—have had direct access to the president. In World War II, four officers had easy and regular access. With direct advice from the experts, the president had the information he needed to make decisions about alternate courses of action. In today's world, one officer has access, but it is constrained. Thus, the president is dependent on filtered advice and has essentially delegated responsibility—something he is not permitted to

do. Second, the military establishment is organized much as it was when World War II ended. Our forces are parceled into geographic "CINCdoms," where the local commander has responsibility for today's battle but neither responsibility nor resources to prepare for tomorrow's global threats. An organizational system developed when communications and air travel were in their infancy has little relevance to today's world. Radical restructuring is essential to allow concentration of resources in the center, from where they can be dispatched to achieve quick results and returned quickly to prepare for the next operation. Organizational change in itself will help significantly in allowing us to rethink the multiple simultaneous-contingency problem.

These are but two examples of organizational dysfunction; many more exist within the services themselves, which have a structure that Frederick the Great would have recognized immediately. It is not the right answer.

The New American Security Force is about the hardware, people, and structure necessary to ensure that America can further its interests successfully for an extended time into the future. It is not about jealously guarding ancient prerogatives or resisting change. The rest of the world is making rapid and wrenching adjustments to the most exciting era in human history; the US military should be in the vanguard—not the rear guard.

Conclusions

We hope we don't have to go to war again anytime soon. If we do, however, it is imperative that the United States win—quickly and cheaply and on its terms. The United States should be able to dictate the outcome of any war at least as cleanly as it dictated the outcome of the war to the Iraqis. The object is not a fair "*mano a mano*" fight but one that will overcome the enemy in minutes without spilling a drop of unintended blood on either side. Likewise, when human lives are at stake following a disaster, we ought to be able to do something about it immediately. We can do this, and we can ensure long and prosperous peace for the United States and for the whole world only if we press our technology and intellectual advantages aggressively. Our goal must be to dominate the military technological revolution for the next century. We can do it—if we adopt a new strategy and new ideas consonant with the information revolution, not one mired in the first industrial age. We are in a genuinely new period of history with unprecedented opportunities to advance peace and prosperity. In this new era, however, we cannot afford to use yesterday's ideas and measurements. We must move to a New American Security Force. □

Montgomery, Alabama

The New American Security Force in Summary

Desired Force Characteristics. US military forces should have the following characteristics:

- Ability to conduct operations around the globe with little or no notice.
- Ability to conduct successful operations without depending on overseas bases.
- An array of offensive and defensive capabilities that no actual or potential aggressor has even a small chance of defeating.
- Ability to impose strategic and operational paralysis on any opponent in 24 hours or less.
- A mix of nonlethal and lethal weapons that have precision of impact and precision of effect (hit where they are supposed to hit and do only the damage necessary to accomplish objectives).
- Ability to capitalize on technology to get the job done in minimum time, with minimum risk, and with as few people as possible exposed to enemy fire.
- Ability to be highly asymmetric vis-à-vis potential opponents.

New Approach. Advances in technology and the necessity to have a global force capable of defeating any future aggressor allow and demand a new approach to force acquisition and sizing:

- It is not possible to predict who potential enemies will be or what military capabilities they will have; thus, US force structure can no longer be based on response to a threat, as it was during the cold war.
- The highest probability of defeating a future opponent will come from having multiple attack (and defense) platforms and weapons that capitalize on the latest technologies. Potential enemies will have little or no chance to develop appropriate defenses.
- To capitalize on the latest technology, we must shorten weapon-system development cycles (not more than one to three years, as in the case of the SR-71, U-2, F-117, Boeing 777, and GBU-28).
- By 2010 the United States can have a minimum of eight to 10 new major weapons platforms (air, land, sea, and space) and a greater number of new weapons (bombs, rays, and other devices). This force can have many times the impact on an opponent than what is currently available.
- Each new platform system will have only a small number of "vehicles" (not more than 20 to 30 in most cases). Small, one-time production runs mean that many new companies can participate because they don't need the floor space, overhead, and decades-long financial commitments that are requisite for today's defense industry. Small numbers are possible because each new system is highly productive—and is many times more productive than most current systems.
- The cost for a large increase in capability coupled with significant decreases in reaction time will be less on a yearly basis than that for today's force (includes platforms, personnel, basing, procurement, etc.) and will be a decreasing percentage of the gross domestic product.
- Development and fielding of this force can be done but only with a new approach to strategy and procurement. It also requires a cultural change—the ability to move from a force concept born in the industrial age to one born in the computer age and one measured not by the number of things or people in it, but by its ability to affect an opponent.
- The New American Security Force creates the future.

Notes

1. "Motorola's Six Sigma asks that processes operate such that the nearest engineering requirement is at least plus or minus six sigma [six standard deviations] from the process mean." Thomas Pyzdek, "Motorola's Six Sigma Program," 1997; on-line, Internet, 7 July 1999, available from <http://www.qualitydigest.com/dec97/huml/motsix.html>.

2. As an example, the Air Force has developed a concept called the "small smart bomb" that has the potential to multiply the effectiveness of bomb-dropping aircraft by a factor of about three. Unfortunately, there will be difficulties incorporating it on aircraft like the new F-22 because that aircraft program is so massive that changing it to accommodate new technologies is expensive and difficult.

*You have to be careful if you don't know where you
are going because you might not get there.*

—Yogi Berra

Understanding Peace Operations: A Reply to Col Robert C. Owen

THOMAS R. SEARLE*

IN "AEROSPACE POWER and Land Power in Peace Operations: Toward a New Basis for Synergy," which appears in this issue, Col Robert C. Owen makes some important points about peace operations, but I take exception to some of his views. Let me begin by defending the United States against Colonel Owen's accusation that all of our interventions are "imperialistic," "hegemonic," and "self-interested." (He starts out by accurately stating that foreign and domestic opponents of a US intervention will claim that such interventions are hegemonic, but then he seems to come around to this view himself.) The United States has been the world's leading economic power since at least 1918 and the leading military power since at least 1945. As a result, for more than half a century (and arguably for 80 years), *every* US interaction with another country has involved the substantial power advantage of the United States over the other party and could be portrayed as a US effort to dominate others. Peace operations could not possibly be different, and we should be used to this by now. This, however, does not mean that every US peace operation is *in fact* hegemonic or perpetrated against the will of "the locals." To take an obvious example, the United States has stationed troops in the Sinai for decades to monitor the Camp David peace agreement between Egypt and Israel. The peace they have been keeping is in the best interest of both Israel and Egypt; both nations welcome the US presence; and neither side regards the peacekeeping force as evidence of US imperialism. Contrary to Colonel Owen's claim, Egypt and Israel do not feel that the peacekeepers represent a "reduction of their sovereignty." The US troops do not "mak[e] the locals behave"; instead, they help the Egyptians and Israelis do what they already want to do—remain at peace.

The locals on both sides of a conflict sometimes welcome peace operations. Even more importantly, the policy makers of rich, powerful countries respond to claims that they are being hegemonic and imperialistic. Colonel Owen dismisses the fact that many of the troops conducting peace operations come from Pakistan, Botswana, and other clearly nonhegemonic and nonimperialist nations by noting that they could operate only with the assistance of richer, more powerful countries. But he misses the point. The key question is not, Could small, poor, weak countries project forces around the world without the help of big, rich, powerful countries? Rather, the question is, Why do big, rich, powerful countries want to

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include the forces of small, poor, weak countries in their peace operations? To take the example with which Colonel Owen is most familiar, why should the 32,000 troops of the Bosnia Stabilization Force be drawn from about 40 different countries? Including contingents from so many nations increases the expense of these operations and vastly decreases their military effectiveness by causing enormous command, control, communication, linguistic, and logistics problems. These problems are compounded by the fact that different nations often give their troops rules of engagement (ROE) that are different from those promulgated by the nominal combined-force commander. The richer countries put up with this added expense and decreased military effectiveness precisely because doing so makes it harder to demonize these operations as hegemonic and imperialistic. If the North Atlantic Treaty Organization (NATO) *and* Russia *and* several Asian countries *and* several African countries and so forth, are *all* willing to send troops to enforce the peace somewhere, then that peace is more than just the imperialism of the United States or the West or even the rich and powerful. It is something like a global consensus. In order to achieve such a consensus, rich and powerful nations have to negotiate with the less rich and less powerful to gain their cooperation, and, in so doing, the rich and powerful sacrifice money, military effectiveness, some of their self-interest, and their hegemony.¹ For example, bringing Russian troops into the Bosnia and Kosovo peacekeeping operations has made both operations more difficult but less hegemonic and imperialistic (and hopefully more *politically* effective in the long run).

Oddly, Colonel Owen then goes on to claim that nations should intervene only in situations that “truly involve significant national interests and can be accomplished with a net improvement in the national conditions of the intervening and perhaps even the intervened states.” This is a classic statement of self-interest, but if all interventions were actually as self-interested as he claimed earlier, then nations would already be following this criterion and he needn’t waste a paragraph lecturing them on the point. Of course, for all Colonel Owen’s wishes that nations might follow only their enlightened self-interest, they in fact often behave less “rationally” or at least less self-interestedly, as he acknowledges by reminding us that self-interest should be a prime consideration.

More damaging to Colonel Owen’s case is that his criterion for choosing peace operations clearly does not apply to the United States. He claims that nations should intervene only when “the intervention truly is necessary *and* [when the nation] likely will come out of the intervention stronger than when it went in. Any less disciplined approach is the first step to strategic overreach.” But clearly, US intervention in some failed state (Bosnia, Rwanda, Haiti, Somalia, etc.) is not “necessary” to the United States, and, whether successful or not, its impact on US “strength” will be so small as to be immeasurable. For the sake of argument, let’s assume that the US intervention in Haiti succeeded and that the interven-

tion in Somalia failed. The impact on Haiti and Somalia is enormous, but in a US strategic sense, so what? Surely Colonel Owen does not think that intervention in Haiti has appreciably increased the strength of the United States or that failure in Somalia appreciably weakened us. And note the extravagant US apologies for not intervening in Rwanda. For the United States, there are not only costs of intervening but also high costs for *not* intervening. The choice for the United States is not, as Colonel Owen suggests, between the possible gains from intervening and risk-free nonintervention; instead, the choice usually comes down to the cost of intervening versus the cost of not intervening, with both options leaving the United States weaker or unchanged.

Colonel Owen is very concerned about the costs of peace operations, but by taking them out of context, he tends to exaggerate these costs. Although every life lost is a tragedy, US military fatalities in peace operations have been tiny compared to what the US Department of Defense (DOD) suffers in accidents. If the current rate of accidents will not destroy the force, then losses from peace operations are no threat at all. The financial, training, and morale burdens imposed by peace operations appear large because we have not adjusted our budgeting, training, and organization to make such operations routine. When we do (through initiatives like the Air Expeditionary Force), these burdens will not seem so great. For example, think of our current forces in South Korea. At about 37,000 personnel with all the appropriate planes, trucks, tanks, and guns, they amount to less than 3 percent of our total active force, and no one suggests that maintaining them for the foreseeable future will burst the budget or destroy the services. However, if Korea were a brand-new commitment for which none of the services had made any plans or budget requests, it would seem like a crushing burden and severely disrupt the entire DOD. As peace operations become institutionalized, I think they will become less burdensome—as has our commitment to Korea.

Colonel Owen's unwillingness to acknowledge cases like the US Army's Sinai Battalion and other nonhegemonic peace operations leads him to ridicule the possibility of peacekeepers' being neutral and to speak in terms of "enemies" in peace operations. It seems clear that the US troops have maintained their neutrality in the Sinai and have no enemies there, even though the peace between Israel and Egypt may have helped one country more than it helped the other. The Sinai is a peacekeeping operation, and, depending on how one defines *neutrality*, one may find it very hard to achieve neutrality in peace-enforcement operations; but declaring *enemies* and abandoning all efforts at neutrality is likely to be counterproductive. The goals of peacekeeping and peace enforcement are (to repeat Colonel Owen's quotations from Joint Publication 3-07, *Military Operations other than War*) "to monitor and facilitate implementation of an agreement," "support diplomatic efforts to reach a long-term political settlement," and "maintain or restore peace and order." Some of the locals will

be more inclined to oppose these goals than others are, but that does not make them our enemies or some other side our allies. War is the effort to help our allies triumph over our enemies, and peace operations are different precisely because we do not seek victory for one side. Occupation operations after a victorious war (e.g., in Panama after Operation Just Cause) may resemble peace operations, but profound differences exist. I assume that when Colonel Owen speaks of peace operations, he does not include occupation and reeducation of defeated enemies.

Colonel Owen claims that the key difference between airpower and ground power is presence: the former is generally “not there” while the latter is generally “there.” This difference can be overstated. Even air forces have to be based somewhere, and Khobar Towers reminded all of us that the “somewhere” we use as a base can be vulnerable to attack. But the fact remains that during peace operations, manned fixed-wing aircraft will often not get within two miles (10,000 feet) of a potential target and rarely move slower than several hundred miles per hour. Ground forces, on the other hand, typically get within handshaking, passport-checking (eye-gouging?) range of potential targets and are often stationary. Oddly, Colonel Owen ignores the obvious fact that this means that, by ground standards, air systems are hopelessly inaccurate and imprecise. Every sensor that can be mounted in space or on an aircraft can be ground-mounted less expensively and is less accurate than a physical “hands-on” inspection. (When I want to buy a car, I do not try to find a satellite photo of it. Instead, I look at pictures taken by someone on or near the ground or, better yet, go look at the actual car.) The same Global Positioning System and laser designators that have revolutionized the accuracy of bombs dropped from several miles away work just as well for guiding artillery shells and ground-launched missiles. Besides, the best precision-guided munition performance to date is no better than that achieved by the half-trained fanatic who drove his truck-bomb into the US Marine Corps barracks in Beirut. We can talk about “surgical” air strikes all we want, but the fact is that when I have had real surgery, the surgeon was inches—not miles—from his “target,” and I wanted it that way.

