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A Word from the Chief

Why “Air and Space”?

GEN JOHN P. JUMPER, CHIEF OF STAFF

IN THIS EDITION, only the title has changed. The *Air and Space Power Journal* continues its distinguished tradition of providing Airmen a forum to become knowledgeable and debate the issues of our profession. This intellectual activity is critically important—it is the fuel behind the leadership and vision needed to continue the transformation of the world’s greatest Air Force. We must be prepared to meet all the challenges of this millennium—both in our current war on terrorism, and beyond. Our nation expects this of us, and we will do it.

The January 2001 Space Commission report represents a significant intellectual effort, studying how our nation should best utilize space in the 21st century. Notably, the Space Commission report does not use the term “aerospace” because it fails to give the proper respect to the culture and to the physical differences that abide between the environment of air and the environment of space.

We need to respect those differences, and that’s why the description of our war-fighting environment as air *and* space is important. We will respect the fact that space is its own culture, and that space has its own principles. And when we talk about operating in different ways in air and space, we have to also pay great attention to combining the effects of air and space because in the combining of those effects, we will leverage this technology we have that creates the asymmetrical advantage for our commanders.

One way we respect those differences is by understanding we need to develop space warriors—those trained in the planning and execution of space-based operational concepts. At the same time, these warriors are still Airmen who work in our Air and Space Operations Center, integrating space capabilities with air and surface capabilities. Air and space capabilities have to work together to bring the right war-fighting effect to the right target at the right time. We will accomplish this transformational marriage of air and space capabilities through the horizontal integration of our manned, unmanned, and space platforms. Our air and space warriors are working side by side to make this happen.

Another way we respect the differences between air and space is through the transformation of our organizations. On 1 October 2001, the Air Force implemented a key Space Commission recommendation when we realigned the Space and Missile Systems Center under Air Force Space Command. In addition, in April 2002 a four-star general took command of AFSPC as his sole responsibility. The result of these changes is a clear operational focus on the development of our space capabilities and the acquisition of space systems.

America’s Airmen—our air and space warriors—whose job it is to leverage both air and space, will combine their skills and their talents to bring the greatest asymmetrical advantage to those commanders whose job it is to win America’s war; not only the war we are in today, but every war. □



Prelaunch Notes

LT COL SCOTT G. WIERSCHKE, SENIOR EDITOR

BRINGING DECISIVE FORCE to bear quickly on any point of the globe by integrating the very different operating environments of air and space has been—and will continue to be—the US Air Force’s primary function. Similarly, as General Jumper stated, bringing hearty debate and innovative thought to bear on the challenges facing the Air Force as it incorporates new missions, technologies, and strategies into that function has been—and will continue to be—the primary role of the Air Force’s flagship professional journal.

The *Journal* now embarks upon a new era of leading the air and space power discourse under a new name that highlights the two unique environments and the integration challenges airmen must conquer. Our readers can expect to get their usual fill of lively debate and stimulating articles from the renamed *Air and Space Power Journal*. The *ASPJ* editorial staff will continue to push hard to provide an open forum for controversial topics, dissenting opinions, and new ideas that are so important to the evolution of our profession of arms. In order to better emphasize that forum for debate, beginning with this edition, we have moved the “Vortices” (opinion/commentary) section to the front of the *Journal*. We hope that all of our readership, especially Air Force members, will find this change a useful facilitation of their professional reading and an inspiration to contribute to *ASPJ*.

Some of the articles in this first edition of *ASPJ* underscore the unique characteristics that divide air and space into distinct operational environments; others debate important topics about the joint fight. Lt Col Tony Wolusky and Dr. James Corum both use historical precedents to glean relevant lessons for today’s air warriors in their pieces on the air campaign planning process and the Falklands War, respectively. In a provocative analysis, Dr. Mark Clodfelter builds a new framework for assessing the effectiveness of airpower in warfare, which depends upon measuring the fulfillment of positive and negative political objectives. Col John Hyten and Maj John Grenier unearth problems with US space policy and Air Force counter-space doctrine, respectively. Both authors offer several recommendations for remedying the situation. Finally, we discover new ways of conducting joint operations in three outstanding commentaries: Lt Col Mick Quintrall’s examination of fire-support coordination boxes; an article on organic versus joint operations by Lt Col Bob Poynor, USAF, retired; and a discussion of the Navy’s role in the global strike task force by Capt Floyd D. Kennedy Jr., USNR, retired.

As always, the *ASPJ* staff looks forward to your feedback and contributions to the professional dialogue on air and space power. □



The great end of education is to discipline rather than furnish the mind; to train it to the use of its own powers rather than fill it with the accumulation of others'.

—Tryon Edwards

A Change-Challenge

The Fire-Support Coordination “Box”

LT COL MICK QUINTRALL, USAF*

Fire and maneuver win battles. The purpose of movement is to get fires in a more advantageous place to play on the enemy. [To this end] Air and Ground commanders must be constantly on the alert to devise and use new methods of cooperation . . . for there can never be too many projectiles in a battle.

—Gen George S. Patton Jr., USA

JOINT DOCTRINE is in a catch-up mode with modern war-fighting tactics. Specifically, joint doctrine has difficulty keeping pace with the integration of fire support in the airland battle space. The fire-support coordinating measures (FSCM) postulated in Joint Publication (Pub) 3-09, *Doctrine for Joint Fire Support*, for instance, have needed a doctrinal push for quite some time.¹ Manned and unmanned air weapon systems are extremely precise and lethal; we can use them nearly anywhere on Earth. Army weapons such as the Apache Longbow (AH-64D) and the Army Tactical Missile System project fires over 300 kilometers and locate their targets by using acoustic and infrared sensors. Similarly, the Navy's Tomahawk Land Attack Missile provides a very accurate, long-range standoff capability that has added another dimension to battlefield fires. These ever-evolving capabilities significantly enhance a theater commander's ability to prosecute a deep battle. Consequently, battlefield lines and restrictive fire measures are moving toward a more dynamic fires process that incorporates airborne command and control (C²), navigation/positioning aided by the Global Positioning System (GPS), and a joint-/combined-fires viewpoint.

Traditionally, the geographically based fire-support coordination line (FSCL) has served as an airland-operations fire-control measure that

*Colonel Quintrall is director of operations and JSTARS mission crew commander for the 93d Operations Support Squadron, Robins AFB, Georgia.

follows well-defined terrain features. Mountain ridges, lakes, streams, roads, and trails demarcate the traditional FSCL. Some of the problems associated with using geography to define the FSCL include the following: (1) inaccurate identification of war-fighter terrain, (2) inability to locate the FSCL at night, and (3) the time required (up to six hours) to change and promulgate a new FSCL. The sometimes-contentious terrain-based FSCL needs a technical facelift. Although the traditional FSCL has lost its ability to “facilitate the expeditious attack of targets of opportunity beyond the coordination measure,”² the opening and closing of a longitude-/latitude-based grid box can prove very dynamic during the prosecution of a war plan and just as reactive if one needs to change air-ground areas of operations. United States Pacific Command and United States Central Command (CENTCOM) complement the FSCL concept with longitude-/latitude-based three-dimensional grid-box systems, resulting in novel but functional modifications to contemporary FSCMs.

In the battle space, one can use grid boxes for restrictive-fire areas, no-fire areas, air-to-air kill areas, and combat search and rescue areas, to name a few. CENTCOM outlines one example of a three-dimensional grid-box scheme for the battlefield in its *USCENTCOM Concept of Operations for Joint Fires*, validated during various exercises, Operation Desert Storm in Iraq, and, most recently, Operation Enduring Freedom in Afghanistan. These codified close air support (CAS) and air interdiction (AI) grid-box procedures have resulted in more permissive air fires, allowed rapid ground maneuver across a three-dimensional battlefield, reduced the chance of fratricide, and muted the service-parochial FSCL by minimizing the overlap of battle-space fires and clearly defining the supported/supporting relationships in the ground commander’s area of operations.³ This article, however, makes a case for using the leading edge of CAS/AI grid boxes controlled by the ground commander as an evolutionary FSCL.

Deep and Shallow FSCLs

I had trouble with the Fire Support Coordination Line placement. . . . At one point after the ground war started [in the Gulf War of 1991], the FSCL [moved to a position] well north of the Tigris River, yet all the Iraqi army was on the interstate highway between Kuwait City and Basrah approaching the river from the south, making the river an ideal FSCL. . . . The Iraqi army was getting across the river, giving them a free ride since we [air component forces] had to attack under close air support rules with no [forward air controllers] in the area.

—Lt Gen Charles “Chuck” Horner, USAF
Desert Storm Air Component Commander

According to Joint Pub 3-09, joint lethal and nonlethal weapon systems are meant to support the regional combatant commander's efforts to disrupt, divert, delay, and/or destroy the capabilities of the enemy's air, sea, and land forces before he can use them effectively against friendly forces. Additionally, joint-fires procedures should reduce redundancy, integrate and deconflict component fires, maximize both effects and utilization of resources, and help eliminate fratricide. If joint fires are integrated correctly, they will complement and reinforce each other, resulting in synergistic combat power applied at the decisive point in a manner consistent with the combatant commander's priorities and concept of operations.

CAS/AI coordination issues in recent war-fighting history continue to address the "deep" versus "shallow" FSCL. In the twenty-first-century battle space, ground commanders plan on maneuver speeds, which require fire-support systems that quickly detect and engage enemy forces deep in the area of operations. High-tempo offensive maneuvers by the ground component; precise, quick target acquisition; and the reach and lethality of weapon systems exacerbate the FSCM dilemma. Correspondingly, commanders must place FSCLs farther forward, adjust and/or simplify them more often, and initially establish them significantly deeper within the ground commander's area of operations.

Both the deep and shallow FSCL approaches tend to inhibit overall joint effectiveness and limit potential success. In the deep approach, the ground commander places the FSCL at the maximum range of Army and Marine organic fires (fig. 1). The deep FSCL ensures that their effects always occur short of the line and eliminates the requirement to coordinate with the air commander. Unfortunately, this option places disproportionate restrictions on air assets operating inside this deep FSCL. Further, if the ground commander's long-range acquisition and attack assets cannot reach the deep FSCL, he or she inadvertently creates an enemy sanctuary, to which General Horner alluded above.

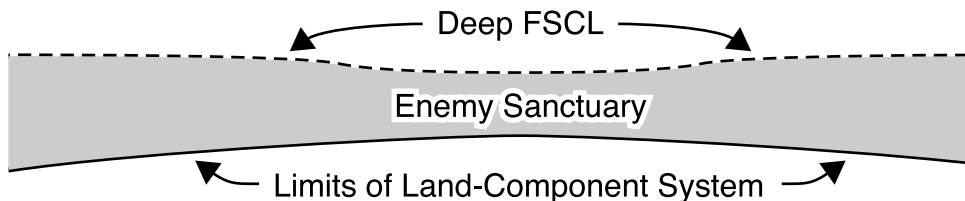


Figure 1. The Deep FSCL

Conversely, a shallow FSCL—established close to friendly ground forces in the area of operations—tends to maximize the flexibility of the air component and the potential for quick air attacks. Uninhibited by

extensive requirements for coordinating ground forces, the shallow FSCL allows air-component forces to engage the enemy with impunity. However, coordination restrictions associated with ground-component fires and maneuver beyond the shallow FSCL place unreasonable constraints on the maneuverability of ground forces, thus increasing the chance of fratricide (as has been the case historically).

USCENTCOM Concept of Operations for Joint Fires

When I became CINC I asked my component commanders to get together and start defining certain things, like joint fires. . . . They got together; locked themselves in a back room with a lot of black eyes and bloody noses. I kept checking in asking, "Do I have to weigh-in?" They said, "Stay out of it." In the end, they produced [CENTCOM] joint fires standard operating procedures.

—Gen Anthony C. Zinni, USMC
Commander, US Central Command

According to *USCENTCOM Concept of Operations for Joint Fires*, component commanders employ restrictive and permissive FSCMs that enhance the expeditious attack of targets; protect friendly forces, populations, critical pieces of infrastructure, and cultural or religious sites; deconflict fire-support activities; and set the stage for future operations. On the one hand, restrictive measures, such as no-fire areas and airspace-coordination areas, impose specific coordination requirements before one can prosecute any target engagement. Permissive measures, on the other hand, such as the coordinated fire line and FSCL, facilitate target attack without detailed coordination among component commanders. Joint task force or component commanders establish and adjust restrictive and permissive FSCMs consistent with the location of friendly forces, the combatant commander's operational concept, and anticipated enemy actions. Nevertheless, war fighting today requires more reactive and dynamic methods for coordinating fires.