The surgeon example leads us to the next major weakness of airpower: severely limited choice of weapons and effects. Aircraft can drop bombs as large as the one that demolished Khobar Towers, but they can't wield scalpels. At the low end of the spectrum, aircraft run out of munitions and options, resulting in either inaction or severe collateral damage. Ground forces do not face such tight limits. For example, not only the armed forces but also thousands of police SWAT teams across the United States have snipers capable of killing (or even deliberately wounding but not killing) a single man in a crowd, without harming anyone else around him. They can even kill him without harming a hostage he is physically touching. Currently, aircraft can't deliver a munition as small as a rifle bullet within inches of its aiming point. As a result, aircraft are not very good

at freeing hostages. In addition, the inability of aircraft to interpose themselves between people on the ground makes it very difficult to prevent people from being taken hostage. (In fact, in Bosnia, hostages were taken *because* of air attacks.) Further, ground forces can use nonlethal weapons (nightsticks, stun guns, handcuffs, etc.) and even bare hands to control people's behavior and take them into custody without killing them. The ability to arrest and detain suspicious people without killing them or endangering those around them is critical to reestablishing peace and order. Aircraft currently can't take prisoners for trial later, so the aircraft faces the choice of killing everything (guilty or innocent) within the blast radius of the smallest weapon on board—or doing nothing. Until we have air weapons that can kill the targeted man but not wound the hostage next to him, we will need ground power to free hostages. Until we can “set phasers on stun” and “beam up” the stunned suspect (or otherwise make arrests from the air or space), we will be stuck with ground power as our method of making arrests.

Airpower's inaccuracy and limited mix of weapons are, of course, relative. Every day, our ability to see and hit things from long range at high speed gets closer to our ability to see and hit them from a range of two feet and zero relative motion; eventually, the gap will close entirely. Similarly, the range of weapons available to aircraft continues to expand daily. (The US Marine Corps in particular is working hard at reducing the collateral damage of air weapons and expanding the number of nonlethal weapons available to airpower.) As a result, we should not be surprised to see more tasks move from the ground to air and space, as they always have. But we must not get so excited about our recent technological progress that we forget how accurate, flexible, cheap, and effective ground systems are.

The real advantage of air and space is that it gives us an overhead angle of vision (from which sensors and targeting systems may be more effective than at ground level) and the ability to observe and target places the ground troops can't get to. In Colonel Owen's “there/not there” phrasing, ground systems “there” are typically more effective than air and space systems “not there,” but ground systems “not there” (i.e., in denied areas) are virtually useless, while aerospace systems “not there” may be very effective indeed. Since peace operations are generally conducted under conditions that allow us greater ground access than we typically enjoy during wartime, airpower's and space power's ability to fly over denied areas will normally be less important in peace operations than during wartime.

Of course, with capabilities come tasks and risks. The ability to make arrests encourages decision makers to demand arrests, and that is what got Task Force Ranger in trouble in Somalia. The seven missions they ran trying to capture Gen Mohammed Farah Aidid and his chief lieutenants were successful “snatch” operations (although they never captured Aidid himself). Unfortunately, on the seventh mission, one of the helicopter pilots

violated his ROE and got shot down by an RPG-7 in the middle of a hostile city. Showing more valor than perhaps they should have, the task force attempted to conduct combat-search-and-rescue operations in what may have been the most dangerous and heavily armed city in the world. Support from AC-130s (or US armored vehicles) would have cut down on US casualties and increased Somali losses, but the critical choice was deciding to try to capture Aidid and his henchmen. Colonel Owen's view that "reliance on airpower as the 'killing' force in the hunt for General Aidid" could have led to a dramatically different result ignores the fact that capturing, rather than killing, was the aim. When things went bad, the ground forces tasked with capturing Aidid wished they had close air support (and artillery support, US armored forces, naval gunfire, more troops, etc.), but the tanks, ships, troops, and AC-130s had been sent home. Colonel Owen's claim that the dead rangers demonstrate the "vulnerability" of ground power seems excessive. The heavy Somali losses indicate that ground forces are hardly the helpless creatures Colonel Owen would have us believe them to be, and if the helicopter pilot had stayed within his ROE or the force had been backed up by US armor and close air support, things would have gone a lot better. Remember that until October 1993, the US Air Force had suffered more fatalities in Somalia than the US Army and Marine Corps combined. (An AC-130 went down on a mission over Somalia, killing eight members of the aircrew.) The loss of an AC-130 with most of its crew was a tragedy, but, like Task Force Ranger's difficulties trying to rescue downed aircrews, we should be careful about what lessons we learn from singular events.

Colonel Owen is certainly correct in recognizing that, just as ground forces increase the number and types of weapons our troops can use on hostile locals, decreasing engagement ranges also increases the number of weapons the locals can use on our troops. But this does not necessarily make them vulnerable to those weapons or mean that they will suffer significant losses. At last count, exactly one US soldier was killed in Haiti (shot by an armed Haitian trying to run a roadblock), and one US soldier was killed in Bosnia (by a land mine). These casualty figures (after years of peace operations in both countries) indicate that the concerns raised by Task Force Ranger may be excessive.

Colonel Owen makes much of the troubles suffered by the peacekeepers in Bosnia before US troops arrived, but this points to a more serious problem than the relative strengths and weaknesses of airpower and ground power—the difference between peacekeeping and peace enforcement. Colonel Owen recognizes this difference but is so anxious to move on to a broad discussion of the two combined (peace operations) that he neglects the critical difference between them at the operational level of war. On the one hand, peacekeeping (for example, in the Sinai) is done in support of an agreement with which both parties are satisfied. In such a situation, the peacekeeping force need not have as much combat power as

either of the sides in the dispute. In peace-enforcement operations, on the other hand, one or more of the disputants believes he can benefit from continued fighting, so the peace enforcers must have overwhelming combat power—enough to rapidly and completely defeat any or all of the disputants. This overwhelming force must also be deployed and equipped not only to respond to threats but also to decisively defeat any armed opposition; and the ROE must boil down to “shoot first and then call the boss”—not the other way around. Ideally, this overwhelming force will deter all sides from continuing the fighting (as the Dayton Implementation Force has).

Trouble starts when a force designed and deployed for peacekeeping tries to conduct peace enforcement. For example, European nations sent peacekeeping forces to Bosnia, but it became a peace-enforcement operation. When NATO attempted to use air strikes to conduct peace enforcement, the targets of the air strikes simply took the peacekeepers hostage. Subsequently, the much larger and more heavily armed forces in Bosnia since the signing of the Dayton accords have suffered no comparable humiliations, even though it is generally agreed that the various sides are as ready as ever to resume the killing. Unfortunately, Colonel Owen’s notion of using ground troops as the “good cops” and air forces as the “bad cops” repeats this mistake. If ground troops are equipped, deployed, and ordered to be nonthreatening good cops, they will once again be easy pickings for anyone who feels threatened by the aerospace bad cops. Airpower should provide some of the added combat power that transforms a weak peacekeeping force into an overwhelming peace-enforcement force, but the troops on the ground must be strong enough and have the mind-set and ROE that will enable them to hold their own until help (from the air or ground) arrives. If they are too busy being good cops, they are structured for failure.²

Colonel Owen claims that ground power is more susceptible than airpower to mission “creep” (incremental expansion of the original mission) and mission “plunge” (abandonment of the mission). What he means to say is that governments find it easier to conceal mission creep and plunge in air operations than in ground operations. As Colonel Owen recognizes, the episodic nature of air strikes means that in a sense, participation plunges to zero as the aircraft return to base. By the same token, each successful air strike tempts us to “creep” to another target. Let me provide examples of airpower mission plunge and mission creep for those who remain unconvinced. In 1983 two US Navy planes were shot down by the Syrians over Lebanon’s Bekaa Valley. As a result, US air strikes in the Bekaa Valley rapidly “plunged” to zero. Operation Southern Watch, on the other hand, has been fairly successful in its original mission to enforce a no-fly zone, but, in response to the vulnerability of air and naval forces, it has “crept” to include routine attacks on Iraqi missile sites. In the form of Operation Desert Fox, Southern Watch has even expanded to include

attacks on sites housing Iraqi weapons of mass destruction. As these examples attest, air missions creep and plunge as much as ground missions do. The only difference is that it is easier to conceal the creeping and plunging of air missions from the public.

In place of Colonel Owen's notion that airpower should "lead" in peace enforcement and ground power should "lead" in peacekeeping, I would like to suggest a different approach—one that takes local conditions into account and actually conforms to the way we fight wars. The strategic air campaigns in two recent and highly successful US wars, Operations Just Cause and Desert Storm, illustrate this alternate approach. As readers of this journal will recall, Desert Storm opened with a strategic air campaign that used air-delivered bombs and missiles to demolish Iraq's centers of gravity and paralyze its government, economy, population, and, ultimately, its military forces. On the whole, Col John Warden's theories of parallel attack and inside-out warfare seemed to work well against Iraq. Readers may be less familiar with Just Cause, but, once again, parallel attacks on Panamanian centers of gravity and inside-out warfare led to rapid, decisive success without massive, force-on-force battles. The difference was that in Panama, airpower (both fixed wing and rotary wing) delivered US ground troops rather than bombs and missiles to the centers of gravity.³ The fact that ground troops played such a prominent role in Just Cause does not mean that it was a classic ground campaign designed to push a clearly defined front line across the enemy's country and focused on taking and holding ground. Instead, air-delivered US troops simultaneously assaulted a wide variety of different Panamanian centers of gravity scattered throughout the country (and often abandoned the ground they captured after they had incapacitated the center of gravity located there).

Why did airpower deliver bombs against Iraq and troops against Panama, and what does this tell us about the roles of troops and bombs in peace operations? In Panama, the goals were to capture Manuel Noriega and his henchmen and free several hostages held by Noriega (Kurt Muse is the best known of these). The critical US vulnerability in Panama was the large number of US citizens scattered throughout the country who could be taken hostage or attacked by Noriega loyalists. A further consideration was that, having removed the Noriega government and replaced it with the elected Panamanians whom Noriega had ousted, the United States would be responsible for repairing damaged infrastructure in Panama. Finally, Panamanian air defenses were rudimentary, and Panamanian military forces were brutal but not particularly combat effective. These factors combined to make a bombing campaign unattractive. Bombs would cause too much collateral property damage (that the United States would wind up paying for); the legality of killing Noriega with a bomb while making no effort to arrest him was debatable; and there was too great a probability that large numbers of US civilians would be killed or taken hostage. On the other hand, this situation made air delivery of

ground troops more attractive. Rapidly and properly deployed by airpower, troops could capture Noriega and his cronies, take down the centers of gravity with little collateral damage, protect US citizens from being taken hostage, and rescue any who were taken hostage. Given the weakness of Panamanian defenses, ground forces could accomplish all this without suffering heavy casualties.

In Iraq the situation was quite different. The United States had no desire to capture Saddam Hussein; all the potential hostages had already left Iraq; repair of damaged infrastructure would be paid for by Iraqi oil revenues; and Iraqi defense forces were strong enough to inflict unacceptable losses on ground troops air-delivered to the Iraqi centers of gravity. For these reasons, the United States chose (correctly) to use air-delivered bombs and missiles against the Iraqi centers of gravity rather than the air-delivered ground troops that worked so well in Panama.

Just as the United States can conduct strategic air campaigns using either air-delivered bombs or air-delivered ground forces as the primary “killing” force, so can it use either bombs or ground forces in peace operations. The way to choose the correct force mix for a given situation is not (as Colonel Owen claims) to rely on a crude and theoretical choice between peacekeeping (using ground forces) and peace enforcement (using air-delivered bombs). Instead, we must make a much subtler and more nuanced study of our tasks and potential foes, as was done in assessing Panama and Iraq. Colonel Owen is quick to note that air-delivered bombs were the right choice for peace enforcement in Bosnia, but he neglects to note that air-delivered ground forces were the right choice for peace enforcement in Haiti. The conditions in Bosnia and Haiti were different enough to require different solutions. To its credit, the US leadership was flexible enough to tailor solutions to fit the different needs of the two situations. We must build on the flexibility and agility of mind that has enabled us to conduct both strategic air campaigns and peace enforcement using either air-delivered bombs or air-delivered ground forces. We must not insist on meeting future challenges with narrow notions of what airpower is or oversimplified rules about what force “leads” in peacekeeping and peace enforcement. □

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Notes

1. People who like to use *self-interest* as a pejorative have a tendency to claim that everything anyone does is in his or her self-interest and is therefore reprehensible. For example, if I give nothing to charity, I am “greedy and without feelings for those less fortunate” (i.e., “bad”), but if I give everything to charity, I am “desperate for the approval of others and feel guilty for my success” (i.e., “bad”). This heads-you-lose, tails-you-lose reasoning is frequently used against US foreign policy. For example, every time the United States fails to intervene forcefully in a region racked by slaughter and human misery, it is criticized as uncaring, ungenerous, and failing in its role as a world leader. But if the United States *does* intervene forcefully, then it is hegemonic and imperialistic. Since the US response to most world events will appear too intrusive to some and not active enough to others, any given US policy will routinely be criticized as both a demonstration of US indifference to the suffering of others and a hegemonic effort to make everyone live by US standards of behavior.

2. In actual peace operations, the large number of different national forces involved and the wide variety of national, international, and nongovernmental aid agencies on the ground combine to produce an almost infinite array of good cops and bad cops without any need to devise separate roles for ground and air elements.

3. I realize that some readers will not care for my notion that helicopters are part of airpower, but for purposes of this discussion, it seems reasonable to put troop-carrying helicopters and paratroop-carrying C-130s into the same category. I can only hope that the same readers who vehemently deny that helicopters are part of airpower will fight equally hard to keep the helicopters off the air tasking order in all future conflicts.

Men and nations behave wisely once they have exhausted all the other alternatives.

—Abba Eban

Ricochets and Replies*Continued from page 3*

and intent of an author are invalid and should not be taken seriously. We should ask, "What did Clausewitz mean?" We should not ask, "How many different ways can we twist and distort his words to arrive at meanings he did not intend?"

If Clausewitz actually meant to state things other than those found in his words, then why didn't he state them in the first place? Are we supposed to regard the words of Clausewitz as in effect a sort of verbal banana peel that must be discarded in order to get at the hidden fruit of meaning?

If such an approach is used—and many, many writers use it—then Clausewitz can be utilized to validate any position that an imaginative, verbally skillful writer wants to take.

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THE FALLACY OF AEROSPACE?

Lt Col Frank Jennings's "Way Points" article ("New Doctrine Demands Changes in the Aerospace Force," Spring 1999) on the Air Force's interpretation of the term *aerospace* accurately summarizes, I believe, the current Air Force doctrinal approach to that term. In short, both Jennings and the Air Force argue that the aerospace is one seamless medium, thus reinforcing the Air Force's doctrinal argument that because space systems and forces are merely extensions and examples of existing Air Force systems and forces, they should be owned and operated by the Air Force. Whether or not the Air Force should be solely responsible for space systems and forces is beyond the scope of this letter; indeed, it is an issue for any future Commission on Roles and Missions to take on. The argument that the aerospace is one seamless operational medium, however, is simply fallacious; although it may make bureaucratic sense, it flies in the face of several realities, including operational, scientific, and legal ones.

The plain, unarguable fact is that systems that operate in the two mediums of the air and outer space respond to and are governed by two entirely different sets of the laws of physics. *Aircraft* operate according to the laws of fluid aerial dynamics—airflow-generated lift foremost among them. *Spacecraft* operate according to the laws of orbital mechanics. You need do nothing more than look at the two to intuitively understand the difference. *Airplanes* have wings because they need wing-generated lift in order to fly. *Spacecraft* can be and often are shaped like the result of a NASA engineer on a two-week bender because they don't need wings to generate lift to be aerodynamically efficient. (There's that pesky *aero* word again—but more about that later.) That's why they can have huge solar panels sticking out at all angles and be shaped like boxcars: the efficiency of their operations does not depend on aerodynamic efficiency. The scientific principles that govern how *aircraft* and *spacecraft* move and maneuver are completely different, and the point in space—altitude—where that transition takes place can be relatively firmly fixed as that point at which air-generated lift simply ceases to function. Thus, the aerospace is *not* a seamless physical medium, at least operationally. Although one can make the argument that the only physical difference between the atmosphere (where airplanes fly) and outer space (where spacecraft orbit) is the amount of air in either medium, this simple difference becomes an unbreachable operational barrier that no amount of assertion can overcome.

Another plain, unarguable fact is that the movement paths of *aircraft* and *spacecraft* are treated completely differently under international law, which has a commonsensical recognition of the fact that the laws of Newton transcend the laws of legislatures. If I fly my American military *aircraft* over another country without its permission, I've violated international law and may even be legally destroyed by the offended country. Why? Because I've violated its *airspace* and thus its national sovereignty. What happens if my *spacecraft* passes over another country during

its movement path, which we call an orbit? Nothing at all, because international law recognizes—indeed, was forced to the first time *Sputnik I* circled the Earth—that the laws of physics governing movement in outer space, which we call orbital mechanics, dictate that such movements over national borders are unavoidable and physically impossible to prevent. The result is that a satellite in orbit does not violate the national or territorial sovereignty of the nations over which it passes. Thus, the aerospace is *not* a seamless medium in terms of the law, either.

The obvious conclusion, then, is that the Air Force's assertion of a seamless and indivisible aerospace medium is simply wrong.

This does not mean that space is unimportant to military capability or national security. Just the opposite is true, and space becomes an increasingly vital theater of operations (the word choice is intentional) with every passing day and satellite launch. Nor does this necessarily argue for the creation of a separate and autonomous US Space Force analogous to the US Air Force. But let's not delude ourselves with scientifically, operationally, and legally unsupportable claims about the indivisibility of the aerospace.

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Net Assessment

The man who does not read good books has no advantage over the man who cannot read them.

—Mark Twain

The Aerospace Power Course: Preparing the Expeditionary Air Force for the 21st Century by the College of Aerospace Doctrine, Research, and Education. CD-ROM. Cubic Applications, Inc., 401 Chennault Circle, Maxwell AFB, Alabama 36112, 1999.

The Aerospace Power Course is a slick, new, CD-based multimedia presentation designed to give Air Force officers “just-in-time” doctrinal education. Its aim is to prepare these officers to “intelligently articulate and advocate aerospace power principles and beliefs in the joint arena.” Developed as a result of a CORONA tasking in the fall of 1996, its primary target audience consists of Air Force captains through lieutenant colonels selected for joint-duty assignments.

The course couldn't have come along at a better time. Many midlevel Air Force officers today lack knowledge of their own service's doctrine and history, and this course can help educate them.

Air Force officers spend their early professional lives learning career fields and technical specialties at the expense of true education in the culture and history of war fighting, which underpins doctrine and makes sense of it. Some are therefore susceptible to blind acceptance of another service's perception of war when that perception is presented persuasively. Also problematic is the fact that Air Command and Staff College must, of necessity, teach joint doctrine and emphasize a joint perspective on war fighting. This is good, and the college teaches it well, but teaching the joint perspective to officers who don't well understand their own doctrine merely reinforces the idea that

the Air Force is little more than a provider of services to surface forces.

These are the problems that *The Aerospace Power Course* is designed to help remedy. It presents aerospace doctrine, history, and perspective in 11 instructional blocks of spoken and written text accompanied by still images. Many of the blocks refer to documents such as Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine*, *The National Military Strategy*, and *Joint Vision 2010*, which are included on the CD; alternatively, users can access the documents via hyperlinks if the host computer is connected to the Internet. The CD even includes Army Field Manual (FM) 100-20, *Command and Employment of Air Power*, published in 1943. The course is almost worth having for its reference value alone.

Much of the course is devoted to explaining the airman's perspective on the principles of war, the tenets of aerospace power, the Air Force's core competencies, and the link between doctrine and military strategy. All of these sections are well written and easy to understand (they would make a good review and/or introduction to Air Force students selected for intermediate service school). This AFDD 1 primer is supplemented by excellent sections on the integration of space and information operations into the Air Force way of war, the other services' perspectives on the role of airpower (a good elaboration of the well-known “Perspectives” lecture of Maj Gen Charles Link, USAF, Retired), and the presentation of Air Force forces at the operational level. The last section contains an excellent précis of expeditionary Air Force concepts.

The course CD also comes packaged with two of the best books yet published on airpower's role in Desert Storm: Col Richard T. Reynolds's *Heart of the Storm: The Genesis of the Air Campaign against Iraq* (Air University Press, 1995) and Col Edward C. Mann's *Thunder and Lightning: Desert Storm and the Airpower Debates* (Air University Press, 1995). (Chapter 10 in the latter contains one of the best indictments yet written of the professional

"stovepiping" problem described above.) In addition, the course comes with two of the best recent monographs produced by the College of Aerospace Doctrine, Research, and Education: Lt Col William F. Andrews's *Airpower against an Army: Challenge and Response in CENTAF's Duel with the Republican Guard* (Air University Press, 1998) and Maj John R. Carter's *Airpower and the Cult of the Offensive* (Air University Press, 1998).

On the whole, *The Aerospace Power Course's* narration is pleasant, and the presentation is well organized. Navigation within the course is very intuitive. The courseware is visually attractive, if somewhat "low-end" as multimedia presentations go. Although *The Aerospace Power Course* perhaps is not as effective as it might be, the lack of visual sophistication does not detract from the presentation of information. The academic content of the course is consistently excellent; if there are problems with *The Aerospace Power Course*, they lie with what it does not contain rather than what it does.

The first instructional block deftly melds history and doctrine, tracing the evolution of airpower theory through the ideas of early advocates like Hugh Trenchard, Giulio Douhet, and Billy Mitchell. The second block, "Foundations of Air Power Doctrine," picks up the historical lesson with the growth of the Air Corps Tactical School's doctrine during the 1930s. The text traces the three parallel threads in the Air Corps's evolving thought: the conviction that strategic bombardment, independent of surface forces, could win wars and provide an alternative to the incomparable horrors of trench warfare; the belief that air superiority was necessary to enable all other air—and most surface—operations; and the belief that airpower should be centrally controlled by an airman.

The next section, "Excursions from Air Power Doctrine," traces how Air Force thinking moved away from the lessons learned in World War II under the impetus of Korea, Vietnam, and the "nuclear mentality" of the cold war. The course here indicts Air Force leadership for fixating on nuclear deterrence and thus failing to prepare the service for the conventional wars it was tasked to fight during this period. The indictment is fair. However, the discussion of Operation Rolling Thunder, which occurred early in the Vietnam War, misses some important considerations. Most people would agree that the text is correct in say-

ing, "Foremost among the reasons for ROLLING THUNDER's failure was the disconnect between the political strategy of graduated response and the military objectives." Few would deny that President Lyndon Johnson's personal mismanagement of military action during the war's opening years hampered achieving any meaningful military objectives. But in 1964–65, the Air Force's proposed strategy was a "concentrated strategic air offensive" against 94 "military-industrial" targets in North Vietnam, intended to cripple war production and interdict supplies flowing to the insurgency in the south. A significant school of thought (most prominently expressed in Mark Clodfelter's *The Limits of Air Power: The American Bombing of North Vietnam* [New York: Free Press, 1989]) maintains that the "94 targets" strategy was as misguided as Johnson's gradualist policy and that strategic bombing, especially given its limitations at the time, was not the proper mechanism to defeat the largely indigenous southern insurgency in the early phases of Vietnam. The course text implies (but does not state) that "94 targets" would have worked had the politicians just left the military alone. This is too simplistic and does the officers it seeks to educate no favors if they attempt to argue this line with better-read officers from other services.

On the other hand, the course's discussion of the convoluted command and control in Vietnam deserves kudos. The segment deftly highlights why theater airpower must be centrally controlled by an airman. In fact, this subject appears to be the course writers' "pet rock." It surfaces several times (of course, deservedly so) in the opening historical lessons, and the later block on "Operational Air Power" devotes almost two-thirds of its discussion to the origins of the concept of the joint force air component commander. The subject deserves the attention it receives in the course, particularly in the "Operational Air Power" discussion, but so too should similar attention have been lavished on the other two central themes of airpower developed in the course.

Although the necessity for control of the air is mentioned frequently as a core tenet of aerospace doctrine, the development of this idea is not given the same emphasis as is centralized control. This is understandable, given that the need is rarely disputed, if not particularly appreciated, in today's

joint environment. This is partly attributable to our current overwhelming ability to gain and maintain aerospace superiority. However, in our history, both the necessity for such control and aerospace control itself have been seriously contested. In World War II, the Army Air Forces fought the Luftwaffe for control of the air while simultaneously contending with Army surface commanders over the direction of the air war. It was again debated during the early 1970s, when the ascendancy of modern air defenses made the counterair function compete seriously with other uses of our aircraft. These debates are touched on lightly in *The Aerospace Power Course* but deserve a bit more attention. America's overwhelming air superiority today should not be taken for granted. Forced to contend with some currently unforeseen emerging technology, we could find ourselves in this debate again.

The third theme, the efficacy of strategic bombing, is treated almost as if it is beyond the need of proof (i.e., as dogma, not doctrine). *The Aerospace Power Course* starts with this bold assertion: "Although modern airpower is significantly different than it was at the beginning of the century, the core of airpower has retained its inherently strategic nature. Quite often detractors of airpower question the viability of the strategic bombardment mission. Yet, the subject of strategic attack is at the very heart of Air Force belief."

All true, but the course does not follow up by making a case for the effectiveness of this central article of Air Force faith. It does an excellent job of describing the historical context in which strategic bombing doctrine evolved and an equally good job of tracing that doctrine through its early advocates. But the story stops there. There is but one small blurb in the section on Billy Mitchell that describes aspects of the Combined Bomber Offensive in World War II as "disappointing." Then several sections later, the course jumps straight to the independent Air Force, in which "the importance of strategic bombing was clearly established," with nuclear weapons giving it "a new and unquestioned level of importance." Unquestioned, indeed. No mention is made of what strategic bombing *did* do in Europe, especially to the German transportation and fuel infrastructures. Further, no mention is made of the fact that the entire island-hopping effort in the Central Pacific was a

surface campaign designed primarily to *support* strategic bombing, which did finally end the war in that theater. (The subsurface campaign, nearly as important to victory as airpower, could have been pursued without the seizure of many of the Central Pacific islands finally taken. The planned invasion of Japan, which compelled the taking of Okinawa, was never launched because the air campaign made it unnecessary. The New Guinea-Philippines campaign, however useful in other ways, was irrelevant to the war's outcome.)