Historically, frequent FSCL changes have made it difficult for combatant commanders to synchronize fires; they also limit their employment of combat power and increase the likelihood of fratricide near the FSCL. Within CENTCOM, subordinate commanders recommend the location of—or changes to—the FSCL to the land component commander via the daily air-component target guidance working group and daily joint coordination board. The land component commander coordinates with affected component commanders and recommends a consolidated, theaterwide FSCL to CENTCOM's director of operations (J-3) for the CENTCOM commander's approval. The commander of CENTCOM or the designated joint task force commander then establishes and adjusts the

FSCL in consultation with subordinate and supporting commanders, using a specific code:

- Short of the FSCL, the appropriate ground or amphibious commander controls all air-to-ground and surface-to-surface attack operations.
- If forces attack targets beyond the FSCL, they must coordinate with all affected commanders in sufficient time to avoid fratricide.
- A published air tasking order (ATO) satisfies the requirement for coordinating deliberate operations beyond the FSCL.
- During ATO execution, fires between the FSCL and the ground commander's forward boundary are coordinated with either the ground component commander's deep-operations coordination center or a Marine fires-coordination center.

The cornerstone of CENTCOM's joint target planning, the joint coordination board—which resembles the joint targeting coordination board—serves as the command's forum for promulgating the CENTCOM commander's priorities and intent as well as refining the guidance for targeting and fires.⁴ The deputy coalition/joint force commander chairs the board, whose members typically include the component and support deputy commanders, director of intelligence (J-2), J-3, and the branch chief of special technical operations. As the situation dictates, additional subject-matter experts and coalition members are invited to attend. During meetings of the board, the deputy coalition/joint force commander briefs the combatant commander's prioritized air objectives, which drive the air component commander's air-apportionment recommendation.

The joint coordination board discusses courses of action, changes in boundaries and FSCMs for future operations, and joint-fires considerations in order to develop a long-range targeting plan. In coordination with the component commanders, the J-3 develops proposed assignments in the areas of operations and submits them to the board for comment and coordination prior to the combatant commander's approval. When the combatant commander establishes the FSCL or changes an existing FSCL, the J-3 notifies all components and major subordinates as far in advance as possible, but no less than six hours before executing a change in the FSCL. Consistent with the operational situation, planned and projected modifications to the FSCL are then published in the ATO. CENTCOM's integration of the CAS/AI grid box as one FSCM, together with reducing reliance on the traditional FSCL, constitutes an evolutionary way to plan and think about battle-space geometry (e.g., FSCL, forward line of own troops [FLOT], restricted operations zone [ROZ], missile engagement zone [MEZ], etc.). That is, CENTCOM moves the CAS/AI grid boxes

forward (after closing them to air attack) as the ground troops move forward, rather than moving a line (FSCL) on the ground.

The Grid Box

A CAS/AI grid-box reference system seeks to help coordinate, deconflict, and synchronize joint-fires operations as well as complement—rather than preclude or conflict with—other FSCMs. Grid boxes are based on a 30-by-30-minute grid system (in which the distance between each minute of latitude is equal to approximately one nautical mile [NM] and the distance between each minute of longitude is equal to approximately one NM times the cosine of the latitude), defined by the 00' and 30' latitudinal and longitudinal lines; altitude block; and assigned, coded identifiers for each grid (fig. 2). The three-dimensional grid boxes can be subdivided, and either ground or air forces can refer to them to facilitate target location, attack, and deconfliction. The 30-by-30-NM grid zones are often subdivided by magnetic direction into 15-by-15-NM quadrants (NW, NE, SW, SE) or 15-by-30-NM quadrants (N/S, E/W).

Typically, the combatant commander appoints a functional commander (normally the air component commander) to develop and code the CAS/AI grid-box reference system. A functional commander assigned by the combatant commander manages the boxes by opening and closing them to air component fires. The land component commander has responsibility for closed boxes within his/her area of operations, and the air component commander assumes responsibility for open AI grid boxes beyond the forward boundary of the land component commander's area of operations. The closing and opening of CAS/AI grid boxes on either side of the FSCL, however, rely upon coordination and process.

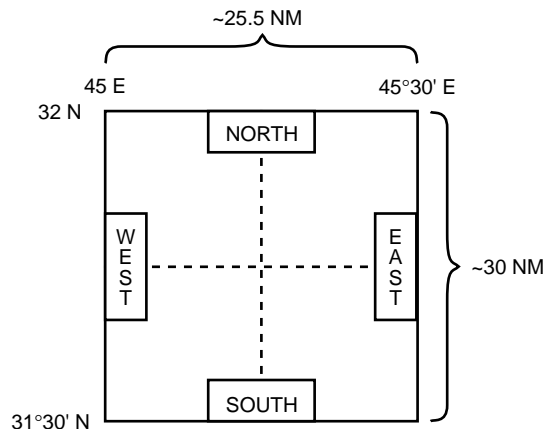


Figure 2. Grid-Box Layout

CAS/AI grid boxes short of the FSCL remain closed to air attack until opened by the land component commander. An open grid box short of the FSCL represents clearance from that commander for air component assets to fire on specified targets/target sets in accordance with the land commander's priorities without direct, positive terminal control. The land component commander closes a grid box short of the FSCL through coordination between his/her air support operations center and the air operations center. Ground troops cannot enter a newly closed grid box until the air support operations center uses airborne warning and control system (AWACS); joint surveillance, target attack radar system (JSTARS); or other airborne C² aircraft to confirm the cessation of air attacks in the grid box. Additionally, direct, positive control by a forward air controller or land component C² facility is required before air forces can expend ordnance in any closed CAS/AI grid box.

According to the *USCENTCOM Concept of Operations for Joint Fires*, CAS/AI grid boxes in the area beyond the FSCL and short of the land component's forward boundary are open for air attacks against targets in accordance with the land component's targeting priorities, unless the land component commander closes the boxes through the air operations center's combat-operations director. Normally, the air component commander's airborne C² platforms listed in the ATO and C² portion of the special instructions use the open grid boxes beyond the FSCL. Nevertheless, closing an AI grid box beyond the FSCL does not restrict the land component commander's organic assets unless it is designated a restrictive-fire area.⁵ Air component assets may overfly any closed CAS/AI grid box. Generally, air assets cannot transit through or employ ordnance in a closed grid box unless it is deconflicted through the targeting or ATO development cycles. Even in time-critical situations, one must coordinate the employment of air-delivered ordnance into a closed grid box through the land component. The land commander opens or closes grid boxes beyond the FSCL either through the battlefield coordination detachment located in the air operations center or through the JSTARS, airborne battlefield command and control center (ABCCC), AWACS, or other theater air control systems. The land component's fire-support element processes immediate missions by coordinating with the air component for closure of the CAS/AI grid box(es) or applicable quadrants.

During mobile-target planning, aircraft designated to attack targets in a CAS/AI grid box are scheduled for the most likely locations, based upon a joint mobile-target list. The battlefield coordination detachment normally brings these target nominations of the ground component commander to mobile-target planning. In the execution phase, the ground component commander may divert these aircraft to higher-priority targets through the collocated air support operations center, which coordinates with the air operations center, JSTARS, and/or ABCCC, which in turn directs inbound aircraft to the land component commander's highest-priority target. The

air support operations center may require radio relay through an Air Force ground-based theater air control system unit if it is located beyond line-of-sight radio range. This process allows the land component commander to divert dedicated CAS/AI grid-box aircraft from original target locations to the most current and highest-priority targets on a near-real-time basis.

Typically, attack-helicopter operations beyond the FSCL continue to evolve up to the go/no-go brief, four hours before execution. Due to the intricacies involved and the likelihood that the attack is oriented on a mobile target, location of the specific target and aircraft attack positions may not be completely resolved prior to ATO distribution. Thus, in early planning stages, attack-helicopter units establish “place holders” on the ATO, with time-on-target windows, intended target, and estimated grid-box quadrant(s) for the attack. This process provides air component planners the minimum information required for ATO development. From an air component’s perspective, it also reduces the likelihood of fratricide due to the distinct identification-friend-or-foe codes associated with every Army aviation unit in the area of responsibility, in accordance with the airspace control order and/or special instructions. Closure of the required CAS/AI grid box quadrant(s) and the coordinating altitude further deconflict the airspace. Under certain circumstances, attack-helicopter units are employed beyond the FSCL in a reactive mode to prevent defeat or exploit success. The fire-support element coordinates closure of the required CAS/AI grid box(es) and/or quadrants, either through the battlefield coordination detachment or airborne C² elements.

The Change-Challenge

There is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things. For he who introduces it has all those who profit from the old system as his enemies, and he has only lukewarm allies in all those who might profit from the new system.

—Niccolò Machiavelli

Even the most marvelous technology, perfectly written doctrine, and fully integrated battle space will have to contend with what Clausewitz called the “friction” and “fog of war.” Although CENTCOM continues to refer to the FSCL, theater war fighters have demonstrated in various exercises that the coordination of joint fires does not have to depend upon visual or topographical battlefield lines. In fact, as part of a targeting and coordinating process during Enduring Freedom in Afghanistan, CAS/AI grid boxes proved their worth as a more dynamic and flexible battle-space fire-support measure.

Functionally, the leading edge of a grid-box lattice closed to air attack acts as the FSCL and moves with the opening and closing process with consequential results (fig. 3). Instead of the typical four-to-six-hour FSCL movement-coordination process, grid boxes are opened and closed in minutes. Additionally, three-dimensional CAS/AI grid boxes limit enemy sanctuaries, give battle-space freedom above closed grid boxes to the air component, maximize the application of fires, and reduce the chance of fratricide.

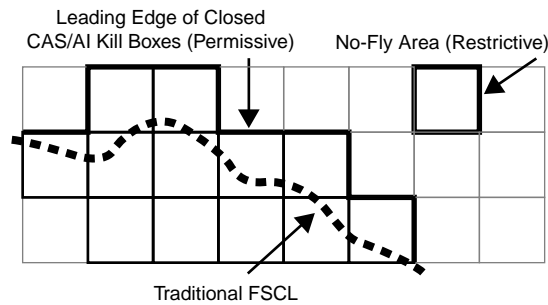


Figure 3. Grid-Box Leading Edge

Opening or closing a CAS/AI grid box without moving the FSCL follows a process similar to that of the CENTCOM model. The significant differences include reduced coordination time and a common, all-weather, day-or-night reference system for all friendly forces. A CAS/AI grid box can close after all of the following occur: (1) the land component commander or air support operations center coordinates through the battlefield coordination detachment, (2) the air operations center contacts the airborne C² platform controlling the grid box, (3) the airborne C² agency directs aircraft clear of the grid box, and (4) the information makes it back to the land component commander or air support operations center. The coordination process for opening or closing a CAS/AI grid box may take up to 20–30 minutes—much faster than the present four to six hours required to change the FSCL. Moreover, the dynamic coordination required for opening and closing CAS/AI grid boxes offers functional components the new ability to quickly move the battle space in order to prosecute the fast-moving ground-to-ground battle without inhibiting air-to-ground support.

Conclusion

If recent history is any indication, joint doctrine will continue in a catch-up mode with modern war-fighting technology, and C² capabilities will not keep pace with the integration of airland fires. What was once considered

the “deep battle” is now the “close battle,” and systems growth indicates that the trend will continue. The precision, range, speed, and lethality of the battle space and the evolution of nonlethal weapons will result in designs and applications that today’s war fighter can only imagine. Consequently, battlefield geometry and coordination boundaries will have to become more reactive, incorporating contemporary C² based in the air and space; GPS-aided navigation/positioning; and a joint-/combined-fires viewpoint.

The three-dimensional grid-box scheme provides a catalyst for doctrinal change that favors more reactive and functional FSCM. Codified CAS and AI grid-box procedures result in more permissive air fires, allow rapid ground maneuver across a three-dimensional battlefield, reduce the chance of fratricide, and mute parochial FSCL fights among the services by minimizing the overlap of battle-space fires and clearly defining the supported/supporting relationships in the ground commander’s areas of operations. The next doctrinal step, however, calls for the joint community to examine more closely the use of a longitude-/latitude-based grid box’s forward borders as a fire-coordination boundary. The community must then institute a quick and complete coordination and dissemination process within all joint and coalition battle-space units, whether ground, maritime, or air and space. □

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Notes

1. See Joint Pub 3-09, *Doctrine for Joint Fire Support*, 12 May 1998, passim.
2. Ibid., A-2.
3. *USCENTCOM Concept of Operations for Joint Fires*, 10 November 1999, on-line, Internet, 15 May 2002, available from <http://www.fas.org/man/dod-101/ops/docs/jfconops.htm>.
4. A joint targeting coordination board is “a group formed by the joint force commander to accomplish broad targeting oversight functions that may include but are not limited to coordinating targeting information, providing targeting guidance and priorities, and refining the joint integrated prioritized target list.” Joint Pub 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 12 April 2001, 240, on-line, Internet, 15 May 2002, available from http://www.dtic.mil/doctrine/jel/new_pubs/jp1_02.pdf.
5. A restrictive fire area is one “in which specific restrictions are imposed and into which fires that exceed those restrictions will not be delivered without coordination with the establishing headquarters.” Ibid., 376.