We must be careful here; airpower's historical record can bear (and has borne) several differing interpretations. There is a unique and credible "aircentric" view of airpower history, but it is often at odds with the historical interpretation given by more "surfacecentric" authors and academics. The "surface" school far outnumbers the "air" school, dominates other services' perception of airpower (not surprisingly), and seems to have the ears of Congress and the press. If we are to present airpower in a package that will persuade our officers to become its advocates, then we must give them the tools to intelligently debate members of the surface school. Serious and intelligent people writing about airpower doubt that it has ever been decisive; doubt that "strategic" bombing, however defined, ever works; and believe that airpower would be more effective if parceled out to the "decisive" (read "nonair") combat arms. It is vital to our interests as a service that our officers understand these schools of thought and be able to answer them cogently. This is the central—and only major—weakness of *The Aerospace Power Course*. It presents some elements of our core beliefs without the larger context of the intelligent criticism leveled against them.

Even without this, the course is an excellent presentation that should teach and help motivate our officers going to joint billets. I believe it is a necessary step along the road to fixing the problem the Air Force has in educating its officers in the profession of arms. It has appeared in the right place at the right time because today's joint officers will grow into the generals, theorists, and civilian leaders of tomorrow.

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Women in the Military: Flirting with Disaster by Brian Mitchell. Regnery Publishing, Inc., One Massachusetts Avenue Northwest, Washington, D.C. 20001, 1998, 390 pages, \$24.95.

Spend your \$25 on anything except this book, which, at best, will outrage a liberal reader and embarrass a conservative one. In *Women in the Military*, Brian Mitchell argues that women have no role in the military (save the medical field) because they degrade military effectiveness. His argument is essentialist in nature: men and women are biologically programmed with fixed, unalterable traits. He reasons that because men are aggressive and women are passive, women are ill suited to serve in the military, an institution grounded in stereotypical male qualities (pages 22, 140–47, 160, and 171). Why is the mere presence of women in the military “flirting with disaster,” as the subtitle asserts? Mitchell writes that “nothing has done more to cheapen rank and diminish respect for authority than cute little female lieutenants and privates. Military customs and regulations are no match for the forces that draw men and women together in pairs” (page 160). The author has little faith that military professionalism is capable of overriding supposedly “natural” instincts; ironically, he thus undermines the integrity of the institution he tries so desperately to honor.

In chapter 4, “The Last Class with Balls,” Mitchell repeats his essentialist refrain: “even self-disciplined men could not remain indifferent” to the women cadets who entered the US Air Force Academy in 1976. “The men were charmed. They could never see the women as just cadets, and they could never treat women as they treated men. . . . The women were just too hard to hate. Some men could bluster threats and insults from a distance, but when they came face to face with the enemy, they quailed out of natural affection and decency” (page 68). Note just a few of Mitchell’s assumptions: (1) the notion that female cadets are “too hard to hate” ignores the harassment from male cadets who hoped to make them quit; (2) threats and insults yelled from afar constitute appropriate training; (3) female cadets are “the enemy”; (4) the military bearing of male cadets is no match for their “natural affection and decency” after having been “charmed” by the fe-

males; and (5) in this case, to be “quailed” is a male, not a female, characteristic.

What possible evidence could Mitchell cite to support assumptions and statements like these? He quotes an unnamed Army colonel who says, “It’s tough to discipline a soldier when she blinks her baby-blue eyes or slips you a dimple” (page 56). Mitchell also quotes James Salter, a West Point graduate of 1945, who offers this homoerotic portrayal: “There were women in the barracks. There were cadets with beautiful, boyish hair, like that of a shipmate on a cruise. It was an appeal that touched fantasies—on a clear autumn morning or in the winter dusk, the image of a tender cheek beneath a military cap, the trace of a smile, the womanly figure in rough clothes” (page 68).

When not arguing from essentialism, Mitchell relies on “studies” that suggest women are disadvantageous to the military because of their higher rates of attrition, the difficulty of recruiting them, their greater need for medical care, their shortcomings in physical ability, and so forth. His conclusions are questionable because the logic is often specious. Grossly generalizing (his worst offense) in reference to the Women’s Army Auxiliary Corps (WAAC), Women Accepted for Voluntary Emergency Service (WAVES), and Women’s Air Service Pilots (WASP), he writes that “once established, the women’s components fulfilled no one’s expectations. . . . Many Americans could believe only that the kind of women who would join the Army were not the kind to take home to mother” (page 5). Such generalizations about national American sentiment are unsupportable, not to mention offensive.

In another instance, the author draws an incorrect conclusion from his assessment of a Navy weight-training program called SPARTEN (Scientific Program of Aerobic and Resistance Training Exercise in the Navy). Noting that women are physically weaker than men, he concludes that “when men in the military are encouraged to think that being strong and quick is good, the professional reputation of military women suffers” (page 145). His cause-and-effect relationship here is incorrect on two accounts. First, he assumes a limited-sum gain: a “good” quality for men equates to a “bad” quality for women. In addition, he does not realize that strength (and bulk) has its disadvantages as well, particularly in the tight confines of Navy ships. Second, he assumes that profession-

alism is limited to physical ability, negating many facets of professionalism, such as knowledge of the job or an ability to lead.

In addition to fallacious generalizations and cause-and-effect relationships, Mitchell dismisses any studies that endorse the integration of women on the basis that "feminists" had "infiltrated" the Defense Department (page 80). In the early 1970s, for example, a study titled "The Use of Women in the Military," commissioned by the secretary of defense and secretary of the Army, found that women save the military money and improve the quality of the force. Mitchell essentially writes off the findings of the study, stating that military leaders "already knew that the study would conclude that the services could make greater use of women" (page 81). He concludes that a ubiquitous group of feminists, his nemesis throughout the book, is capable of manipulating studies and cowing top military brass. How do feminists wield power? Evaluating the case of Kelly Flinn, he writes that "the way her story played out in the media and in Washington is a textbook example of feminist victimology, the clearest demonstration yet of how feminists identify The Victim in any circumstance. Only two things count: The Victim must serve the cause of feminism, and The Victim must fit the image of the high-flying woman brought down by low-lying men" (page 314). As this quotation suggests, Mitchell's personal biases warp his ability to analyze information objectively, thus inhibiting his ability to provide a rational, impartial evaluation of women in the military.

The most damning impact of feminists on the military, according to Mitchell, is the "feminization" of the force. For instance, feminists ultimately caused the replacement of "abusive and demeaning" hazing at the service academies with less humiliating means of training (page 63). Similarly, he accuses feminists of encouraging soldiers to "think of all humans as human beings first rather than animals to be casually slaughtered" (page 184). He adds that "feminists, nevertheless, have always insisted that the attributes of a leader are neither masculine nor feminine, that virtues traditionally considered masculine or feminine can be found in both sexes" (page 339). Frankly, these statements are scary. Mitchell concedes that the sons and daughters of Americans entering the armed forces must be debased and degraded—treated as if they

were less than human beings—as a rite of passage into the military. Furthermore, the fact that he reduces the lives of hundreds of troops to animals for slaughter suggests a nearly unbelievable callousness. Finally, he implies that the traits of leadership are exclusively male—apparently, men have cornered the market on leadership.

All told, Mitchell's essentialist vision of men and women is flawed because it does not account for social constructions of gender. He fails to acknowledge that men and women have the power to recognize societal limitations of "traditional" gender roles and shape the military into an integrated fighting force that maximizes the strengths of all soldiers. Moreover, his vision limits the military to one based on stereotypical male characteristics, producing an institution in which women are unjustly excluded from serving their country and in which men serve exclusively because they cannot control their animalistic behavior toward women. We should reject Mitchell's vision and give the troops credit for an ability to accomplish the mission as a team that takes advantage of each member's ability. Further, we should recognize a professional military institution capable of treating its members with the dignity and respect they deserve.

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A World Transformed by George Bush and Brent Scowcroft. Alfred A. Knopf, Inc., 201 East Fiftieth Street, New York, New York 10022, 1998, 566 pages, \$30.00.

In the four years that President Bush occupied the White House, many pivotal events around the world would occur. He will go down in history as a president who devoted his position in the executive mansion to foreign policy that ushered in the post-cold-war era. *A World Transformed* leaves no doubt about what President Bush perceives as his greatest contribution to the presidency. For Franklin D. Roosevelt it was the New Deal and coping with fascism. For Lyndon Johnson it was the Great Society. For George Bush it is Operation Desert Storm and the peaceful transition that ended the cold war.

Written from the vantage point of the president's office and the National Security Council, the book is bold, intelligent, and easy to understand.

Persons studying national-security decision making will find it an excellent inside account of how a sitting president deals with global events such as the fall of the Berlin Wall, the end of Soviet détente, and the evolution of new dictators like Saddam Hussein. The book is gripping at times and offers keen insight into the thought process of the president and his National Security Council as these events unfold. Scholars of Sino-American relations, Middle East affairs, and Eastern European history will all find something here.

What is fascinating about this work is the vivid description of Bush's and Scowcroft's interaction with world leaders. The authors give diplomacy—from direct contact to personal letters—much attention, especially regarding the way it is perceived not only by individual nations but the entire world. Nowhere are the skills of diplomacy more tested than with the leaders of the People's Republic of China after the massacre at Tiananmen Square. Bush and Scowcroft, his national-security advisor, had to contend with a hostile Congress and a few influential members who wanted to sever relations with Beijing. Knowing that this diplomatic relationship was cultivated during the Nixon administration, Bush saw the historic implications of punishing a China already sensitive to centuries of foreign intervention and the possibility of Chinese leaders retreating into a shell of isolationism. The book devotes several chapters to the diplomacy and harrowing work the Bush administration undertook to avoid damage to Sino-American relations.

Eastern Europe and the yearning of East Germany, Romania, and Poland to be free from a Soviet-based economy would occupy the early months of the Bush presidency. Grappling with issues such as a potential crackdown by Soviet troops and the disentanglement of Moscow from Afghanistan would leave the administration cautious of Soviet reaction. It also had to contend with the issue of how Eastern bloc nations would cope with a market economy and whether disillusionment would bring nationalism and the rise of ultrafascists. The book is chilling in its depiction of the decisions made in the oval office to cope with such potential scenarios as Gorbachev's new era of perestroika and glasnost.

The authors conclude with an account of the Gulf crisis. Each leader of the coalition forces would be called on by the president, and hours of meetings and diplomacy would ensue, building the largest force assembled since the end of World War II. At home the Vietnam syndrome would tug at the president's heels with the Senate approving the use of force: by a three-vote majority. An elec-

tric environment gripped the White House as the air campaign began, setting up the rout of the Iraqi Republican Guard by coalition ground forces. Bush explains his rationale behind the decision to stop at Kuwait—a decision questioned by many scholars. The president offers an explanation in his own words in the final chapters of the book. *A World Transformed*, an excellent read, is the definitive book written to date about the end of the cold war and the new world order that followed. It offers an analysis of crisis management on a global scale.

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Cyberwar 2.0: Myths, Mysteries and Reality
edited by Alan D. Campen and Douglas H. Dearth. AFCEA International Press, 4400 Fair Lakes Court, Fairfax, Virginia 22033-3899, 1998, 398 pages.

Al Campen and Douglas Dearth compile an impressive list of authors in *Cyberwar 2.0*. The list of contributors includes such information operations (IO) notables as the late Thomas Rona, Winn Schwartz, and Chuck deCaro. Articles span the gamut of IO topics, beginning at the tactical and operational application of information in Gary Beavers and Stephen Shanahan's "Operationalizing IO in Bosnia-Herzegovina," to the more esoteric subject of risk and connectivity contained in J. P. MacIntosh's "Connectivity: The Space, Tempo, and Exploitation of Risk in the Information Age."

Campen and Dearth organize the compendium into five sections: "Strategy and Diplomacy"; "Society, Law, and Commerce"; "Operations and Information Warfare"; "Intelligence, Assessment, and Modeling"; and "Reality." Within each section they compile a series of articles loosely related to the section's topic. Part one urges a reassessment of the way we approach the geopolitical landscape, generally arguing that information may have made many of our historical models obsolete. In part two, "Society, Law, and Commerce," Campen and Dearth attempt to negotiate their way through the legal and encryption morass. Part three attempts to operationalize the concepts of information through a diverse discussion of psychological operations, command and control, and IO in Bosnia. Part four, "Intelligence, Assessment, and Model-

ing," pulls together such disparate concepts as preparing intelligence for the IO battlefield, modeling and assessing the IO threat, and exploiting information to achieve national-security objectives. The final part, "Reality," approaches such topics as infrastructure protection, IO education, and the roles of allies and coalitions.

Cyberwar 2.0 is not for the faint of heart or novices to the IO realm. Many of the topics addressed require an intermediate or advanced knowledge of IO. The complexity of some of the subject matter may scare off newcomers or intimidate those who are not familiar with it. The book's major shortcoming is common to all anthologies. Although Campen and Dearth have compiled an impressive list of authors, the book lacks a consistent theme to pull the variegated topics together. The major theme seems to be obscured by the sheer variety of the contents, inevitable unevenness in the quality of individual contributions, and some evident shoehorning of pieces into somewhat contrived categories. The book has the feel of being a compiled series of articles clipped from one book or another. The authors have almost completely spanned the subject, but it is nearly impossible to treat these weighty subjects in any detail in 398 pages. However, this is not to say that the book is not an excellent source as an IO resource. When taken in isolation, the articles are some of the most incisive and cogent written on the subjects. Many of the essays are timely yet timeless. This book would serve as an excellent resource for a graduate course on information or as a reader on IO for one of the intermediate or senior service schools. For the practitioner in the IO realm, *Cyberwar 2.0* provides a menu of subjects applicable across the spectrum.

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NATO 1997: Year of Change edited by Lawrence R. Chalmer and Jonathan W. Pierce. National Defense University Press, Fort Lesley J. McNair, Washington, D.C. 20319, 1998, 245 pages.

With substantial changes affecting all international organizations, none have been as dramatic as

the post-1989 changes in the North Atlantic Treaty Organization (NATO). For the fourth time since its founding, NATO has the potential to enlarge itself but is severely challenged by trying to maintain security in a Europe no longer threatened by the Warsaw Pact, distribute responsibilities among Europeans and Americans, and stabilize Eastern Europe. This volume by American and European contributors documents the discussions, bureaucratic battles, and operational challenges faced by the alliance in 1997. It covers the eastward expansion of NATO, an independent European Defense Identity, and the impact of operations in Bosnia.

According to this volume, expanding NATO to include ex-Warsaw Pact member nations and pushing the NATO defensive umbrella closer towards Russia represent defining issues of our time. The book debates the question of what Russia would or could do (in the end, nothing). We learn of Poland's determination to ignore Russia's concerns as well as Russia's statement that it would not tolerate the eastward expansion of the alliance. The nationalist and communist rhetoric of current Russia mirrors the concerns expressed in this volume, the product of a National Defense University symposium held in Washington, D.C., in 1997. The impact and cost of expansion to the alliance and the United States represent a valuable economic primer in alliance spending. The book's exploration of the limitation on expansion and the ability to accommodate three countries that applied for membership reflects the creation of a two-tiered system and European proposals such as using the Western European Union to help Eastern European nations.

France is leading the charge, trying to sound out alliance members about establishing a European Defense Identity. The Western European Union currently operates a small military planning cell and has no forces assigned; thus, it is not capable of running operations in the former Yugoslavia. The debate over greater European participation and redistribution of alliance command and control responsibilities has angered the United States and shows that the alliance faces a far-reaching problem. Although the United States can project power outside Europe were a crisis to occur, NATO cannot. Countries are unwilling or unable to restructure their forces from territorial defense to flexible intervention forces. The expeditionary

capabilities of Europe are so small that peace operations in Bosnia rely on the United States.

NATO is also searching for a post-cold-war strategic purpose and out-of-area concerns where European and American defense interests merge. North African insurgencies, African genocide, and the Middle East's access to energy resources are a few areas in which agreements appear to exist. But out-of-area contingencies remain the Achilles' heel of NATO. The United States can project, Europe cannot, and Europe still looks to US leadership, despite being the second-largest economy in the world.

The book presents a very positive picture of operations in Bosnia. Logistics and command and control worked as planned, and the alliance can be proud of its success. However, it overlooks the fact that member nations provided only weak support for the United Nations Protection Force, and until the United States took the leadership role, Europe had been paralyzed and unable to do anything. It also fails to discuss how long-term issues, such as restoring peace to the former Yugoslavia, are to be resolved.

Although *NATO 1997* is an excellent historical overview, 1999 will see the alliance face new challenges, and the quest for alliance leadership may yet sour transatlantic relations. Certainly the alliance faces external security problems—Macedonia, Kosovo, and Cyprus, for example. The inability to restructure and redefine the NATO alliance creates difficulties that the member nations need to examine before they spill into the public domain. Although some of the problems discussed at the symposium have melted away from the security scene, others remain—for instance, how to deal with East European countries that believe a new security vacuum has been created. In the minds of these nations, economic growth and political stability in this region are tied to acceptance by the European Union (economically and politically) and NATO (for security). The cost of buying new weapons to match the existing NATO structure is one of the economic difficulties confronting the three new NATO members. Clearly, the alliance still has much work to do.

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United States Naval Aviation, 1910–1995, 4th ed., by Roy A. Grossnick. Naval Historical Center, 901 M Street SE, Washington Navy Yard, Washington, D.C. 20374-5060, 1997, 881 pages, \$73.00.

A Heritage of Wings: An Illustrated History of Navy Aviation by Richard C. Knott. Naval Institute Press, 118 Maryland Avenue, Annapolis, Maryland 21402, 1997, 339 pages, \$49.95.

The purpose of *United States Naval Aviation, 1910–1995*, essentially an encyclopedia of naval aviation history and development, "is to provide naval personnel, historians and aviation enthusiasts with a general background on naval aviation history." Divided into 12 parts and 34 appendixes, the book features individual parts listed either by decades during peacetime (the 1920s or 1930s) or by dates of wars. The Vietnam War does not have its own section, as do World Wars I and II and the Korean War. Information on the Navy's involvement in Vietnam is included in the parts covering the 1960s and 1970s, probably reflecting the fact that many other events such as the space race happened concurrently with the conflict in Southeast Asia. Other combat operations involving Libya, Grenada, and Iraq have their own appendixes. Within each part, important happenings in Navy aviation history are dated and described, covering such monumental events from the Battle of Coral Sea to the obscure date when naval aviators first received flight pay. Grossnick's book also contains hundreds of photographs.

By reading this book, one can learn about some important though overlooked contributions of naval aviation. For example, it describes the Navy's early involvement in the development of early warning radar and guided missiles prior to and during World War II. By reading further, one learns about the maturation and employment of these systems by the fleet.

The 34 appendixes comprise half of the book's total length. Subjects covered here include the history of aviation training, naval aviation's contribution to the space program, the history of all aircraft carriers, and a list of all the different types of aircraft employed by the Navy.

A Heritage of Wings, an easier read, provides a more personal look at flying in the Navy. Richard C. Knott, a former naval aviator, blends fact, testimony, and anecdotal evidence in this history of the Navy's air arm. He starts with the Navy's turn-of-the-century interest in aviation and finishes with the story of naval personnel in the space program.

Along with historical facts, *A Heritage of Wings* highlights some of the personalities who shaped naval flying. Knott does a fine job of demonstrating the tough times aviation pioneers had with the Navy's "battleship brass." A handful of determined men—Chambers, Curtiss, Ely, and others—fought the bureaucratic inertia of the surface-fleet Navy and secured a place of prominence for aviation.

Knott discusses some oft-forgotten areas of naval aviation such as lighter-than-air craft, seaplanes, and scout planes launched from battleships. He also features a collection of photographs that show everything from the first arresting-hook experiments to the first attempt at plane-to-ship communication—a carrier pigeon. *A Heritage of Wings* also pays a great deal of attention to the Navy's work in the Atlantic Ocean during World War II. Although not as famous as the carrier battles in the Pacific, the Atlantic battles fought by carriers, seaplanes, and shore-based patrol aircraft played a vital role in the war against Germany's U-boats.

United States Naval Aviation, 1910–1995 does a fine job of chronicling the evolution of naval air. It is an excellent resource for research and background study. *A Heritage of Wings* provides more insight into the men who crafted naval aviation. These two books provide an excellent overview of an important element of aviation history.

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The War of Atonement, October 1973 by Chaim Herzog. Greenhill Books, Lionel Leventhal Limited, Park House, 1 Russell Gardens, London NW11 9NN, 1998, 300 pages, \$29.95.

Reading Herzog is always a delight, and many people who study the Middle East are familiar with his book *The Arab-Israeli Wars*, which is the defini-

tive work on a conflict that spanned over four decades. *The War of Atonement* was first published in 1975 and was republished in 1998 to mark the 25th anniversary of the Yom-Kippur War of 1973. Its 18 chapters offer insight into the conflict, and the late author gives a balanced and thorough view of the war, using material not only from Israeli records but also from Arab reports and commentary. An excellent tactical analysis of the conflict, the book contains nine maps and 18 illustrations.

Herzog starts with the opening of Syrian and Egyptian artillery at 1400 hours on 6 October and moves to the encirclement of the Egyptian Third Army and the crossing of Israeli mechanized forces into the West Bank of the Suez on 24 October. Having read both Israeli and Egyptian accounts of the four Arab-Israeli wars, Herzog does not pontificate or exaggerate the capabilities of the Israeli Defense Forces; neither does he underestimate the adversary. The opening chapter lays out the political climate of the region prior to the opening of hostilities. Authors like Herzog and Heikal (an Egyptian writing about the Arab-Israeli War) see the wars in the region as part of a 40-year continuum. The Six-Day War of 1967 and Yom-Kippur War of 1973 are peaks in this continuum. Herzog discusses how Egypt and Israel developed defensive measures along the Suez Canal and details the development and shortcomings of the Bar-Lev Line. The author meticulously analyzes the tactical problems and solutions of defending the East Bank of the canal and the Syrian Golan Heights.

Every chapter is filled with tales of heroism and personal introductions to the men who commanded at the company through the brigade levels. Herzog explains the logic behind tactical decisions made by the Israeli military commanders and is highly critical of the late Moshe Dayan and Israeli chief of staff Ezer Weizman. Aside from Israeli commanders, he also introduces several Egyptian generals such as Ahmed Ismail Ali (minister of war) and General Shazli (Egyptian chief of staff). From a strategic level, we see the flaws of Israel's military intelligence, from its failure to make sense of troop movements and high-level talks between Cairo, Damascus, and Moscow, to the total dismissal of how surface-to-air missiles would be employed by the Egyptians. The book chronologically details Israel's decision to deal a crushing blow to Syrian mechanized forces in the Golan before

turning to deal with Egyptian advances in the Sinai. Herzog criticizes Israel's heavy reliance on airpower and the utilization of tanks without infantry support. He also shares his views on Egyptian tactical successes and failures and has high praise for Jordan's 40th Tank Brigade, which saved Syrian mechanized forces from certain doom. The final chapters deal with the lessons of the 1973 war from political and strategic perspectives.

For people who liked *The Arab-Israeli Wars*, *The War of Atonement* is a must read. Writing in an easy-to-understand style, Herzog has produced a book that will be of interest to anyone remotely concerned with Middle-Eastern affairs.

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The Lions of July: Prelude to War, 1914 by William Jannen Jr. Presidio Press, 505B San Marin Drive, Suite 300, Novato, California 94945-1340, 1996, 456 pages, \$18.95.

The 80th anniversary of the armistice ending the Great War has recently passed. Historians and political scientists, professional and amateur, continue to ponder the cause of that bloody conflict. In *The Lions of July*, his first book, William Jannen Jr. presents yet another look into the furious diplomatic and military maneuvering during July of 1914 that inexorably marched Europe and much of the world into war. A practicing attorney, Jannen earned his law degree and a PhD in modern European history from Columbia University. In addition to his legal practice, Jannen has taught history at Brooklyn College.

The Lions of July is a tough read—not because it is poorly written but because the author follows the machinations of over 80 different personalities in at least eight European capitals. Jannen peels back another layer from Barbara Tuchman's famous *The Guns of August* and examines not only the behavior of kings, prime ministers, and generals but also the actions of the many ambassadors to the European powers. Consequently, it becomes difficult to follow the large cast of characters through the turbulent month of July 1914. The work is exhaustively researched and well docu-

mented with numerous foreign-language primary-source materials. Jannen balances his treatment with perspectives from all the major powers. His research is excellent, his sources are compelling, and he valiantly attempts to breathe life into the scores of actors. The average reader, however, will find it difficult to track more than a handful of the more compelling personalities.

The Lions of July is a diplomatic history. Anyone looking for a thorough analysis of the military causes of World War I will be sorely disappointed. Because armies are the instruments of politics, Jannen rightly places responsibility for the war on the politicians and not on the Germans' single-minded adherence to the Schlieffen Plan. Count von Schlieffen and his infamous plan for the conquest of France do not even make their appearance until halfway through the book. Jannen believes that war did not inevitably result from mobilization. The cause rested squarely on the numerous leaders who refused to present or accept plausible solutions that might have averted war at many stages.

The last hope for reversing the waning Austro-Hungarian Empire lay in crushing Serbia. Russians were committed to defending their brother Slavs. Germany could not tolerate a Russia postured for war marshaling along its borders, but the German war plans demanded the defeat of France before Russia. Britain, allied with France, was motivated to fight only to protect the honor of the heroic Belgians. Serbia had been the touchstone of the crisis and was also the keystone to its resolution. As Jannen concludes, "Everyone was prepared to have Serbia pay for the peace of Europe by being invaded." For their part, Serbian leaders agreed to almost complete subjugation to redress the Austrian grievances and avoid a war they would certainly lose, but subjugation was not enough to reinvigorate the ailing Austrian Empire. The road could lead only to world war.

Contrary to the comments on the dust jacket, *The Lions of July* is not a perfect companion to *The Guns of August*. The former is a much more serious work of historical scholarship and, as such, does not match Tuchman's riveting, page-turning style. Although midcareer service members may be familiar with World War I, this is not the book for them. *The Lions of July* is a book for a serious student interested

in a deeper understanding of the human failings that led to the war that did not end all wars.

Maj Mark P. Jelonek, USAF
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The Paths of Heaven: The Evolution of Airpower Theory edited by Col Phillip S. Meilinger. Air University Press, 170 West Selfridge Street, Maxwell Air Force Base, Alabama 36112-6610, 1997, 650 pages, \$20.00.

Discerning readers will derive well-grounded observations from this exhaustive collection of essays which traces the "evolution of airpower theory from the earliest days . . . to the present" (page xii). Readers will not fail to see that the early theorists operated from theoretically and experientially derived assumptions formed by the crucible of the First World War. Framed against this background, Col Phillip Meilinger discusses airpower proponents in the conceptual continuity of the strategic, destructive potential of British airpower. Eventually airpower widened its theoretical base, and we find Meilinger's second essay examining Alexander de Seversky's contributions to incipient aerial refueling and long-range escort aircraft, as well as his in-person evaluations of the efficacy of strategic bombing. Meanwhile, David Mets contextualizes the rise of naval aviation as it evolved from acting as an adjunct to established doctrine to giving credence to strategic bombing and establishing the carrier as the eminent instrument of sea power. James Corum's essay describes airpower failure in interwar France when French technology was not wed to doctrine. He also notes that the poor performance of the Italian air force resulted not from doctrinal but industrial insufficiency. The Soviet Union, meanwhile, adhered to the primacy of the offensive while developing the world's first airborne forces and a mature ground-attack theory. Finally, Germany failed to translate airpower theory into doctrine for an effective air force, especially with the de-emphasis of strategic bombing. Concurrently in America, the Air Corps Tactical School had the task of getting national leadership

to advance its strategic and operational thinking toward striking an enemy's core vulnerabilities.