A New Construct for Air Force Counterspace Doctrine

MAJ JOHN GRENIER, USAF*

FEW PEOPLE WOULD argue with the suggestion that space operations, especially counterspace operations, will play an increasingly larger role in the Air Force's future. Unfortunately, Air Force counterspace doctrine is poorly developed and lacks detail.¹ This article provides a new construct for the service's counterspace doctrine by asking what counterspace should consist of and how its doctrine should be presented to war fighters. An examination of the current state of Air Force counterspace doctrine and a comparison with counterair doctrine reveals that (1) the Air Force has far to go in defining what counterspace is and should be and (2) counterspace and counterinformation are nearly indivisible, a fact that has profound importance for the future of space and information operations (IO).

The Air Force's existing counterspace doctrine is less than robust. Airmen gain their first familiarity with counterspace in Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine*. Designed to address overarching themes, AFDD 1 provides a rough guide to where counterspace—"those operations conducted to attain and maintain a desired degree of space superiority"—fits in Air Force operations.² It places counterspace among the Air Force's 17 air and space power functions—the service's broad, fundamental, and enduring missions.³

Both AFDD 1 and AFDD 2-2, *Space Operations*, the Air Force's space doctrine, note two subtasks within the counterspace mission: offensive counterspace (OCS) and defensive counterspace (DCS).⁴ According to AFDD 1, OCS seeks to "destroy or neutralize an adversary's space systems or the information they provide at a time and place of our choosing through attacks on the space, terrestrial, or link elements of space systems." It also points out that war fighters conduct OCS to achieve five goals, commonly known as the "5Ds"—deception, disruption, denial, degradation, and/or destruction.⁵ AFDD 2-2 expands upon the 5Ds structure found in AFDD 1, noting that OCS uses either lethal or nonlethal methods (the 5Ds) to target an adversary's space systems or third-party space capabilities that support an adversary.⁶ As such, a significant disconnect exists within the doctrine. AFDD 1 rightly discusses the 5Ds in terms of goals, yet AFDD 2-2 muddles the meaning by

*The author, an assistant professor at the United States Air Force Academy, wishes to thank and acknowledge the following individuals for their inputs to this article: Lt Col Rick Walker, Lt Col Doug McCarty, Maj Reb Butler, Maj S. L. Davis, Capt Toby Doran, and Capt Dan Gottrich.

addressing them as methods. Since doctrine demands consistent and precise terminology so as not to confuse its readers, this article considers the 5Ds as effects—the tactical-, operational-, or strategic-level outcomes (read “goals”) that a military operation produces.⁷

According to both AFDD 1 and AFDD 2-2, DCS operations consist of active and passive measures to protect friendly space-related capabilities from enemy attack or interference. “The objective of active counterspace defense measures is to detect, track, identify, intercept, and destroy or neutralize enemy space and missile forces.” Passive DCS involves designing survivability features in satellites and maneuvering satellites, as well as employing camouflage, concealment, and deception techniques to protect space assets.⁸

Readers familiar with air doctrine will recognize superficial similarities between counterspace and counterair doctrine. The latter, contained in AFDD 2-1, *Air Warfare*, divides the counterair mission into offensive counterair (OCA) and defensive counterair (DCA). Subsumed within OCA are surface attack, fighter sweep, escort, and suppression of enemy air defenses (SEAD). Like DCS, DCA includes both active and passive variants. AFDD 2-1 amorphously defines active DCA as using reactive air-to-air assets to destroy an attacking adversary’s air and missile assets, while passive DCA uses camouflage, concealment, and deception, together with hardened shelters.⁹

Basing counterspace doctrine on a counterair model, however, leads to problems, the first of which emerges when counterspace doctrine tries to call out the tasks for OCS. Space has no equivalent to air’s surface attack, fighter escort, sweep, and SEAD. Counterspace doctrine, therefore, lists the 5Ds as the methods for OCS. But, as noted above, the 5Ds are desired effects—not methods.

Second, the DCA-DCS comparison falls apart for both active and passive DCS. Because the Air Force lacks the capability to maneuver on-orbit satellite assets as easily as air platforms, active DCS based on an active DCA model does not work. As previously mentioned, AFDD 1 lists active DCS effects as detecting, tracking, identifying, intercepting, and destroying an adversary’s space and terrestrial forces. These closely resemble the traditional air tasks of finding, fixing, targeting, tracking, engaging, and assessing, but, as will become clear below, they are not particularly useful. Basing passive DCS on the passive DCA model is more appropriate but still problematic. Because space assets are capable of variations in camouflage, concealment, and deception as well as hardening techniques, passive DCS mirrors passive DCA to some extent, but the devil is in the details.

The third—and, arguably, the most significant—problem relating to the current counterspace construct is that few people use it. Several issues underlie this problem. First, most space operators—the men and women tasked with operating the satellite systems overhead—have few concerns beyond the “care and feeding” of their global space assets. OCS and DCS

become unimportant to the immediate tasks at hand.¹⁰ Second, the Air Force has not fully integrated space doctrine into theater campaign plans. Space usually is tacked onto operations plans in an annex and rarely spread across the plan. Third—and, arguably, most important—Air Force Space Command (AFSPC) and United States Space Command (USSPACECOM) have laid claim to counterspace planning and isolated much of it from theater consideration. Counterspace and, for that matter, all space doctrine have become AFSPC's and USSPACECOM's "rice bowl." Thus, counterspace doctrine meets their needs but potentially at the expense of anyone not directly involved in space.¹¹

Most importantly, the Air Force has yet to fully integrate space into theater operations. Following the Persian Gulf War of 1990–91, the Air Force made an initial attempt at theater-level space integration by creating space support teams and space specialty teams that would serve in theater air operations centers. Air Force leadership, however, believing that these teams would "stovepipe" space, determined that space should be spread across all divisions (Strategy; Plans; Operations; Mobility; and Intelligence, Surveillance, and Reconnaissance [ISR]) of an air operations center. Responsibility for that integration has fallen to space weapons officers, graduates of the Space Division of the Air Force Weapons School.¹² Although they have enjoyed some success integrating space support for ISR and combat search and rescue operations, these officers have had only marginal success in integrating counterspace operations into theater air plans and operations.¹³

The relevance, or lack thereof, of current counterspace doctrine stands as a major obstacle facing space weapons officers. Some people argue that the problem has roots in the lack of counterspace capability, the limited threat to space assets, the high classification of space systems, and AFSPC's and USSPACECOM's insistence on developing counterspace campaign plans separately from theater plans. Indeed, those are substantial hurdles, but they are merely excuses for the inability of space operators, space weapons officers, and space experts to tell in-theater aviators what counterspace brings to the fight. Aircrews naturally view OCS and DCS just as they do OCA and DCA. But, as shown above, OCS-DCS and OCA-DCA resemble each other in name only. In reality, a lack of both understanding and accessibility prevents counterspace from assuming a larger role in theater operations.

War fighters need a counterspace doctrine that accurately and concisely explains counterspace and puts it in a context relevant to airmen, who must see that counterspace supports—and is supported by—the other air and space power functions. Since the conclusion of Operation Desert Storm, space has affected three main areas: command and control (C²), including communications; ISR; and navigation and positioning. Space lift, the key to deploying, sustaining, and/or augmenting space assets, constitutes a fourth area of extreme importance for space operations. A

new counterspace doctrine, therefore, initially should focus on affecting friendly and adversary C², ISR, navigation and positioning, and space lift. Of course, as technologies, tactics, techniques, and procedures evolve, counterspace will affect other air and space power functions.

Airmen need counterspace to “counter” an adversary’s space capabilities. For that reason, OCS actions must focus on denying, deceiving, disrupting, degrading, and/or destroying his space-based C², ISR, navigation and positioning, and space-lift systems. Simply put, OCS should entail counter-C²; counter-ISR; counternavigation and counterpositioning; and counter space lift.

Redefining the makeup of DCS is also critical. Instead of the rubric of active and passive defense, the tasks of DCS should focus on protecting friendly space capabilities. In that vein, those tasks must counter the OCS operations that adversaries will conduct. Since most of the attacks against our space-based C², ISR, and navigation and positioning systems will occur in the electromagnetic spectrum—and to avoid engaging in “countercounter-C²” and then “countercountercounter-C²” operations—we should view DCS as providing electronic countermeasures (ECM) for friendly space assets. The first task within DCS, therefore, becomes satellite communications ECM (SATCOM-ECM). The goal of defending ISR assets, meanwhile, is to assure that war fighters have access to the most accurate and relevant ISR data and analysis. Thus, the ISR piece of the DCS puzzle becomes ISR assurance. Since the main navigation-and-positioning system in use by friendly forces is the Global Positioning System (GPS), we can call DCS’s third part GPS-ECM. The final DCS segment protects friendly space-lift capabilities, including both the C² and communications infrastructure (such as the worldwide Air Force Satellite Control Network, used to “talk” to overhead satellites) and the launchpads for US space vehicles at Cape Canaveral, Florida, and Vandenberg AFB, California. Because the major threat to friendly space lift occurs at the ground site, normal ground-force protection measures are of paramount importance.

Among the counterspace experts who work in the “space control” branches of AFSPC, the last several years have seen discussion of a new counterspace construct known as space situational awareness (SSA). At its basic level, SSA involves intelligence preparation of the space battlefield; it uses terrestrial- and space-based ISR assets to determine the space order of battle as well as present and future locations of space assets. The product of SSA is discernment of the adversary’s intended employment of his space assets. With SSA in hand, war fighters will be able to engage in OCS and DCS operations more effectively.

The Air Force’s adoption of the new counterspace construct would have profound implications for how the space-control community views its place in operations. For a long time, space-control advocates have argued that the Air Force must evolve from focusing space resources on force enhancement to directing them toward force application. That rhetoric is

misplaced, emphasizing the future at the expense of the present. Indeed, the essence of OCS and DCS has less to do with force application and more to do with supporting, enabling, and enhancing other air and space operations.

We must remember that doctrine is not about ownership but about using sanctioned best practices to accomplish missions. Of course, certain technologies (such as the Space Operations Vehicle) hold promise of attacking space assets in orbit. As such, counterspace doctrine may evolve to account for the employment of systems that can knock a satellite out of the sky, to cite one example. Until such systems are fielded and operational, however, the Air Force should remain focused on using space as a force enhancer for the joint war-fighting team. Indeed, in terms of what space brings to the fight today, counterspace will remain primarily a force enabler and enhancer for the foreseeable future.

The interrelationship between counterspace and counterinformation suggests how this new counterspace construct can enable another air and space power function. Counterinformation contains the sub-mission of IO, accomplished by offensive counterinformation (OCI) and defensive counterinformation (DCI). OCI operations include psychological operations, electronic warfare (EW), military deception, physical attack, and public-affairs operations. DCI's functions consist of operations security, information assurance, computer network defense, counterdeception, counterintelligence, counterpropaganda, public-affairs operations, and electronic protection (EP).¹⁴ Most clearly, the OCS tasks of counter-C², counter-ISR, and counter navigation and positioning enhance and enable the OCI task of EW. Meanwhile, SATCOM-ECM, ISR assurance, and GPS-ECM similarly enhance and enable DCI's EP task. EW and EP, in turn, become primary enablers of air and space superiority, information superiority, global attack, precision engagement, and rapid global mobility. Joint war fighters do not care about who—either the counterspace community or the information community—provides the EW and EP they need. Counterspace advocates should have the same mind-set.

The counterspace community may find it difficult to accept the suggestion that much of counterspace supports IO. A feeling exists within the counterspace community that IO proponents are making a “power play” to absorb counterspace. Murmurs of such arguments arose during late 1999, during discussions of a merger of the Space Warfare Center and the Information Warfare Center. Part of the rationale for opposing the merger of the respective warfare centers was the space-control community's contention that space and IO were “too different” to be combined.¹⁵

Nonetheless, some people continue to believe that the two disciplines must operate synergistically. Although space and IO each has its own volume in the Air Force Tactics, Techniques and Procedures (AFTTP) 3-1 series

(AFTTP 3-1, vol. 28, *Tactical Employment, Space*, 2002; and AFTTP 3-1, vol. 36, *Information Warfare*, 2001), space and information operations are combined within the Air Force Operational Tactics, Techniques and Procedures (AFOTTP) series. Outside the parochial space and IO communities, the close correlation between the two areas becomes apparent.