Several essays are thematically tied. Harold Winton provides "a critical, comparative analysis" (page 400) of Army and Air Force air-ground operations from 1973 to 1990, elaborating upon the key doctrinal cooperation arduously worked out between the two services and explaining how such collaboration resulted in "relative cohesion and strength" in Army-Air Force doctrine (page 430). Meanwhile, Dennis Drew probes Air Force thinking on the application of airpower to low intensity conflict, concluding that airpower can be successful in a counterinsurgent role only if it is totally integrated into the military campaign.

In addition, Maris McCrabb's engaging essay on NATO airpower shows how conceptual differences between US and NATO command and control and weapons employment were eventually modified for alliance needs. Relatedly, Edward Felker reviews how major changes to Russian Federation airpower doctrine led to an emergent perception of security interests which forced the Russians back to "earlier ideas about the preeminence of the offense" (page 515). Yet, as Felker warns, "Russian airpower will remain fragmented" amidst a doctrinal unreality (page 519).

In examining more modern concepts, David Fadok elaborates John Boyd's theory of conflict with its military objective of breaking the enemy's spirit and will. In addition, Fadok explores John Warden's theories of how airpower achieves strategic ends with maximum effectiveness and minimum cost. What about airpower and nuclear warfare? Karl Mueller's thesis is that deterrent theories of the past continue to be relevant, despite the fading of East-West confrontation. Regarding the potential of space, Bruce DeBlois provides a masterful analysis of the vast capabilities of aerospace power and discusses the possibility of a separate Space Force. He underscores the vital fact that space power reduces US casualties through the remoteness of its operating realm. Finally, I. B. Holley provides the volume with a needful redaction, classifying the ideas of the theorists according to the way they can be authenticated.

There is little to criticize here. Although perhaps true on a proverbial level, this reviewer cannot agree with Winton that *all* airmen disbelieve that "the ultimate result comes from soldiers on

the ground" (page 401). The results are situationally dependent. DeBlois's use of the pejorative "emotional" to characterize all who dissent from the military use of space is puzzling. Finally, the title of the book is more suited to a history of sport flying than that of airpower theory. Nevertheless, as the gangrenous wound of the Great War's trenches still haunts us, Meilinger's compilation amply illustrates the primacy of striking an enemy's will before his killing machines are fielded. This is the historiographical undergirding of one of the most comprehensive surveys in print on the evolution of airpower theory.

Maj Jeffrey C. Alfier, USAF
Ramstein AB, Germany

To Save a City: The Berlin Airlift, 1948–1949
by Roger G. Miller. Air Force History and Museums Program, 200 McChord Street, Box 94, Bolling AFB, Washington, D.C. 20332-1111, 1998, 132 pages.

Roger G. Miller's *To Save a City* is one of the most detailed yet concise analyses of the first military confrontation of the cold war. This official United States Air Force history of the biggest airlift of all time provides voluminous facts presented in an interesting and fast-moving read that offers many practical lessons for military operations in general and air mobility operations in particular.

Miller begins with a thorough description of the political and military causes of this crisis. The blockade was the inevitable result of the clash of Soviet and Western ideas on the future of postwar Germany. The Soviets wanted a pro-Soviet, weak state that would pay reparations indefinitely for the war, while the West wanted to rebuild and make Germany the center of gravity of a revitalized, democratic, and peaceful Europe.

On 25 March 1948, the Soviets began restricting allied military and passenger traffic into the western zones of Berlin, and the West responded with the "little lift," the precursor of Operation Vittles. Using the C-47 Skytrain, which Eisenhower had cited after World War II as one of the four most important weapons in that war, along with the bazooka, jeep, and atom bomb, the allies

began lifting supplies into Berlin. Noting that this airlift was having a meager impact, the Soviets drew the incorrect conclusion that an airlift would never meet the needs of a city of 2.3 million. In June the Soviets further tightened the blockade, and on 26 June the airlift officially began.

Although most members of the Air Force are very familiar with the resounding success of this 15-month airlift, many may not be aware of some very interesting anecdotes and facts. In the beginning, the airlift moved just 80 tons daily into Berlin; it eventually reached over eight thousand tons a day. During the famous Hump airlift of World War II, the most common cargo was gasoline; during the Berlin airlift, it was coal, which accounted for 65 percent of all cargo. Weather was the biggest threat to aircrews, not the Soviets, and ground-control approach (GCA) was integral to the airlift's success. The British portion of the airlift was named Operation Plainfare, while the drop of candy to German children from C-54s initiated by 1st Lt Gail Halvorsen was called Operation Little Vittles. To prevent the Soviets from taking any further aggressive action, two groups of B-29 bombers were moved to the United Kingdom, and although they were not nuclear capable, every effort was made to imply that they were. Furthermore, the allies were making contingency plans to continue the lift for three years when it finally ended.

One discerns many lessons from the Berlin airlift, including the crucial importance of effective leadership (Secretary of the Air Force Stuart Symington and Generals Clay, LeMay, Smith, and Tunner); decisiveness (Truman's refusal to capitulate); unity of command (General Tunner's running the airlift and subsequently improving its efficiency and effectiveness dramatically); jointness (Army units overseeing the loading and unloading of aircraft and the involvement of 24 R5Ds—Navy versions of the C-54); multinational operations (participation of British, commonwealth, and French units); host-nation support (from hundreds of German laborers who helped load and unload aircraft, while several hundred former Luftwaffe mechanics alleviated a shortfall in maintenance personnel); and training (establishment of a three-week training course for aircrews at Great Falls, Montana, which duplicated the approaches into Berlin).

The airlift's success shocked not only the Soviets but also the US National Security Council and Joint Chiefs of Staff, who believed it would fail. One can attribute its success to people, equipment, and infrastructure. Without the leadership, hard work, and courage of so many, from Truman down to the support units at the airlift bases, without the C-54s, trucks, and other aircraft and equipment, and without the airfields and supporting structures, the forces of evil would have claimed another victory at a critical time during the early days of the cold war.

The significance of this lift is still felt today. The need for larger transports with their ability to haul enormous loads led to the development of the C-141, C-5, and C-17; the need to unify airlift under one major Air Force command begot Military Airlift Command and later Air Mobility Command; the need for joint coordination of all modes of transportation led indirectly to the creation of US Transportation Command; and the critical importance of airlift in national security strategy lifted its stock to the level of bomber and fighter forces, although many "shooters" today are still in denial.

The 50th anniversary celebration of the largest humanitarian operation in military history culminates in September 1999, and it would be well worth your while to read this concise yet fact-packed tribute to the courage and sacrifices of the allies and Berliners who stared into the eyes of evil and won. As these celebrations conclude, we must ironically wonder if the average Russian today eats as well as the average Berliner did during those tense 15 months of the Berlin airlift.

Maj Phil Bossert, USAF
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Perspectives on Air Power: Air Power in its Wider Context edited by Group Capt Stuart Peach, RAF. Her Majesty's Stationery Office, P.O. Box 276, London SW8 5DT, 1998, 351 pages.

Britain's Royal Air Force holds regular airpower seminars wherein airmen from several countries meet to discuss their profession and its future. Pa-

pers are written, and the results are published; this volume is the latest in that series. Most of the authors are British airmen, both active duty and retired, but the issues they address are broad enough to appeal to a wide audience. As a consequence, the book includes essays that deal with airpower theory, strategic bombing, emerging technologies, air logistics, international law, information warfare, coalitions, jointness, and the future of space. Although, as is the case with most such anthologies, the quality of these essays is uneven, some are excellent pieces.

If one had to identify a theme that ties all of these diverse topics together, it would be the premise that airpower—including space operations—will become increasingly important in the next century. This is not an overly surprising conclusion, given the background of the authors. However, the arguments made to support this general contention are certainly persuasive. David Gates, for example, notes the growing sensitivity to violence and bloodshed worldwide, due partly to changing mores but also to an increasingly pervasive and curious media. This means that the use of military force, especially in limited conflicts, has enormous political implications and therefore must be closely controlled. Casualties—on both sides—must be minimal. This in turn requires a precise application of force delivered quickly and at low risk (i.e., from afar). Tony Mason gives an impressive overview of emerging aviation technologies, illustrating that such precision and standoff capabilities are achievable today and will continue to grow. At the same time, William Jones maintains that space operations will become more diverse and less tied to terrestrial action. P. C. Emmett then concludes that the key to all of this emerging technology lies not in hardware but in software. Enhanced capabilities in stealth, precision, communications, and intelligence, for example, are due largely to increased computer power. This is both good and bad news for the West. It is good because we are far ahead in computer and software development, but it is bad because the very nature of this revolution means that it is dependent on brain power—not industrial might or financial strength. Because the West has no monopoly on cleverness or creativity, our dominant position is subject to erosion.

In an interesting and persuasive essay, Phil Sabin argues that traditional distinctions among

air, land, and sea operations are increasingly blurred so that further military force will almost always be exercised jointly. Taking this idea a step further, Stuart Peach foresees an increasing use of coalitions to solve military and political problems. These tendencies would also play to airpower's unique strengths. It is not an exaggeration to state that traditional land and sea operations are quickly becoming a thing of the past. Unsurprisingly, then, a very large percentage of Army and Navy budgets is going towards air assets: the backbone of the American fleet remains the aircraft carrier, and the largest air arm in the world belongs to the US Army. Old debates regarding the efficacy of airpower have thus been transformed: few people today question the dominance of airpower in modern war. Rather, the debates that occur concern who will control those dominant air assets and what they will be used for.

Airmen, especially those in air forces, have tended to see airpower's most important characteristic as its ability to operate against strategic targets, whereas soldiers and sailors want airpower directed at tactical targets to help them obtain their land or sea objectives. Significantly, those views are beginning to change as armies and navies tend increasingly to strive for a deep-strike capability. At the same time, air forces are moving, as Mark Bucknam points out, away from a strategic bombing doctrine that focuses on industrial targeting to strategic air attack directed at command, control, communication, and leadership targets. This convergence of views among soldiers, sailors, and airmen augurs well for an effective application of airpower in future crises. Overall, *Perspectives on Air Power* is a provocative and insightful collection of essays that would be valuable reading for any airman.

Col Phillip S. Meilinger, USAF
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Chinese Views of Future Warfare edited by Michael Pillsbury. National Defense University Press, Washington, D.C. 20402, 1997, 421 pages.

This collection of 40 essays by prominent members of the defense establishment of the People's

Republic of China (PRC) provides a unique look at the perspective of the People's Liberation Army (PLA). Painstakingly translated and edited, these essays were originally published between 1994 and 1996 in various Chinese military journals. Repeatedly, this volume displays an incredible sense of envy within the PLA for American high-tech weaponry. This book will not change the mind of those US security analysts who foresee the PRC as America's next peer competitor. Nor will it alter the contrasting view of those who believe that China is not a true threat to stability in the Far East. What this compendium can do, however, is display how little the PLA understands the nuances of revolutions in military affairs (RMA).

Many of this volume's essays anticipate a "war of aggression" by the United States against the PRC. Thus, perhaps for the reason of knowing one's enemy, these essayists are acutely aware of the success enjoyed by US forces during Operation Desert Storm. In general, the essays reveal a great deal of research on the American military, which is relatively impressive since one would probably have difficulty finding an equal number of pieces by US officers published in military journals during 1994-96 concerning the PLA's operational activities and defense policy concerns. Interestingly, the authors describe the US experiences in Korea and Vietnam as American wars of aggression, and they state that in both cases, China defeated the United States. At the same time, these writers take little notice of the PRC's excursions into India (1962), Siberia (1969), or Vietnam (1979). Furthermore, they give no explanation as to why the PRC and the United States are likely to engage in conflict. Obviously, the authors were unwilling or unable to take on the task of enunciating the American policy of defending Taiwan.

Along these lines, the volume's contributors focus on the strength of America's precision strike capability instead of the vulnerabilities involved in the US military's reliance upon the American public will. Operational and technological factors are subordinate to the political and societal aspects of war. However, without a realistic appreciation of these overarching considerations, the PLA is fundamentally unlikely to comprehend the dangers and opportunity it could face in a conflict with the United States. The PRC's leadership seems more concerned with attempting to manage the flow of

information in China than with speculating on how public information can affect the United States. In short, the contributors ignore how the PRC could potentially harness information networks to shape American public opinion. Perhaps this is because the PLA fears the degree to which information networks may upset the political stability of the PRC. Or maybe this is because the PLA simply does not understand that the center of gravity for the United States is the will of the American people.

In both details and overarching conceptions, the writers display an idealistic belief in the capabilities of technologically advanced weapons systems, sensors, and communication devices. They pay no attention to the limitations of such equipment, nor do they appear to recognize that military hardware and software invariably experience breakdowns. Additionally, America requires civilian technical advisers and contractors for a majority of its armed forces' high-tech devices because the technology is too complex and changes too rapidly for uniformed service members to have all the necessary answers. Although the PLA probably could not overcome similar demands, considering the limitations of the PRC's education system, the essayists ignore this point.