In the final analysis, the construct presented here suggests that counterspace and IO are not and should not be separated from one another. Basing counterspace doctrine on this construct would tie it more closely to counterinformation. The Air Force Doctrine Center should reassess the counterspace doctrine it has published in AFDD 1, AFDD 2-1, and especially AFDD 2-2. Should the center make that reassessment, it must include representatives from the air, space, and IO communities. Rice bowls may break as counterspace and IO advocates grapple with the proper role and place of their particular subdisciplines in Air Force and joint operations. Of course another option—one that, hopefully, this brief article will inspire—is that a counterspace advocate will explain why the construct presented here is wrong. That, however, will do little to correct the significant inadequacies of the current doctrine. □

Colorado Springs, Colorado

Notes

1. In fall 2001, Air Force Space Command (AFSPC) assembled a team to write and submit to the Air Force Doctrine Center a proposed Air Force Doctrine Document (AFDD) 2-2.1, *Counterspace*. As of this writing, Headquarters AFSPC/XPX plans to propose AFDD 2-2.1 to the Air Force Doctrine Working Group. The joint-doctrine community, with US Space Command's Plans Directorate (J-5) in the lead, would like to prepare a joint version of counterspace doctrine. However, because of the history of disagreement among the services regarding Joint Publication (Pub) 3-14, *Joint Doctrine for Space*, I suspect that joint counterspace doctrine remains a long way off. The fact that the Air Force and the other services have not resolved fundamental doctrinal disagreements has left Joint Pub 3-14 in draft for over a decade.

2. AFDD 1, *Air Force Basic Doctrine*, September 1997, 47, on-line, Internet, 30 May 2002, available from <https://www.doctrine.af.mil/Main.asp?>

3. *Ibid.*, 46–60.

4. *Ibid.*, 47–48; and AFDD 2-2, *Space Operations*, 27 November 2001, 12–14, on-line, Internet, 30 May 2002, available from <https://www.doctrine.af.mil/Main.asp?>

5. AFDD 1, 47.

6. AFDD 2-2, 9–10.

7. *Ibid.*, 4.

8. AFDD 1, 48; and AFDD 2-2, 13–14.

9. AFDD 2-1, *Air Warfare*, 27 January 2000, 8–9, on-line, Internet, 30 May 2002, available from <https://www.doctrine.af.mil/Main.asp?>

10. AFDD 2-2 divides space assets among global, theater organic, and deployable assets—an attempt by the authors of the doctrine to suggest to space operators that they must consider the fact that their assets and operations affect more than just global operations. Indeed, as technologies advance, the Air Force will have an increasingly larger pool of space assets that it can deploy to a theater, and geographic combatant commanders will have space assets apportioned to them.

11. An example of this mentality is AFSPC's decision to provide the Air Force Doctrine Center (AFDC) with a "draft" AFDD 2-2 in 2000. Because AFSPC did not concur with AFDC's version of AFDD 2-2 in late 2000, it formed a team to develop and write a new AFDD 2-2 and provide it to the center, which would in turn staff the document across the Air Force. In its staffing of the document, AFDC received over 400 comments. On the whole, however, those comments touched primarily on minor issues and did

not significantly change the structure or intent of the doctrine as conceptualized by AFSPC's doctrine-writing team of five primary members. One could argue that, because the major commands had only minor comments for the most part, the doctrine met their needs. But one could just as easily argue that, because the commands were unfamiliar with the nuances of counterspace, they did not recognize the inadequacies of the relatively spare sections on counterspace in AFDD 2-2. Yet, because AFDC staffed the document through the other major commands, both AFDC and AFSPC authors can claim that AFDD 2-2 was a "group effort" that encompassed the entire Air Force.

12. SSgt Eric Grill, "Space Invaders Converge upon Nellis Schools," 9 March 2001, on-line, Internet, 30 May 2002, available from <http://www.iwar.org.uk/news-archive/2001/intelligence/03-09-01.htm>.

13. Gen Richard B. Meyers, commander, USSPACECOM, noted in the initial report on the air war over Serbia that "there's still a long way to go before space is really integrated with the rest of the campaign." *The Air War over Serbia: Air and Space Power in Operation Allied Force*, initial report (Washington, D.C: Headquarters United States Air Force, 30 September 1999), 43.

14. AFDD 2-5, *Information Operations*, 4 January 2002, 11-30, on-line, Internet, 30 May 2002, available from <https://www.doctrine.af.mil/Main.asp?>. Note the doctrinal inconsistency between AFDD 2-5 and AFDD 2-5.1, *Electronic Warfare*, 19 November 1999, on-line, Internet, 30 May 2002, available from <https://www.doctrine.af.mil/Main.asp?>. AFDD 2-5 places electronic attack under OCI and electronic protection under DCI, while AFDD 2-5.1 subsumes both under EW. Since AFDD 2-5 is the higher-level doctrine, I have used it instead of 2-5.1.

15. Lt Col Douglas A. McCarty, Space Warfare Center, interviewed by author, December 2001. In 1999 Colonel McCarty served on the Space Warfare Center team that examined possible mergers with the Information Warfare Center.

To conquer the command of the air means victory; to be beaten in the air means defeat and acceptance of whatever terms the enemy may be pleased to impose.

--Giulio Douhet

Organic versus Joint Organization•

LT COL D. ROBERT POYNOR, USAF, RETIRED*

IN THE CLIMATE of the recent Quadrennial Defense Review, US Joint Forces Command's proposed experiments, and the secretary of defense's push for transformation, "jointness" has recently become a very visible issue. Unfortunately, many joint initiatives actually are not very joint, especially regarding organizational structures, largely because service members tend to view new ideas through their own institutional lenses. How they were brought up colors their decisions and thinking. This is neither evil nor wrong—one just has to be aware of the characteristics of one's paradigm and consciously step outside them.

The differences in service perspectives originate in the way each service organizes for war fighting. The three surface services organize "organically"; that is, each sets up a large organization consisting only of its own forces—witness the Marine Corps's Air-Ground Task Force; the Navy's carrier battle group; and the Army's deployment by corps, division, or brigade. This means that the Army fights strictly as a separate US Army component; the Navy as a separate US Navy component; and the Marines as a separate US Marine Corps component. Their models achieve jointness by receiving support "from joint forces"—almost always in the form of Air Force airpower. But when bits of one service are merely added to another service's organic model, the result is not some new form of synergy but, more usually, an increase in efficiency. For example, to the Navy, jointness oftentimes simply means support from the Air Force's tankers and from its intelligence, surveillance, and reconnaissance (ISR) assets; to the Army, it's usually airlift, close air support (CAS), and (again) ISR. Such supporting arrangements are not necessarily bad—increased efficiency and effectiveness are good—but let's not kid ourselves that they are transformational. Do the other services offer up elements of their forces for employment by other services? Yes, but there's a catch: they offer up only those forces and capabilities deemed "in excess of their organic needs" to the rest of the joint force. In reality, how much gets offered up? Not much.

The Air Force, on the other hand, has no organic model for employing its forces; it gives everything to the joint force commander (JFC) through the joint force air and space component commander (JFASCC). The US Air Force expects to fight—in fact, demands that it fight—as part of a joint air and space component made up of air and space forces from all

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services. In fact, Air Force doctrine explicitly states that the expected norm is joint employment and joint command. No other service can make this claim.

This makes the Air Force's employment paradigm the only truly joint model. Although the other services frequently claim that they are "inherently joint," they are in fact only employing a combined-arms model, each one making use of its own various branches.

What might happen if the Air Force emulated the other services and used an organic scheme as its war-fighting model?

- We could assume that we would make available only those forces "excess to our organic scheme of maneuver" to support the rest of the joint force. CAS would probably dry up, but this might be a reasonable trade-off for simplicity in planning and command and control among the services.
- We might use "our" airlift (it says "US Air Force" on the sides of all those airlifters, doesn't it?) to get our forces into a theater first. That solves most of the deployment squabbles over the flow of time-phased force and deployment data—any airlift "excess to our organic needs" would then be made available later to move the rest of the joint force. Besides, most of the other services' heavy stuff goes by ship anyway.
- We could solve the "halt phase" debate simply by declaring it part of our organic scheme of maneuver. The Air Force would then be free to optimize its own operational concepts for truly independent operational maneuver. Since organic operations fall under Title X service prerogatives, the other services don't have a say on how and why we employ.¹

Sounds simple, doesn't it? That's the point: service-only organic models are easy but suboptimal. Joint integration is hard work—but it optimizes above the service level at the operational level, where the JFC has to operate. □

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Note

1. For a more complete discussion along these lines, see my "'Organic' versus Joint: Thoughts on How the Air Force Fights," *Strategic Review* 29, no. 1 (Winter 2001): 58–62.

Transforming the Submarine Force

Integrating Undersea Platforms into the Joint Global Strike Task Force

CAPT FLOYD D. KENNEDY JR., USNR, RETIRED*

IN THE AIR FORCE Future Capabilities Game 2001, Blue force Trident nuclear submarines snugged up close to the Red country's coast, well inside the seaward perimeter of its integrated air defense system (IADS), and launched their payloads (fig. 1). This wasn't a nuclear strike but a series of tactical and operational actions, integrated with the joint force air and space component commander's (JFASCC) plans and orders, designed to inform the intelligence preparation of the battlespace (IPB) process, suppress the enemy's air defense, and preemptively strike at his operational centers of gravity.¹ These Tridents weren't the nuclear ballistic missile submarines (SSBN) of today's fleet but conversions to nuclear-powered guided-missile submarines (SSGN) with payloads of unmanned aerial and underwater vehicles, tactical ballistic missiles, and tactical cruise missiles. They paved the way for other elements of the joint global strike task force (JGSTF).²



Figure 1. An artist's concept of a Trident-class SSGN firing a Tomahawk cruise missile, with an Advanced SEAL Delivery System locked onto the submarine's forward missile tube

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SSGNs are no longer a mere vision—they are now a funded program. Four Trident submarines became surplus to the needs of the national nuclear arsenal and were to be decommissioned and scrapped or converted to other uses. Enormous ships with significant payload capacity (fig. 2), they can carry 154 Tomahawk land attack missiles (TLAM) in 22 of their 24 tubes and alone can fulfill the cruise-missile requirements of many combatant commanders. All four Tridents are now programmed for conversion to carry TLAMs; however, are TLAMs the most useful payload to the joint force commander?

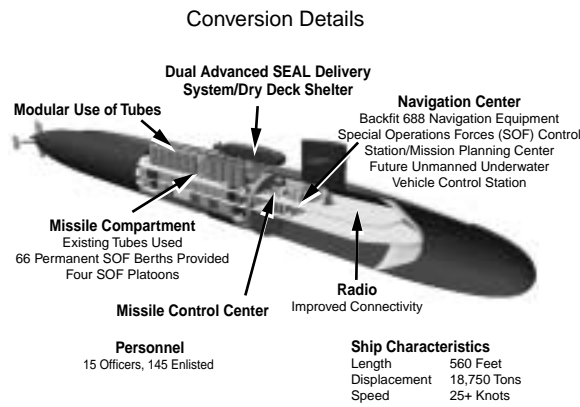


Figure 2. Major components of a Trident-class, nuclear-ballistic-missile-carrying submarine were refitted to configure it as a conventional-missile-carrying and special-operations submarine.

The submarine force initiated an active concept development and experimentation (CD&E) process to examine this and other questions. The ultimate objective is to transform the force from its secretive and operationally independent stereotype to a valued, conventional element of American military-power projection—a fully integrated partner in the JGSTF. By participating in the Air Force Future Capabilities Game, we were able to identify many ways submarines could employ their inherent characteristics of stealth, endurance, and flexibility to support the JFASCC and the combatant commanders. The lessons learned from that game would help refine the concept for employing submarines in the joint-fires role.³

Submarines in Joint Fires Concept

The submarine force embraced CD&E in 1999 as a means of integrating itself into the joint force. Our first operational concept was entitled

Submarines in Joint Fires and explored the means by which the inherent characteristics of a mobile undersea platform could contribute to the component elements of the joint-fires process: target acquisition, command and control, and attack resources.⁴

Undersea Platform Characteristics

Before there was stealth in the air, there was stealth in the sea. In the year 2000, the US submarine force celebrated a centennial of silent service. Early submarines were submersible torpedo boats, using the sea as a cloaking device to enable an undetected approach to the enemy. Not until the advent of nuclear power in the mid-1950s did submarines become true undersea platforms with the ability to remain submerged indefinitely and navigate with impunity.

Nuclear-powered submarines are multimission platforms that when appropriately equipped can make significant contributions in a number of joint roles. They have the inherent advantages of stealth, agility, and endurance. As stealthy platforms, they have dramatically reduced signatures in all detection regimes and are simply not vulnerable to the types of weapons (ballistic and cruise missiles, including those armed with weapons of mass destruction) that dominate a joint force commander's force-protection concerns. Their agility enables them to execute different taskings in a multimission environment, and their endurance on-station is measured in months—without a logistics tail or the need for escorts or other mutually supportive assets. These characteristics have made submarines extremely effective in a variety of missions, from antisurface and antisubmarine warfare to persistent intelligence, surveillance, and reconnaissance (ISR). Since World War II, these missions have been conducted primarily as independent operations. Nevertheless, tomorrow's relevance in the battle space will be predicated on the ability to integrate into the joint force.

Since submarines were already performing ISR tasks that could contribute to the target-acquisition process (including service as launching platforms for special operations forces [SOF]) and were firing TLAMs as directed by the air tasking order (ATO) against assigned targets, joint fires seemed to be the most appropriate way to integrate submarines into the joint force. The question facing the Navy in general, and the submarine community in particular, was how best to apply the characteristics of stealth, agility, and endurance to support joint fires. This included potential roles in developing and maintaining IPB situational awareness, transitioning from deterrence to hostilities, participating in the daily ATO process, and providing fires on call. A possible answer to that question was a draft operational concept that has driven much of the force's experimentation effort over the past two years.

Concept of Operations (CONOPS)

US attack submarines (SSN) operate undetected off the coasts of potential adversaries and routinely—almost constantly—collect information. Historically, that information has been of strategic value and was thus provided to national-level customers for fusion with other forms of strategic information to inform decisions made at the highest levels of government. Since the fall of the Soviet Union and the end of the Cold War, the operational value of that information has been increasingly recognized, and operational-level commanders have become customers for what the SSNs provide. This necessitated a higher level of connectivity and increased bandwidth to transfer the information to fusion centers where it can be processed into actionable intelligence. This CONOPS for submarines in joint fires reinforces the requirement for communications capabilities that enable the submarine to transmit collected information to interested operational commanders in a tactically—not simply operationally—relevant period of time. That translates into near-real-time information flow to operational command centers such as the joint operations center at the commander, joint task force (CJTF) level, and the joint air, maritime, or land operations centers.

The types of information collected include all forms of radio communications and data streams on virtually all frequencies. These communications could provide indication and warning of an impending attack or establish force dispositions or changes in those dispositions. The transmissions could also be track-orders to a transporter-erector-launcher (TEL) for ballistic or cruise missiles. Furthermore, the collected information includes visual and imagery intelligence, as well as other transmissions with intelligence value. There's no doubt such information is tactically useful if quickly received by the proper command and control nodes. Ideally, such information can be injected into a network accessible to all relevant nodes from which the submarine can identify additional information needs to be fulfilled, such as the Joint Digital Fires Network. Thus, the submarine lurking off an enemy coast becomes an integral part of an expeditionary-force sensor grid and contributes to joint fires target acquisition by performing ISR tasks that complement the activities of surface-, air-, and space-based ISR assets.

As an attack resource, today's submarines carry torpedoes and TLAMs. Tomorrow's submarines will add to that inventory the Tactical Tomahawk (TACTOM) cruise missile, which has considerably greater operational flexibility, including a launch-to-loiter capability, and in-flight retargeting. This concept, together with other submarine-force research and development ideas, envisions future submarines with tactical ballistic missiles and unmanned aerial vehicles that can perform a variety of ISR and attack tasks employing a wide range of payloads. Among the nonlethal payloads envisioned are decoys and jammers to stimulate and suppress enemy air defenses. Potential lethal payloads include penetrating warheads

and a variety of submunitions that can individually target both soft and armored targets.

Exploiting their stealth, submarines would penetrate deep within the seaward defensive perimeter of hostile littoral nations, permitting them to launch from within the enemy's IADS and coastal-defense threat rings. Depending on the extent of an enemy's coastline, this could permit a dramatic increase in the threat axes an enemy would have to consider. Under virtually any circumstance, it would greatly reduce warning time and generate surprise. Undersea-based attack could be used to support a rollback of the enemy's IADS and coastal defenses and/or strike directly at operational or strategic centers of gravity without the need for rollback. The balance between the two approaches would be governed by the firepower present on the submarine—once expended, it cannot be rapidly replenished.⁵ So, the value of that firepower as an enabler of succeeding attack versus a direct attack on centers of gravity must be addressed by the joint force's staff.

Submarines constitute both a complementary and supplementary attack platform to existing and planned platforms of the Navy and other services. They are complementary in the sense that their platform characteristics of stealth and long loiter time (measured in months) in potentially high-threat areas are not duplicated by other types of platforms, thus adding a new dimension to platform options available to the joint force commander. They are supplementary in that they can carry the same types of weapons and ordnance as other types of platforms. Against a technologically unsophisticated enemy far removed from the coast, such as the Taliban regime in Afghanistan, submarine-launched weapons merely supplement those of other platforms. Against a peer competitor or near-peer competitor, submarine-launched weapons complement those of other platforms by adding unexpected launch positions well within a perimeter that other platforms could penetrate only at much greater risk.

The location of the previously undetected submarine (datum) is potentially provided to the enemy by a missile-launch event.⁶ However, the datum is very fleeting, especially if the submarine uses a "shoot and scoot" tactic. Enemy antisubmarine forces would need to be poised and ready to attack in the immediate area of the submarine to have any chance at success, a potential risk the submarine's preceding and succeeding stealthiness would minimize. In fact, studies have concluded that even with an enemy submarine positioned within two nautical miles of a submerged TLAM launch event, no enemy firing solution on the launching submarine could be achieved. Navy submarines engaged in these attack missions will necessarily be maintaining situational awareness by sharing a common, relevant, operational picture with other forces in the joint task force—thus being provided warning of proximate enemy antisubmarine warfare (ASW) forces.

Nuclear-Powered Guided-Missile Submarines

The number of Tridents that can be converted to tactical-missile-delivery platforms is principally determined by what is excess to strategic requirements. The *Nuclear Posture Review* of 1994 deemed four of the 18-ship Trident force surplus to strategic requirements, and those four are now programmed for conversion.⁷ There is little doubt that these huge submarines, with 22 of their 24 missile tubes dedicated to land-attack weapons, will become the most capable land-attack undersea platforms available to future combatant commanders.⁸

The Trident SSGN baseline configuration will accommodate seven TLAMs in each of the 22 available missile tubes—a total of 154 attack missiles. While it is spatially and technologically feasible to double-stack TLAMs for a total of 308, the current and anticipated TLAM inventories do not justify the added expense. However, with the adaptation of existing tactical ballistic missiles and development of new encapsulation approaches, a double-stack capability becomes much more attractive and is a candidate for further experimentation (fig. 3).

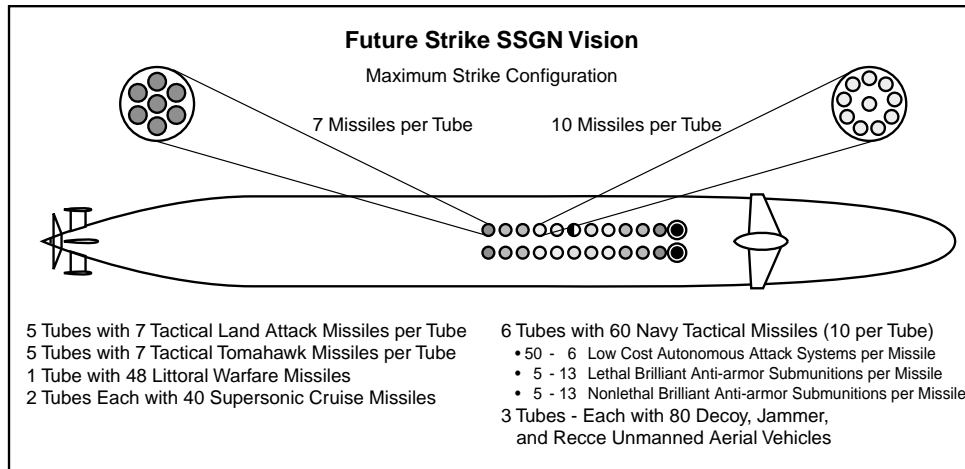


Figure 3. Illustration of the strike SSGN load out, as played in the December 2001 Air Force Future Capabilities War Game

A SOF transport and command and control capability is also included in the baseline configuration. Each SSGN can accommodate a company-sized SOF detachment with its own special operations command and control element (SOCCE). The two forward-missile tubes are reserved as access trunks to the Advanced SEAL Delivery System (ASDS), a miniature submarine that can accommodate two operators and up to eight SEALs

with equipment, comfortably transporting them submerged over 125 nautical miles (fig. 4).

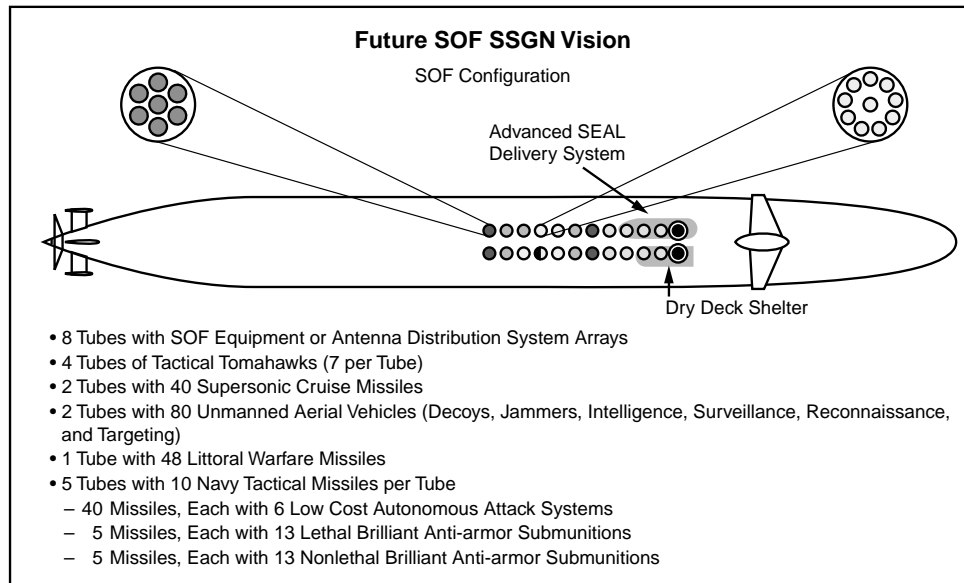


Figure 4. Illustration of the special operations SSGN load out, as played in the December 2001 Air Force Future Capabilities War Game

An advantage of using an SSGN as an attack platform is that virtually its entire ordnance capacity can be dedicated to offensive weaponry. It doesn't need to arm itself against hostile air or missile attack since the sea that surrounds it provides a passive defensive barrier to such weapons. Only its separate torpedo room contains self-defense weapons for use against its principal enemy—another submarine. There are significant technological difficulties in developing an ASW capability against a slow-moving, quiet Trident. That task, barring a suspension in the laws of physics, would bankrupt the defense budget of most nations without a NATO state-of-the-art ASW capability.

The employment concept for SSGN mimics that for the SSBN. Dual crews will keep it forward deployed 70 percent of the time as a theater combatant commander asset in contrast to an SSN, which only spends up to 33 percent of its time deployed. The four SSGNs that will be in commission by the end of this decade will be able to generate a continuous on-station attack capability equal to joint fires of more than 2.5 Trident SSGNs.

Given the enormous capacity and potential of SSGN as a joint-fires platform, we initiated a rigorous program of CONOPS development and

experimentation to determine its most efficient employment in that mission while integrating its capabilities with those of other platforms and services. Our participation in the Air Force Future Capabilities Game 2001 allowed us to further refine our CONOPS and identify numerous sensors and weapon systems that would be of great value to the joint force commander.