On another note, the contributors propose that technological developments will make centralization easier and more efficient. But centralized decision making creates a "single point of failure." Centralization also interferes with the lower echelons' ability to respond in an appropriate and timely fashion to opportunities or obstacles. Information systems and advanced weapon systems are more profitably used to empower lower echelons through facilitating coordination among adjacent units for support and allowing engagements at greater distances than the enemy is capable of striking. As well, technology can provide small-unit leaders with the perspective to make tactical decisions in accordance with a view of the overall operation. Centralization and micromanagement are not solutions for the ambiguity and nonlinearity found in the dynamics of military operations.

China's culture is based on hierarchy, community, and custom, and, historically, China's society has been centralized. This will make it difficult for the PLA to change its institutional mind-set and will inhibit the PLA's ability to innovate and adapt. Advances in technology play only an enabling role

in precipitating new and effective ways of fighting. The creation and development of new organizational structures, doctrine, operational concepts, and tactics—not mere technological development—bring about an RMA.

Overall, this volume of essays raises several questions for the reader regarding the PLA and conceptions of warfare in the twenty-first century. Although it provides no exceptional insight concerning China or RMAs, *Chinese Views of Future Warfare* clearly presents viewpoints of the PRC's normally opaque defense establishment. I recommend it only to people studying the PLA or examining American strategy towards China.

Capt Jeff Kojac, USMC
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Neighbors and Strangers: The Fundamentals of Foreign Affairs by William R. Polk. University of Chicago Press, 5801 South Ellis Avenue, Chicago, Illinois 60637, 1997, 366 pages, \$24.95.

Neighbors and Strangers is a reflective work from someone who worked in the Policy Planning branch of the State Department and then went into academia, lecturing on foreign affairs. It addresses the four most important areas of foreign policy, which define how the world conducts relationships with friends and enemies alike: defense, trade, intelligence, and diplomacy. Polk uses historical examples in each of his chapters to illustrate the points he is trying to make. His choice of examples, which stretch from antiquity to modern events, shows his vast knowledge. By using ancient Chinese and other oriental examples, Polk also tries to draw the reader away from the usual Western European foundations to which most of us are accustomed. He shows that while Europe was still recovering from religious wars or massive population shifts, the Chinese were conducting sophisticated relations with their neighbors and trading with Africa and the Middle East. He also mentions the Indus valley, an area frequently overlooked, in numerous places and shows how invasions affected the Indian subcontinent and the population groups inhabiting this part of the world.

Polk argues that scholars and practitioners of foreign policy are interlinked, but some readers would take exception to that statement. Foreign policy has changed with the end of the cold war, and the author is trying to show that we have always lived in a multipolar world and that while the players and empires have shifted, the actual practice of foreign relations has not. The text also looks at how society has transformed itself and how foreign relations has evolved. Such defensive measures as building walls, from Jericho to the Great Chinese Wall, meant far-reaching changes in those societies. Workers had to be trained and housed, and building materials had to be gathered and produced as societies moved past their traditional boundaries. Changes had to occur, and scientific and technical discoveries had to precede such events. All of these issues are illustrated using historical evidence, which gives the book a multidisciplinary approach not often found in such overviews.

Polk opens with an examination, usually reserved for medical texts, of why people do not like foreigners, feel uncomfortable around them, and have psychological reactions that lead to dramatic and sometimes catastrophic results. This chapter provides insight into human interaction rarely discussed in the social sciences. Moving to defensive reactions that people have in the presence of foreigners, the author looks at the walls and other defenses humans have built and the ancient Egyptian ways of making an enemy a nonperson. The chapter shows Polk's multidisciplinary approach to the problem societies have encountered while dealing with foreigners. The Ming dynasty and French Maginot Line were much the same sort of military solution as was the Berlin Wall.

The evolution of standing armies and weapons is the subject of the next chapter. Most military officers will find no surprises in this treatment, which also covers guerrillas, mercenaries, and colonial auxiliaries. It notes that the United Arab Emirates is currently attempting to buy strike fighters, even though it has no capability to employ them, and is making the sale conditional on the supplier nation's providing some form of defense alliance. This attempt to buy an alliance by subsidizing a Western defense industry shows a shift in defense economics.

The following chapter examines trade, which is nongovernmental in nature but still consumes a large portion of any foreign-policy maker's time.

Capitalism and, before it, imperialism require a certain economic growth rate if the system is going to work and keep a large portion of the population happy.

Following that is a discussion of intelligence and espionage, in which Polk shows how people have conducted the latter since antiquity. He notes that counterintelligence—preventing a foreign power from knowing one's activities—can lead to more complications than the original "policy" a state was trying to hide. This is an interesting observation, especially since the United States has suffered through some painful espionage cases.

In another chapter, the author examines diplomacy and the way diplomats work. In medieval times diplomacy was a profession one avoided since it involved risks and bad pay; one usually had to take a second job as a salesman/trader in order to make ends meet. This depiction contrasts starkly with the diplomatic service we have today.

The final chapter, dealing with ethnic cleansing, might well be taken straight from today's headlines. Although not condoning the practice, Polk shows the reader that this type of behavior, which involves a way of dealing with foreigners in our midst, has occurred since antiquity and should come as no great surprise. Some of the examples cited include the removal of Muslims and Jews from medieval Spain, Imperial Russia's treatment of Jews, Stalin's transshipments of tribes of Muslims from their homelands to Siberia, and the expelling of noncitizens from Rome.

Neighbors and Strangers is a very complex comparative-analytical study, which, although sometimes hard to follow, makes the case that foreign relations never has and never will be a singular system. Rather, it is the product of multidimensional engagements conducted on a variety of levels. Information warfare and those wonderful cultural developments such as television and the Internet, which affect global interactions on a daily basis, are all explored in this text. Foreign relations has shaped every society and civilization and will continue to do so.

Capt Gilles Van Nederveen, USAF
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Battlefire! Combat Stories from World War II by Col Arthur L. Kelly. University Press of Kentucky, 663 South Limestone Street, Lexington, Kentucky 40508-4008, 1997, 226 pages, \$22.00.

Battlefire! is a collection of the wartime memoirs of 12 servicemen from Kentucky. The author, a retired Army veteran of World War II, Korea, and Vietnam, conducted over one hundred interviews with World War II survivors. From all their stories, the author selected 12 that he felt best represented what it was like to be in battle. The narratives span the actions of all four of the services engaged in both major theaters of war and provide the reader with a unique perspective of the all-encompassing nature of World War II. Wanting to preserve the experiences of these men for posterity, the author contends that "the powerful stories of these combatants may help all of us to better comprehend the ugly face of war and all that American combat veterans endured."

By using interviews Kelly allowed the combatants to tell their story in their own words and convey the emotions they felt at the time. He then conducted extensive research from secondary sources to verify details, fill in the gaps, and place incidents within the overall context of the war. The narratives are all quite different, each one providing another snapshot of World War II. The stories convey the ever-present danger, psychological stress, and uncertainty of war as ordinary individuals found themselves in extraordinary situations. The sacrifices these men made for their country are phenomenal.

The book begins with the experiences of a US Navy signalman who witnessed Pearl Harbor and later participated in the battles of Leyte Gulf and Okinawa. Another narrative graphically conveys the horrors of the Bataan Death March and the terrible conditions at the infamous Camp Cabanatuan. A subsequent narrative by a Navy pilot describes carrier operations, kamikaze attacks, and combat missions. Yet another tells the story of the air war over Germany through the eyes of a US Army Air Forces B-17 gunner who was shot down, captured by the Germans, and eventually placed in Stalag 17, the German prisoner-of-war camp made famous by the movie. Other oral narratives tell the story of a combat medic, an Army surgeon, an in-

fantry company commander in Italy, a radio operator at Bastogne, an Army infantryman in Normandy, and two marines at Iwo Jima.

Each story is different, yet each conveys perceptions and emotions as these men were thrown into the cauldron of combat. I enjoyed the book and recommend it to my fellow airmen. I fully concur with the author that it is important to keep these memories alive so we all can appreciate the price paid for our freedom.

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Modernity and War: The Creed of Absolute Violence by Philip K. Lawrence. St. Martin's Press, 175 Fifth Avenue, New York, New York 10010, 1997, 206 pages, \$65.00.

For Philip K. Lawrence, professor of international politics, the leitmotiv of modernity has been Western civilization's "dominion over other peoples and lands, the place of science in the construction and ordering of the polity, and the rise of technocratic and instrumentalist rationalism" (page 87). That is, modernity's essential elements of positivism and rationality became excuses to run roughshod over indigenous cultures on an engine of religious and ideological progress. In promulgating that creed, modernity unveiled its more destructive consequences. Yet, the danger was not seriously entertained amidst the ever-optimistic Enlightenment underpinnings. In particular, what was not foreseen—or ignored—was the nascent industrial revolution's production of weaponry, resulting in a lethal symbiosis of lower-cost, higher-volume improvements in communication, standardization, and interoperability. Now people possessed the ability to annihilate an enemy's forces. Consequently, the civilized rules of warfare gave way to ideological wars that could sweep away the old orders as military strategy became science executed independently of the notions of history or culture. These cataclysmic changes were set against the background of social Darwinism and its pseudoscience of eugenics. Racism could now be justified in polite circles as a "survival of the fittest"

mentality, painting the enemy as "the other"—as something less than human.

However, in the ascendant modernity of the nineteenth century, a strategic and tactical stasis failed to keep up with the reality of the destructive prodigies of the industrial revolution, in which industrial workers themselves became a key to war. Eventually, the new strategic thinking of total war would make these workers a target as lucrative as the tank or aircraft they built. Other synergies were at work as well, including the idea of warfare waged as manly and heroic work, a chimera that dissolved in the miseries of Verdun and the Somme, inducing despair among legions of European intellectuals. Yet, such bloodshed, unprecedented on the pages of human history, sprang from modernity that vaulted human perfection into the future, beyond the temporal considerations of armed conflict.

Such was the modernist seedbed spawning the nuclear age. Lawrence believes that by the late 1940s, nuclear thinking became the *arcana imperii* of US-government think tanks, the military, and politicians, thereby eclipsing public discourse on issues surrounding the employment of nuclear weapons. "Abstract reasoning became a problem-solving tool" (page 103), producing conjectures of nuclear deterrence and defense that became logically and militarily suspect.

What of the emergence of the airplane as a weapon of war? According to Lawrence, as an alternative to deleterious wars of mass attrition, a "modernist philosophy of air war . . . re-established a positive cultural gloss for war" (page 61). Of utmost importance was the fact that airpower existed in the popular imagination through the genre of science fiction, decades prior to World War I. This deep cultural mind-set, coupled with the ideas of thinkers like Douhet and Billy Mitchell, set about to restore people's optimism in the ideology and vision of human progress. As it would turn out, it became vogue to think of bombing a nation's morale and thereby its will to wage war. However, the persistent enigma is determining what constitutes a nation's will to continue fighting.

Despite a tincture of "skeptophilia," there is much to commend here. Lawrence challenges our intellectual complacency regarding mass violence in the context of human progress. Because of his philosophical and historical sweep, he makes a

valuable contribution to the dialectics of warfare and morality, offering an optimistic note that "there is also a chance that the powerful will tread more warily in the world" (page 5). His thesis provides a sobering balance to airpower's dreamy solipsism in the post-Gulf War world where too much of our Air Force culture assumes a kind of folk teleology. Meanwhile, much of the West carries on like the avatar of Wallace Stevens's poem "Life on a Battleship": living on a divinity of steel in which we are the sole captain.

Maj Jeffrey C. Alfier, USAF
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Son Thang: An American War Crime by Gary D. Solis. Naval Institute Press, 118 Maryland Avenue, Annapolis, Maryland 21402, 1997, 368 pages, \$29.95.

Son Thang is both a finely crafted work about a little-known massacre of civilians during the Vietnam War and a well-rounded, compelling description of a significant event. The author, Gary D. Solis, is a retired lieutenant colonel who served on active duty as a Marine assault amphibian officer and judge advocate. He draws upon both his combat experience and legal background to produce a fine book that chronicles the grisly particulars of a Marine "killer team" expedition which culminated in the brutal killing of 16 women and children in a Vietnamese village known as Son Thang. The book is not merely a recounting of the murders themselves but includes a careful, interesting description of the courts-martial and other legal proceedings that followed these horrible events. It also highlights the numerous factors (military, political, and social) that combined to cause this incident.

Solis became interested in Son Thang, often referred to as the Marine My Lai, while he was conducting research for another interesting volume, *Marines and Military Law in Vietnam*, the Marine Corps's official history of judge advocates and courts-martial during that war. The Son Thang story contains some unexpected outcomes and interesting twists, including the involvement of two young officers who later acquired a fair amount of notoriety themselves: Oliver North, noted for his involvement in the Iran-Contra affair, and James Webb, who later served as the secretary of the Navy.

For this book, Solis relies on several reliable sources, including the verbatim transcripts and appellate court opinions of the Son Thang trials, and personal interviews with and letters from several persons involved in the event. He also cites court opinions from other like cases and refers to numerous books and articles on Son Thang, My Lai, and the Vietnam War in general. The book contains detailed endnotes and a lengthy bibliography. In sum, it is well researched and should be considered an authoritative work on this particular aspect of the Vietnam War.

One of the unexpected pleasures of reading this book was Solis's excellent writing style. From the beginning, *Son Thang* was hard to put down—as good as the best legal fiction available. It has a little of everything that makes a good book: military action, courtroom drama, and personal tragedy.

Notably, however, Solis has not created a “good read” at the expense of being accurate and completely thorough. He presents the material from a quite objective position. Although an experienced lawyer accustomed to advocating a position, Solis restrains his natural inclination to convince us and leans more towards providing a fair report of the facts as they occurred. His recounting of the events is evenhanded and impartial, allowing readers to arrive at their own opinions, even while he draws several conclusions about the handling of these cases and about the usefulness of the Uniform Code of Military Justice in combat.