SSGN/JGSTF Operational Concept

As crises develop, at least one, potentially two, SSGNs can be on scene early and be able to operate well within a potential enemy's defensive perimeter. They will integrate with other forward-deployed forces and in concert with other undersea platforms (that deploy either independently or with carrier battle groups). The SSGN will contribute to the IPB process—feeding information for target generation by the JGSTF staff. Off-board sensors launched by the SSGN include SOF, recoverable unmanned undersea vehicles (UUV), and expendable unmanned aerial vehicles (UAV). These sensors will complement SSNs' onboard and off-board sensors to help fill collection gaps in the integrated space/airborne/surface/undersea sensor grid.

The prehostilities phase of any crisis is a prime period for special operations—especially in the ISR role. SOF operations from appropriately configured SSNs are usually limited to no more than squad strength, with SOF embarked immediately before and debarked immediately after the operation. The space on board an SSN is simply insufficient for larger units or for the physical conditioning that SOF must perform every day to remain at high levels of readiness. There is, however, space on board an SSGN to accommodate several SOF platoons for 90 days without significant readiness degradation. A SOF-configured SSGN can loiter off a potentially hostile or definitely hostile coast, executing mission after mission while the SSGN remains ready to launch other sensors or weapons in support of the joint force commander. Because SOF-configured SSGN normally dedicates some additional missile tubes to SOF equipment stowage, it has fewer sensors and/or weapons to launch than a strike-configured SSGN.

When the potential enemy drives the transition from prehostilities to open hostilities, friendly surface and air forces operating under prehostilities rules of engagement are at high risk. A properly operated submarine maintains its stealth and can avoid that level of risk. SSNs and SSGNs can remain close-in to the enemy coast and either preempt hostile action, launch on unambiguous warning of an impending strike, and target enemy strike platforms before they launch—or constitute the leading edge of a retaliatory strike and open the door for follow-on forces by creating holes in the enemy's IADS. Of the three options, a preemptive launch from an undetected SSGN (standing just offshore) can be

devastating—as was demonstrated during the Navy’s Title 10 Global 01 war game. Employing miniature air-launched decoys and jammers launched as submunitions on either TLAMs or tactical ballistic missiles, submarines can stimulate and jam enemy sensors; moreover, using lethal missiles, they can kill the IADS sensors and weapons themselves. With large onboard inventories of such weapons, the SSGN can perform this function over and over again—and did, as we executed this joint suppression of enemy air defenses (JSEAD) CONOPS in the Air Force Future Capabilities Game.

If, on the other hand, the joint force commander is driving the transition to hostilities, he or she can elect to commit some or all of the SSGN’s payload to striking enemy centers of gravity without rolling back antiaccess defenses—achieving an element of surprise not possible with other types of near-term systems. As discussed earlier, there is a trade-off between (1) using the SSGN’s weapons in a JSEAD mission to enable a potentially higher level of effort with air strikes and (2) using its weapons to directly attack centers of gravity with a large but finite inventory of weapons.

The onset of hostilities certainly doesn’t signal the end of SOF operations. Quite the contrary, a SOF-configured SSGN can expend its attack munitions in JSEAD or strategic attack, and then remain in position to continue a SOF campaign of ISR, direct action, and combat search and rescue.

The Way Ahead

During the Air Force Future Capabilities Game, the joint force commanders found every payload postulated for the SSGNs in the game’s order of battle to be useful in support of the JGSTF concept. The submarine force’s intent in including such a wide variety of lethal and nonlethal payloads was to identify the payloads that have the greatest utility to the joint force commanders and then pare down the list of options. We failed in that undertaking.

Fiscal reality being what it is, we still need to prioritize payload development beyond the baseline SSGN. To that end, we’ll continue to play in service- and joint-experimentation venues such as the Army Transformation War Games, Air Force Global Engagement and Future Capabilities Games, Navy Global War Game, and the experiments of the services and Joint Forces Command. These venues will help us refine our submarines’ role in the joint-fires concept, prioritize our research and development, adapt existing and future weapons to undersea platforms, and ultimately—transform the submarine force. □

Norfolk, Virginia

Notes

1. The term *joint force air and space component commander* (JFASCC) appears in and is defined by draft Air Force Doctrine Document 2-5, *Information Operations*, November 2001, on-line, Internet, 11 April 2002, available from <http://www.cla.sc.edu/aero/AFDD2-5.doc>.

2. The term *joint global strike task force* (JGSTF) reflects the joint nature of a new concept titled “Global Strike Task Force,” and introduced on 10 August 2001 by Gen John Jumper, commander of Air Combat Command. It’s the nation’s kick-down-the-door force for the new century. A global strike task force will be able to open the way for everyone else, no matter what an enemy can throw against US forces. It will dominate the air and take out enemy assets that threaten a US deployment. The concept, as described by General Jumper, is built on new technologies and new ideas about using military force. First is stealth capability—the task force leads with F-22 stealth fighters to clear a path, taking out enemy aircraft and advanced anti-aircraft missile launchers. B-2 stealth bombers follow to destroy assets that threaten US deployments such as Scud missile launchers, chemical-weapon bunkers, and air and shore defenses. Sea- and air-launched cruise missiles help that effort.

3. *Joint fires* are fires produced during the employment of forces from two or more components in coordinated action toward a common objective. This term and its definition are approved for inclusion in the next edition of Joint Pub 1-02, *Department of Defense Dictionary of Military and Associated Terms*. Joint Pub 3-09, *Doctrine for Joint Fire Support*, 12 May 1998, II-1–II-17, on-line, Internet, 28 June 2002, available from http://www.dtic.mil/doctrine/jel/new_pubs/jp3_09.pdf.

4. Joint Pub 3-09, *Doctrine for Joint Fire Support*, 12 May 1998, II-1–II-17, on-line, Internet, 16 April 2002, available from http://www.dtic.mil/doctrine/jel/new_pubs/jp3_09.pdf.

5. To reload, the submarine must egress hostile waters and proceed to a reloading point, reload, and then transit back to hostile waters, slowly penetrating alerted defenses. Reloading an SSN is much faster than reloading an SSGN.

6. A *datum* (antisubmarine warfare) (DOD) “is the last known position of a submarine, or suspected submarine, after contact has been lost,” *DOD Dictionary of Military Terms*, on-line, Internet, 11 June 2002, available from <http://www.dtic.mil/doctrine/jel/doddict/>.

7. Rear Adm John Butler, “Coming of Age: The SSGN Concept,” *The Submarine Review*, forthcoming.

8. SSBN/SSGNs have an 18,750-ton submerged displacement, compared to the 7,147-ton displacement for a *Los Angeles*-class fast-attack submarine (SSN). The other two tubes of the SSGN will be used as access trunks for SEAL minisubmarines. SEAL teams are one of the primary tactical units of the Naval Special Warfare Command—the naval component of the United States Special Operations Command. SEALs take their name from the elements in and from which they operate (sea, air, land).

Whatever the system adopted, it must aim above all at perfect efficiency in military action; and the nearer it approaches to this ideal, the better it is.

—Rear Adm Alfred Thayer Mahan



Ira C. Eaker Award Winners for the 2001–2002 Academic Year



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(Winter 2001)



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Lt Col Phil M. Haun, USAF
“Airpower versus a Fielded Army:
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Third Place

Lt Col Martin Wojtysiak, USAF
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Airpower versus Asymmetric Enemies

A Framework for Evaluating Effectiveness

DR. MARK CLODFELTER*

Editorial Abstract: Evaluating airpower's political effectiveness in a conflict is not a straightforward proposition. This is certainly the case with asymmetric foes such as terrorist organizations. Professor Clodfelter presents an interesting framework for this determination, one that involves assessing how well indirect, auxiliary, and independent applications of airpower support both positive and negative political objectives. Ultimately, the effectiveness of airpower must be measured in terms of how well it supports positive goals without jeopardizing the achievement of negative objectives.

ASYMMETRIC IS THE current buzzword used to describe a type of warfare that has been with us much longer than the newfangled term. In its purest sense, asymmetric warfare is about ends, ways, or means—fighting for ends that



do not match an opponent's objectives, fighting in ways that differ from an opponent's approach to war, or fighting with means different from an opponent's resources. In the *Quadrennial Defense Review Report* of 2001, however, the term most often describes a weaker power's use of an unanticipated means of striking at the vulnerability of a stronger power—in this case, the United States.¹ Any type of military force can be applied asymmetrically, including airpower, as al Qaeda's terrorists demonstrated in devastating fashion on 11 September 2001. Yet, how might airpower best be used *against* an asymmetric foe? The answer is not so different from the response to the fundamental question regarding *any* application of airpower

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against *any* enemy—that is, how can it be used as an effective instrument of war?

Gauging airpower's effectiveness is not an easy task. One reason for that difficulty is that no universal agreement exists on the meaning of *effectiveness*. Clausewitz offers perhaps the best means of measurement—how much does the military instrument help towards achieving the ultimate aim of winning the war? The author of *On War* equates “winning” to achieving the nation's political objectives, and that criterion guides the following framework for evaluating airpower's effectiveness.² Like all true frameworks, though, this one does not provide a set of standard answers. Nor does it predict the future or offer a universal guide for success or failure. Instead, it offers a consistent approach for determining the value of airpower in any circumstance. This approach includes a distinctive terminology that categorizes various airpower applications, and those categories are used in ascertaining how effectively an application supports a political goal. Yet, determining airpower's political effectiveness is not a straightforward proposition because political goals are not always straightforward. As the discussion of the framework makes clear, those goals can be either “positive” or “negative”—which in turn affects how well a particular airpower application can achieve them.

While the categories of airpower applications can be thought of as constants (the essence of how airpower is applied in each of the categories does not change), five key variables affect the ability of each application to achieve success. Those variables include the (1) nature of the enemy, (2) type of war waged by the enemy, (3) nature of the combat environment, (4) magnitude of military controls, and (5) nature of the political objectives. The importance of each variable may change in different situations to yield different results. Thus, political and military leaders who would employ airpower must understand exactly what the variables are and how they might blend to produce a particular outcome. The framework provides a method for analyzing airpower applications—one that

thoroughly dissects the variables and examines how their integration may affect airpower's ability to achieve political success. Hopefully, it also offers practical considerations and cautions for the statesman contemplating the use of airpower, as well as for the commander charged with transforming political goals into military objectives.

Airpower and Its Applications

Before delving into the framework's particulars, one would do well to define the elusive term *airpower*. Brig Gen William “Billy” Mitchell specified it as “the ability to do something in the air,” a description too vague to be useful.³ Much better is the definition offered by two Britons—Air Marshal R. J. Armitage and Air Vice Marshal R. A. Mason—in their classic work *Air Power in the Nuclear Age*: “The ability to project military force through a platform in the third dimension above the surface of the earth.”⁴ Although Armitage and Mason admit that their definition contains gray areas (e.g., whether or not airpower includes ballistic missiles or surface-to-air weapons), it suffices to guide the proffered framework. Indeed, their definition recognizes qualities of airpower “that are sometimes overlooked”—specifically, its latent impact and its ability to apply force directly or to distribute it.⁵ These characteristics form the basic distinctions used in the framework to categorize airpower missions.

Airpower's modes of application—the ways in which it can be used—are key components of the framework. For instance, airpower poised for use but not actually engaged in an operation is a latent application—a potential impact—that corresponds to its deterrent value. In this case, airpower is not directly used in a contingency; rather, its use is threatened. Examples of latent application abound: Adolf Hitler's references to the Luftwaffe during the reoccupation of the Rhineland in 1936 or the Munich crisis of 1938; President Harry Truman's deployment of B-29s to England during the Berlin airlift of 1948; President Dwight Eisenhower's warning of an



B-29

atomic air attack against North Korea and Manchuria during the closing stages of the Korean War; and President John Kennedy's reliance on Strategic Air Command's B-52s and missile force during the Cuban missile crisis of 1962, among others.

Although the framework acknowledges such latent applications, it primarily concerns itself with the actual use of airpower during a contingency. In a crisis, the application of airpower is twofold, based upon the purpose of the mission: it is either *direct* or *indirect*, and it is either *auxiliary* or *independent*. The direct application of airpower is the intended lethal application—designed to expend ordnance. Dropping bombs, shooting missiles, and firing guns fall into this category of employment. Conversely, the indirect application of airpower is the intended nonlethal use—such as airlift, reconnaissance, electronic jamming, and aerial refueling.

Besides being direct or indirect, the use of airpower is also either auxiliary or independent. Auxiliary airpower supports ground or

sea forces on a specific battlefield, whereas independent airpower aims to achieve objectives apart from those sought by armies or navies at a specific location. The auxiliary form includes both close air support (CAS) and air attack against enemy forces on the battlefield who are not in contact with friendly troops.⁶ So-called strategic bombing—aimed at an enemy's war-making potential before he can bring it to bear on the battlefield—exemplifies the independent application. Yet, the terms *strategic* and *tactical* often overlap and frequently blur. Many air attacks during the last half century's limited wars not only have affected the ebb and flow of a particular engagement, but also have had significant "strategic" consequences. For instance, American air strikes on mobile Scud launchers during the Persian Gulf War of 1991 aimed to wreck Iraq's tactical capability to launch ballistic missiles and to achieve the strategic goal of placating the Israelis, thus keeping them out of the conflict.

Because of such blurred distinctions, the terms *auxiliary* and *independent* seem better

sued than *tactical* and *strategic* to delineate various airpower applications. The former pair, however, is not completely pristine because the distinction between the two depends upon how the user defines the word *battlefield*. In modern war, a specific battlefield may extend for many hundreds of miles; in an insurgent conflict like Vietnam, the battlefield may be even larger. Gen William Westmoreland, commander of US Military Assistance Command, Vietnam from 1964 to 1968, described his battlefield as “the whole country of South Vietnam.”⁷ Such a parameter may seem extreme, but it illustrates the fact that the definition of the battlefield depends to a large extent on the type of war being fought.⁸ In a “conventional” conflict waged to seize or preserve territory, a battlefield’s boundaries are likely to be much more distinct than those in a guerilla war—especially one like Vietnam, in which insurgent forces fought infrequently.

According to the framework’s terminology, each application of airpower has two designations: direct or indirect, auxiliary or independent. For example, the American bombing of the ball-bearing factories in Schweinfurt, Germany, during World War II was a direct/inde-

pendent application; the Berlin airlift of 1948–49 was an indirect/independent application; the B-52 strikes around Khe Sanh, South Vietnam, during the siege of 1968 were a direct/auxiliary application; and the C-130 airlift of supplies into the beleaguered Marine base there was an indirect/auxiliary application. The dual designators describe the purpose of individual airpower missions more clearly than the amorphous terms *tactical* and *strategic*. In addition, the framework’s focus on the intent of the mission highlights airpower’s inherent flexibility by showing that one type of aircraft—whether designated bomber, fighter, airlift, and so forth—can participate in different applications.

But what about the air superiority mission? Where does it fit in the framework? The air control mission is *either* auxiliary *or* independent, *depending upon* the use made of the airspace. For instance, obtaining air superiority over Kuwait to enable allied ground forces to attack Iraqi troops represents a direct/auxiliary application. Achieving air superiority over Baghdad to enable aircraft to strike the city’s key communication and electric power facilities constitutes a direct/independent ap-



B-52s

plication. On occasion, gaining air superiority can be *both* an auxiliary *and* an independent application. The achievement of daylight air superiority over the European continent as a result of the “Big Week” operations in February 1944 is one such example. The resultant air control guaranteed that American bomber operations would continue against German industry and provided the prerequisite protection for the Normandy invasion.

Some might contend that air superiority should be a separate category in the framework, in much the same way that “counterair” is a distinctive “air and space power function” in the current edition of the Air Force’s basic doctrine manual.⁹ The framework does not list air superiority separately because air superiority is not an end in itself. Air control—which employs both direct and indirect methods—allows the direct, indirect, auxiliary, and independent applications to occur. In much the same fashion, the categorization of such indirect applications as aerial refueling, airlift, and reconnaissance depends upon the type of mission that they facilitate. For example, refueling fighters that provide CAS for ground forces would constitute an indirect/auxiliary application. Airlifting smart bombs for F-117 operations against targets in Belgrade, Yugoslavia, during Operation Allied Force would be an indirect/independent application. And obtaining reconnaissance photographs of Iraqi frontline positions in Kuwait would be an indirect/auxiliary application.

However, achieving air superiority that facilitates a cross-channel invasion or securing reconnaissance photographs that lead to a breakthrough of Iraqi defenses does not necessarily imply a successful application of airpower. Only one true criterion exists for evaluating the success of airpower, regardless of whether it was direct, indirect, auxiliary, or independent. That criterion is the ultimate bottom line: *how well did the application contribute to achieving the desired political objective?* Did it, in fact, help win the war? Answering that question first requires a determination of what is meant by *winning*. The war aims must be defined, and the application of airpower must be linked to accomplishing those objectives (fig. 1).

War aims—the political goals of a nation or organization at war—can range from limited to total. Grand strategy blends diplomatic, economic, military, and informational instruments in a concerted effort to achieve those aims. Meanwhile, military strategy combines various components of military force to gain military objectives that, in turn, should help achieve the political goals. Attaining the military objectives may require a mixture of ground, sea, or air operations, and the forces performing those operations may act in either independent or auxiliary fashion. These definitions and connections are relatively straightforward.

Such linkages, however, are not the only ones that determine whether military force—airpower in particular—will prove effective in achieving the desired war aims. Besides being

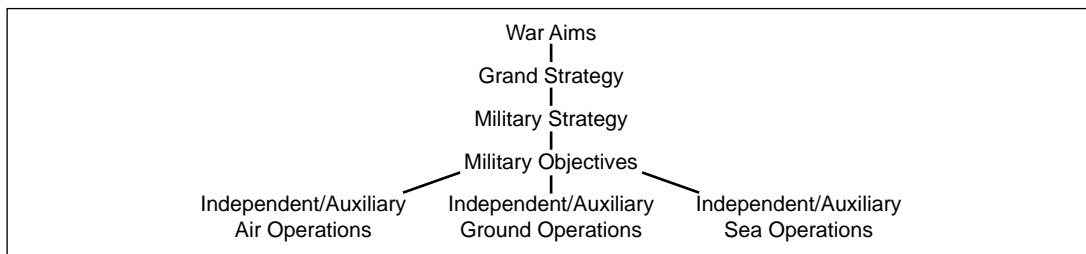


Figure 1. War Aims and the Application of Airpower

either limited or total, war aims are also *positive* or *negative*. *Positive* goals are achieved only by *applying* military force, while *negative* goals, in contrast, are achieved only by *limiting* military force.¹⁰ For example, for the United States, the unconditional surrender of Germany in World War II was a positive political goal—one that required the destruction of Germany's armed forces, government, and the National Socialist way of life. America applied military force to achieve this goal, and few negative objectives limited its use of the military instrument. By comparison, in Kosovo the United States had both the positive objective of removing Serb forces and the negative objective of preserving the North Atlantic Treaty Organization, the latter goal restraining the amount of force that America could apply. A similar example comes from the Persian Gulf War of 1991, although in that conflict the American aim of preserving the alliance was both a positive and a negative goal. That is, President George H. W. Bush had to commit American military force against Iraqi Scuds to keep the Israelis out of the war, but if he applied too much force in the air campaign, he risked dissolving the coalition.

While some critics might equate the notion of negative objectives to constraints, to do so would be a mistake because such objectives have more significance than that. In fact, they have the same importance as positive goals. Failure to secure *either* the positive *or* the negative goals results in defeat; victory requires that *both* must be obtained. The United States would not have succeeded during either the Persian Gulf War or Kosovo had the coalitions that backed those enterprises collapsed. Of course, the contradictory nature of positive and negative goals creates a dilemma—what helps achieve a positive objective works against a negative one. In a limited war, negative objectives always exist; the more limited the war, the greater the number of negative objectives. As President Lyndon Johnson tragically found out in Vietnam, once his negative objectives eclipsed his positive goals, he lost the ability to achieve success with any military force—especially airpower.

How do positive and negative objectives affect the application of airpower? On the one hand, the absence of negative goals encourages the design of an air campaign with few restrictions, such as World War II's Combined Bomber Offensive against Germany or Twentieth Air Force's assault on Japan. A preponderance of negative goals, on the other hand, limits the application of airpower. Negative objectives have restrained American air campaigns in every major conflict since World War II—Korea, Vietnam, the Persian Gulf, Bosnia, Kosovo, and, most recently, Afghanistan. The restrictions typically appear in the form of rules of engagement, "directives issued by competent military authority that delineate the circumstances and limitations under which United States forces will initiate and/or continue combat engagement with other forces encountered."¹¹ The impetus for these directives comes from political leaders and their negative goals (fig. 2).

The greater the number of negative objectives—and the greater the significance attached to them by political leaders—the more difficult it becomes for airpower to attain success in achieving the positive goals. This assessment is especially true of the direct, independent application of airpower. If negative objectives outweigh positive goals, they will likely curtail—perhaps even prohibit—airpower's ability to strike at the heart of an enemy state or organization. Yet, before a user of the framework points to this statement as a basic truth, he or she should realize that the measuring of positive versus negative objectives remains an inherently *subjective* activity. Typically, positive and negative goals are not quantifiable; even when they are, comparing numerical results will likely equate to comparing apples and orange juice. Moreover, positive and negative objectives may be stated explicitly or only implied, which further muddies the water in terms of evaluating results. Spelling out the objectives does not guarantee clarity, however, and the lack of clearly defined goals makes gauging their achievement particularly difficult. For instance, in the Persian Gulf War, the stated

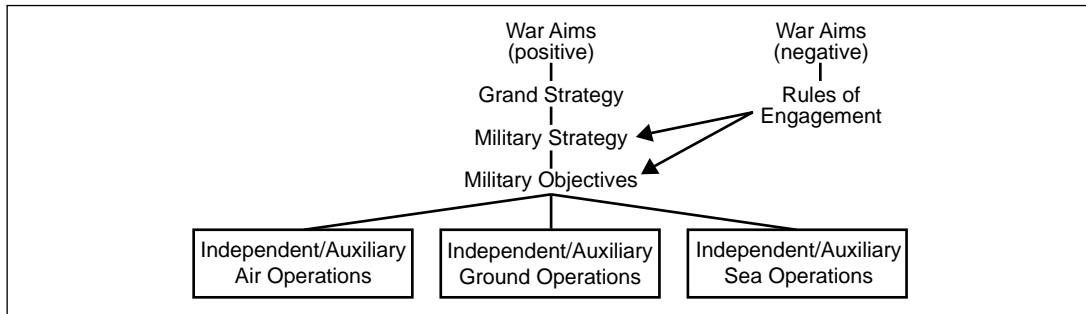


Figure 2. Effect of Negative Objectives on the Application of Airpower

American positive goals of “immediate, complete, and unconditional withdrawal of Iraqi forces from Kuwait” and “restoration of Kuwait’s legitimate government” were straightforward, and success in achieving them was easy to determine. In contrast, gauging success in the stated positive objective of obtaining the “security and stability of Saudi Arabia and the Persian Gulf” proved anything but straightforward during the conflict and has remained uncertain in the aftermath of the war.¹²

In the case of the Persian Gulf War, the negative objectives of preserving the coalition and maintaining public support, both in the United States and worldwide, did not prevent airpower from helping remove Iraqi troops from Kuwait. Likewise, the various applications of airpower in that war did not stop President Bush from achieving his negative goals, even though the direct, independent application that hit the Al Firdos bunker in Baghdad and the direct, auxiliary applications that produced deaths from friendly fire in Kuwait made achieving the negative objectives more difficult. Ultimately, that is how airpower’s effectiveness must be measured—in terms of *how well it supports the positive goals without jeopardizing the negative objectives*.

Key Variables

In the determination of when airpower is most likely to help achieve the positive goals, five main variables, mentioned earlier, come

into play.¹³ These variables are complex factors that cannot be easily dissected; nor can one variable be considered in isolation from the others because the variables’ effects are often complementary. Each has questions associated with it, and the questions provided are not all-inclusive—others will certainly come to mind. Answering the questions differently for one variable may cause the other variables to assume greater or lesser importance. No formula determines what variable may be the most important in any particular situation or how their combined effect may contribute to—or hinder—the achievement of the positive goals. If *all* five variables argue against a particular application of airpower, however, that application is unlikely to be beneficial. The assumptions made in answering the questions for each variable are also of critical importance. If those assumptions are flawed, the assessment of the variables is likely to be flawed as well.

Nature of the Enemy

What military capabilities does the enemy possess? What is the nature of his military establishment? Is it a conscript force, volunteer military, or blend? Is the enemy population socially, ethnically, and ideologically unified? Where is the bulk of the populace located? Is the populace primarily urban or agrarian? What type of government or central leadership apparatus does the enemy have? What about the individuals who lead it? Are they strong or weak, supported by the populace or

despised? Or is the populace ambivalent? What is its relationship with the military and its commanders? How resolute is the political leadership? The military? The populace? How does the enemy state or organization make its money? Is it self-sufficient in any area? How important is trade? What allies does the enemy have, and how much support do they provide? If more than one enemy is involved, these questions must be asked about each enemy and a determination made about which one poses the greatest threat.