I highly recommend *Son Thang*. It is not just for judge advocates. Rather, any reader interested in military leadership, war history, court-martial procedure, or the formulation of rules of engagement will find it a valuable addition to his or her library. This riveting account of an intensely human drama will not disappoint.

Maj Kirk Davies, USAF
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The Decision to Drop the Atomic Bomb by Dennis D. Wainstock. Praeger Publishers, 88 Post Road West, Westport, Connecticut 06881, 1996, 180 pages, \$55.00.

With historical revisionists skulking behind every corner, attempting to rewrite history according to their own secret, sometimes selfish, agendas, it is a breath of fresh air to read a well-written, highly documented account of the events leading

up to the American use of atomic bombs against Japan. *The Decision to Drop the Atomic Bomb* presents an extraordinarily balanced and riveting account of the political, military, and diplomatic maneuvering that took place on both sides of the Pacific and within Stalin's Soviet Union, resulting in the dropping of the atomic bombs on Japan.

The author, despite making clear his position on the use of atomic bombs, does not preach unsupported and opinionated positions to the reader. Rather, he lets his research and documentation do most of the talking. There is no doubt left in the reader's mind that Wainstock does not approve of our using the bombs, yet he skillfully negotiates a maze of complicated political wickets and decisions in order to define what he feels were the real purposes for leveling Hiroshima and Nagasaki.

An associate professor of history at Salem-Teikyo University in Salem, West Virginia, Wainstock is also the author of *The Turning Point: The 1968 Presidential Campaign*. His bountiful use of footnotes and historical references, gleaned from primary, secondary, and tertiary sources, adds significant credibility to his work. By using his sources with care, he has produced one of the significant pieces of work on this incredibly sensitive subject. Further, he artfully avoids the hard-core, pro-atomic Goliaths without simultaneously denigrating policy makers whose unsavory task it was to order the deployment and use of atomic weapons.

What makes this book so interesting is the author's ability to tie together important factors from the United States, the Soviet Union, Great Britain, and Japan, all of which contributed to the eventual use of atomic weapons. Wainstock poses significant questions, answering each one with skillful dialogue and research. What was the real reason for dropping atomic bombs? What role did the USSR play? Why did the Japanese ardently trust the Soviets to help broker a peace plan with the United States? Did the Soviet invasion of Manchuria as well as US desire to demonstrate strength to the Soviets help influence our decision to drop the bombs? Did US insistence on unconditional surrender, as a policy of revenge, help deter early peace efforts in the European theater as well as in Japan? Why did the United States initially refuse Japanese requests to keep Emperor Hirohito in power, yet, after dropping the bombs, keep him in power anyway? The book addresses these and many other significant questions.

Too often, books on this subject take one of two paths: “The Japanese deserved what they got; besides, the bombings saved hundreds of thousands of American lives”; or, “The Japanese were poor,

unfortunate victims of the wanton and unbridled American lust for killing." As is usually the case, the truth resides somewhere in the middle. *The Decision to Drop the Atomic Bomb* takes an honest, objective, and detailed look at that sacred middle ground that too many revisionists or pseudohistorians try to avoid. I highly recommend this excellent book.

Maj Robert F. Tate, USAF
Maxwell AFB, Alabama

Zero Fighter by Akira Yoshimura; translated by Retsu Kaiho and Michael Gregson. Praeger Publishers, 88 Post Road West, Westport, Connecticut 06881, 1996, 209 pages, \$19.95.

Zero Fighter is a technohistory, relating the technical history of one of the finest combat aircraft of the Second World War—the Japanese Mitsubishi Zero. Akira Yoshimura, who has published over 50 books during his career, attempts to take the reader through the inner workings and decisions that helped create the Zero. Arguably, during the first two years of the Pacific war, the Zero was the best fighter in that theater of operations. Its pilots earned the respect of their American, British, Australian, and other Allied opponents. Without ever having read more than a typical high school history book on the Second World War, most of us already knew this to be true. Unfortunately, however, Yoshimura gives the reader precious little quantifiable information beyond the superficial.

Zero Fighter details the requirements handed down by the Japanese navy to build a superior fighter aircraft as well as the process by which Japanese engineers produced an aircraft whose maneuverability and range were without equal. Also making for interesting reading are accounts of discussions between the navy and Mitsubishi engineers, tactics specifically developed by US aviators to defeat the Zero in combat, the Mitsubishi production process, and the performance capabilities of the Zero. Although the book includes some nice pictures of the Zero, I would have appreciated pictures of aircraft that preceded and influenced its production, as well as photos of its greatest antagonists in the Pacific.

Not only is the lack of photographs disappointing but also the author fails to include a single footnote in the entire book. The absence of docu-

mentation leaves the book open to the charge that many of the combat details are merely figments of someone's imagination or, more likely, are the product of memories that have faded during the decades since the war. For example, the author often mentions air battles in which only a handful of Zeros shot down tens of American aircraft and states that carrier aircraft numbered in the thousands. Without solid documentation, such statements are questionable at best.

Further, most aviation historians—as well as aces Richard Bong (40 kills) and Thomas McGuire (38 kills), were they still alive—would probably disagree with the author's statement that the P-38 Lightning was "shot down easily" by Zeros. *Zero Fighter* also fails to depict the incredible attrition that Zero pilots faced as the war progressed. The author also makes an unfortunate and clumsy political foray by discussing the "thoroughly indiscriminate bombing" of Japanese cities, which, he asserts, climaxed with the atomic attacks on Hiroshima and Nagasaki. Similarly, the author makes significant assumptions about American thoughts about the firebombing of Japanese cities—once again, without any supporting material.

When all is said and done, *Zero Fighter* makes for interesting reading, but the absence of documentation drastically reduces its value to the field of aviation history. For that reason, I do not recommend buying this book. If you want to read it, use the library's copy. But there is no point in adding *Zero Fighter* to your personal collection.

Maj Robert Tate, USAF
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Into the Teeth of the Tiger by Donald S. Lopez. Smithsonian Institution Press, 470 L'Enfant Plaza, Suite 7100, Washington, D.C. 20560, 1997, 230 pages, \$17.95.

"I have never been sorreee." So ends Donald Lopez's World War II memoir. Likewise, I am not sorry I read this interesting story of a real Flying Tiger. Although the author often fails to put his story into the larger context of the war, it is nonetheless an engaging story. Lopez describes not only his combat experiences but also his friendships, training, and impressions of leadership. Through the good times and the bad, the author makes it quite clear he has

never been sorry for joining the Air Force, even in his darkest days of combat.

The author intelligently begins with a "there-I-was" vignette. Once he has seized the reader's attention, Lopez retreats to his childhood and embarks upon the real story. Like many children of the depression and World War II, the author remembers his childhood not as one of meagerness but of fullness—he named the chapter on his early years "Child of a Golden Age." Interested in all things mechanical and aviation, he devoured the trashy, pulp magazines of the day with such dubiously inspiring characters as "Coffin Kirk" with his trained gunner-ape "Tank." By the age of seven, he had "slipped the surly bonds" in a Waco biplane—albeit as a passenger. Growing up in Brooklyn, Lopez lived rather close to Floyd Bennett Field, where he often went to bum free rides from a local commercial pilot. When his family moved to Tampa, Lopez lost his conduit to free flight but continued his interest in flying, enrolling in the Civilian Pilot Training Program his freshman year at the University of Tampa. Thinking he would have a better chance of becoming a pilot in the Army Air Forces if he finished his freshman year and earned his pilot's license, Lopez delayed enlisting until June 1942. By then, he had been soloing for several months.

As with most memoirs, the reader is amazed at the amount of time and effort spent on training pilots in World War II, giving some hint as to the industrialization of war. It took approximately two years of instruction before he arrived at his flying squadron in China. Although consigned to P-40s, Lopez became one of the aircraft's greatest supporters, even denouncing the P-51 in favor of the Tigershark.

This is one of the few memoirs in which the flexibility of airpower shines through. The dearth of resources in Fourteenth Air Force and the missions that needed to be done forced the nimble P-40s to run the gamut of what we would call core competencies today. One day his unit would fly escort for bombers. The next, it might be an interdiction mission, and the next, a fighter sweep. Lopez even used his fighter, *Lopez's Hope*, as a transport, so overloading it with food and clothes that he almost crashed on takeoff. For the most part, his unit concentrated on seeking out and destroying the enemy on the ground. Lopez felt that his

squadron made the most direct contribution to the war effort when it strafed the enemy. Unfortunately, his unit discovered that the best-trained air force in the world could not win the war without a decent army supporting it. Evidently, not much cooperation existed between the Americans and the Chinese at the unit level. Nor does it appear from this memoir that much effort was expended on either the nationalist or the US side in that pursuit.

His descriptions of life and combat in China reflect the humdrum monotony of life in the military—not the romantic picture often portrayed by Hollywood. For instance, with little to do when they were not flying, the pilots busied themselves hunting rats or drinking—or both. His descriptions of life in China take on an almost routine flavor, punctuated with occasional moments of tension. Time and again we read of a friend shot down, only to be rescued by Chinese guerrillas and returned safely to the squadron. Similarly, redeploying due to Japanese ground advances became part of doing business instead of an emergency. Lopez uses the lulls in combat to describe his friends. Through his narrative we come to know a little about "Moose" Elker, Jesse Gray, and Don Quigley—the real flying tigers.

Occasionally, however, the author repeats the same mistakes so many veterans make when writing their war experiences. They understand only their microcosm of the war, failing to place their efforts and their units' efforts in the greater context of the war. A good descriptive map would have aided the narrative greatly.

This reprint of *Into the Teeth of the Tiger* is a fine addition to our knowledge of World War II, especially war in the Far East. Most of our World War II memoirs come out of Europe and the Eighth or Ninth Air Forces and, to a lesser extent, from the Pacific. Relatively few Flying Tigers have written and published their view of "how it really was." For readers interested in the China-Burma-India theater in World War II or for those interested in exploring the flexibility of airpower, this book is a must.

Capt Jim Gates, USAF
Los Angeles, California

World Boom Ahead: Why Business and Consumers Will Prosper by Knight Kiplinger. Kiplinger Books, 1729 H Street NW, Washington, D.C. 20006, 1998, 404 pages, \$27.95.

According to Knight Kiplinger, editor of the business-forecasting *Kiplinger Letter*, the next century will experience unprecedented world prosperity. Advances in technology will allow the world to provide for an enormous population with a substantial rise in living standards. This growth will be a long, strong, but gradual expansion unhindered by the major depressions and world wars of the last century. Increasing numbers of consumers with an increasing ability to purchase goods, coupled with a more open and interconnected world market, will fuel the world boom ahead. Although this book is written by a business journalist primarily for investors and companies searching for opportunities, it is also a great read for anyone in the military, especially the Air Force. In addition to chapters devoted to threats to the world boom ahead and upcoming technologies, the book includes specific sections on defense, new military tools, aerospace, and the airplane-manufacturing industry.

Kiplinger only briefly examines alternate—and, according to him, much less likely—scenarios that would result in major world conflict; however, he does admit that smaller conflicts involving military force will occur. The broad distribution of conventional armaments and the intertwining of national economies will prevent these conflicts from escalating into major world wars. He does not predict exactly where and when these smaller conflicts may arise, but the detailed information he provides, from world populations and immigration to relative economic power to the ascendance of Asia, gives an outstanding focus for the future. *World Boom Ahead* predicts that economic sanctions will wane because of a lack of effectiveness. China will become a major military power with the ability

to threaten much of Asia. Russia will experience a resurgence of nationalism that could threaten the former members of the Soviet Empire. The US military's force levels and spending will hold steady at about 1 million active duty troops operating on a budget around 3 percent of the gross national product. Efficiencies in base operations, employment, and defense contracting will allow for a rise in military procurement. Our country will continue to require rapidly deployable forces of modest size; aircraft carriers; and high-tech, missile-firing jet fighters. Eventually, we will move to unmanned fighters and bombers.

However, even when the author does not discuss world conflict directly, detailed predictions backed up by extensive data provide great insight into numerous areas of concern to military personnel of all ranks. From changing US demographics that will affect recruiting to increases in technology that will propel the revolution in military affairs and change the way we train and educate our forces—and from the consolidation of major aerospace and defense companies that will affect aircraft procurement to the growing economy that will determine pay and retirement benefits—*World Boom Ahead* is filled with valuable information.

The Kiplinger organization has been making economic, demographic, and technological predictions for 75 years. Unlike the carnival fortune-teller who gives vague generalities without evidence to support predictions, the author makes specific forecasts based on experienced judgment, informed sources, and an evaluation of current events with a historical business perspective. As this century comes to a close, we should pause to ponder what challenges, opportunities, and threats the world, our country, and our military will face, starting in the year 2000. Readers of this book will be well prepared for such reflection.

Lt Col Drew A. Bennett, USMC
Twenty-nine Palms, California

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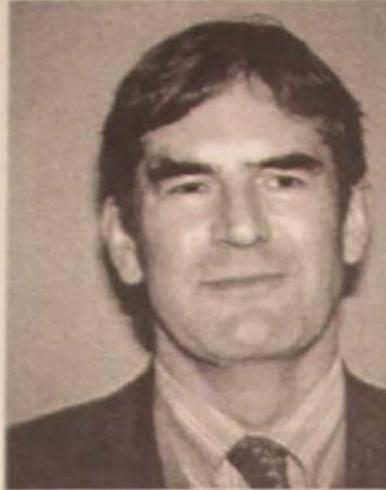
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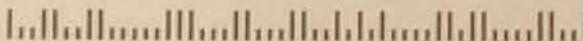
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