Type of War Waged by the Enemy

This variable also affects airpower's ability to achieve a positive political objective. Is the conflict a conventional war to seize or hold territory? Is it an unconventional guerrilla struggle? Is it an insurgency supported by a third party? Is the conflict a war of movement or a stagnant fight from fixed positions? How often does the fighting occur? In general, the direct application of airpower, whether applied independently or as an auxiliary function, works best against an enemy waging a fast-paced, conventional war of movement. For example, the combination of independent and auxiliary attacks during the "dynamic" first year of the Korean War had a telling effect on the ability of the North Koreans and Chinese to fight. During the final two years of the conflict, when the North Koreans and Chinese fought sluggishly in a confined area along the 38th parallel, the direct application of airpower made little headway in achieving President Truman's goal of a negotiated settlement that preserved a noncommunist South Korea.

Nature of the Combat Environment

What are the climate, weather, terrain, and vegetation in the hostile area? How might they affect applications of airpower? Are adequate bases available? What are the distances involved in applying airpower, and can those distances be overcome? What type of support is required?

Magnitude of Military Controls

This variable involves constraints placed on airpower applications by military rather than political leaders. Ideally, no military controls exist, but that may or may not be the case—such controls can stem from many sources. Is there unity of command? What are the administrative arrangements for controlling airpower, and do those arrangements conflict with operational control? The "route package" system that segregated Air Force from Navy airspace over North Vietnam and helped trigger competition between the two services for sorties stands as perhaps the most egregious example of how the lack of command unity can disrupt an air campaign. Doctrine can also lead to military controls. Is the doctrine that guides the various applications of airpower adaptable to different circumstances? What are the personal beliefs of commanders regarding how best to apply airpower? Personal convictions can play a significant role in limiting airpower applications—witness the Korean War. During that conflict, the Army's Gen Matthew Ridgway, United Nations commander, prohibited the bombing of North Korean hydroelectric plants even though he had the authority to conduct the raids and had been encouraged to do so by the Joint Chiefs of Staff. Ridgway believed that such attacks might expand the scope of the war, but his successor, Gen Mark Clark, had no such misgivings.¹⁴ One month after Clark took command, Air Force, Navy, and Marine aircraft attacked these facilities.

Nature of the Political Objectives

Often, this variable is the most important. Are the positive goals truly achievable through the application of military force? Is the application of airpower necessary to obtain the positive objectives? How committed is the leadership that is applying airpower to achieving the positive goals? How committed is the populace? Can leadership attain the positive goals without denying the negative objectives? How do the negative objectives limit airpower's ability to help achieve the positive

goals? The direct, independent application of airpower seems to work best for a belligerent with no negative objectives—*provided a suitable type of enemy wages a suitable type of war in a suitable type of environment free of significant military restrictions*. For the United States in World War II, the suitable conditions existed. Few negative objectives or military controls limited the application of military force. Americans had a decent understanding of both enemies—the Germans and the Japanese—who fought as expected in environments that ultimately proved conducive to the direct, independent application of airpower. However, since World War II, negative objectives have played prominent roles in guiding American war efforts. For the United States in the foreseeable future, the prospect of a war without them is remote indeed.

The Current Conflict

In the ongoing conflict in Afghanistan, the multifaceted nature both of American political objectives and the conflict itself has made the effectiveness of airpower applications difficult to gauge. Those political goals might be listed as follows: (1) destroying al Qaeda's current ability to conduct global terrorism, which includes denying al Qaeda sanctuaries for launching attacks; (2) exacting retribution for the 11 September attacks ("bringing those responsible to justice"); (3) preventing the expansion/future development of global terrorism; and (4) maintaining maximum support for American actions from the rest of the world, especially the Islamic world. At first glance, the initial three goals could be deemed positive, while the fourth could be labeled negative. Yet, although the third objective likely requires lethal military force to destroy terrorist cells and prevent them from expanding, applying too much force is likely to produce collateral damage or the perception of indiscriminate destruction, either of which could serve as an al Qaeda recruiting vehicle and achieve the opposite of the desired results. Thus, the third goal must be categorized as both positive *and* negative.

At the same time, the other variables have had—and will continue to have—a significant impact on airpower effectiveness. The al Qaeda and the Taliban are not the same enemies, and wrecking the Taliban does not equate to eliminating al Qaeda. They also have not waged the same type of war. For the first four months of the conflict, the Taliban provided the bulk of the forces in Afghanistan and fought a "conventional" war against Northern Alliance and allied forces. Airpower contributed enormously to wrecking Taliban strength during that span. Since that time, however, the fighting has resembled the guerilla conflict that plagued Soviet forces for much of their eight-year ordeal. Both Afghanistan's terrain and its climate have proven less than ideal for air operations, although technology has helped to overcome some of those difficulties. Military controls have also affected the air effort in the form of legal reviews of potential targets.

Yet, such reviews must occur if airpower is to help achieve the negative as well as the positive goals in the current conflict. In this war, which is in many respects a global struggle for "hearts and minds," perceptions are often more potent than reality, and an enemy who relies on asymmetric means will be quick to use favorable perceptions to his own ends. Defeating that foe will require a careful employment of airpower—whether its application is direct/independent against isolated leadership targets, direct/auxiliary in support of ground operations, or indirect/independent in humanitarian-relief efforts. Regardless of how it is applied, a key to success will be assuring that *all* concerned view its use in the best possible light.

In the final analysis, the effectiveness of airpower against any type of enemy depends on how well it supports the positive political goals without risking the achievement of the negative ones. The framework presented here offers no guarantee of success or failure—nor is it a predictor of the future. But it does charge those leaders who might apply air-

power to think carefully before making that decision. Clausewitz warns that “no one starts a war—or rather, no one in his senses ought to do so—without first being clear in his mind what he intends to achieve by that war and

how he intends to conduct it.”¹⁵ That admonishment, delivered almost two centuries ago to readers who had fought against Napoleon with muskets and sabers, remains apt in the age of air warfare. □

Notes

1. *Quadrennial Defense Review Report* (Washington, D.C.: Department of Defense, 30 September 2001).

2. Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, N.J.: Princeton University Press, 1976), 87.

3. William Mitchell, *Winged Defense: The Development and Possibilities of Modern Air Power* (1925; reprint, New York: Dover Publications, Inc., 1988), xii.

4. M. J. Armitage and R. A. Mason, *Air Power in the Nuclear Age* (Urbana, Ill.: University of Illinois Press, 1983), 2.

5. *Ibid.*, 3.

6. The largely discarded term *battlefield air interdiction* (BAI) describes this auxiliary function.

7. Quoted in John Schlight, *The War in South Vietnam: The Years of the Offensive, 1965–1968*, United States Air Force in Southeast Asia (Washington, D.C.: Office of Air Force History, 1988), 216.

8. Other factors may help define the battlefield as well. These include the ranges of weapons possessed by deployed ground or sea forces, or the location of such demarcations as the forward line of troops (FLOT) and the fire support coordination line (FSCL). Adm William Owens, former vice chairman of the Joint Chiefs of Staff, contended that a battlefield would consist of the 40,000 square miles in a 200-by-200-mile area. Although Admiral Owens's precise delineation may be appropriate in a conventional war, it may not suit other types of conflict. See Lt Col Terry L. New, “Where to Draw the Line between Air and Land Battle,” *Airpower Journal* 10, no. 3 (Fall 1996): 34–49, on how the battlefield is affected by the

relationship between the FLOT and the FSCL. For Admiral Owens's notion of the battlefield, see Alan D. Zimm, “Human-Centric Warfare,” US Naval Institute *Proceedings* 125 (May 1999): 28.

9. Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine*, 1 September 1997, 46.

10. These terms should not be confused with Clausewitz's concept of positive and negative objectives, which he uses in regard to attacking and defending.

11. Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 12 April 2001, 380, online, Internet, 14 September 2002, available from http://www.dtic.mil/doctrine/jel/new_pubs/jp1_02.pdf.

12. See Bard E. O'Neill and Ilana Kass, “The Persian Gulf War: A Political-Military Assessment,” *Comparative Strategy* 11 (April–June 1992): 219, for a thorough discussion of American war aims in the Persian Gulf War of 1991.

13. The Clausewitzian notion of friction also affects airpower's ability to achieve positive (and negative) political goals, but, unlike the five variables, friction is a constant that cannot be specified according to assumptions and analyses.

14. Robert F. Futrell, *The United States Air Force in Korea, 1950–1953*, rev. ed. (Washington, D.C.: Office of Air Force History, 1983), 480–85; and Gen O. P. Weyland, transcript of oral history interview by Dr. James Hasdorff and Brig Gen Noel Parrish, San Antonio, Tex., 19 November 1974, Air Force Historical Research Agency, Maxwell AFB, Ala., file no. K239.0512-813, 107, 113.

15. Clausewitz, 579.

A man always has two good reasons for doing anything—a good reason, and the real reason.

—J. P. Morgan

Historical Perspectives on Operational Environment Research and Objective Determination in Air Campaign Planning

LT COL TONY WOLUSKY, USAF

Editorial Abstract: The process of planning any air campaign includes five steps: operational environment research, objective determination, identification of centers of gravity, identification of strategy, and development of the joint air and space operations plan. Lieutenant Colonel Wolusky focuses on the first two planning steps, using historical examples to illustrate important concepts for today's air campaign planners. Although airpower is a relatively recent phenomenon, we can learn valuable lessons from past military campaigns, both ancient and modern.



The art of war is simple enough. Find out where your enemy is. Get at him as soon as you can. Strike him as hard as you can, and keep moving.

—Ulysses S. Grant

ALTHOUGH AIRPOWER IS a phenomenon of the twentieth and twenty-first centuries, examples from past military campaigns show us the timeless quality of managing warfare. Xerxes, Alexander, Hannibal, Julius Caesar, Frederick the Great, Mao, and Patton imposed their will on their enemies by brilliant planning before they used military force. We

can apply the lessons learned from military giants of the past to modern air campaign planning.

When our leaders need airpower to support American strategic objectives, the theater combatant commander tasks the joint force commander (JFC) and the subordinate joint force air component commander (JFACC) to create an air campaign plan that embodies the “com-

batant commander's strategic vision" and consists of "a series of related joint military operations that arrange tactical, operational, and strategic action to accomplish strategic and operational objectives within a given time and space."¹ The joint air and space operations plan details how joint air and space forces will integrate to support the JFC's campaign plan. The JFACC's staff prepares the air campaign plan in five steps: operational environment research (OER), objective determination, identification of centers of gravity, identification of strategy, and development of the joint air and space operations plan.² This article examines the first two steps from a historical perspective.

Operational Environment Research

No matter how enmeshed a commander becomes in the elaboration of his own thoughts, it is sometimes necessary to take the enemy into account.

—Winston Churchill

During OER, which gives the air campaign plan its context, planners gather information about our allies' and enemies' capabilities and intentions, doctrine, and the environment facing the joint or combined force—a process also known as intelligence preparation of the battle space. The JFACC staff tries to understand the enemy and his motivations; it also examines the perspectives of the United States, as well as those of allied and neutral countries, in relation to the enemy.

OER planners study the major players' history, culture, military capabilities, leadership, geography, and weather. Of these factors, weather analysis is as important as it is unpredictable. The forces of nature have always haunted war planners. Gen Douglas MacArthur had to master the tides at Inchon, South Korea; Gen Dwight Eisenhower had to hit the beaches in Normandy, France, when the clouds parted; and the Russian winter ravaged Napoléon's retreating forces (400,000

men set out, but only 10,000 returned). Today, the vagaries of cloud cover and dust storms affect our precision-guided weapons and modern fighter aircraft.

Planners must also analyze all parties' command relationships, available forces, rules of engagement (ROE), applicable treaties and agreements, base-use rights, overflight rights, and logistics capabilities. For example, on 14 April 1986, in response to a terrorist attack on US servicemen in Berlin, the United States launched Operation El Dorado Canyon against targets in Libya. The strike package consisted of 24 F-111 fighters and five EF-111 jamming-support aircraft, flying out of bases in England. The US aircraft carriers *Coral Sea* and *America* were in the Mediterranean Sea, ready to suppress Libyan air defenses with EA-6Bs and F/A-18s.³

The operation's air planners had a problem with the Air Force component of the strike package. Taking the most direct route between the United Kingdom (UK) bases and the targets would require flying over France. However, France opposed the retaliatory raid and denied the United States overflight rights. Other routes over land required multiple overflight permissions from multiple countries. The only viable option was to route the strike package out to sea, where the United States did not need overflight rights. Unfortunately, the route around the Iberian Peninsula increased the flying distance to the targets by about 1,300 nautical miles each way, adding six to seven hours of flight time for the crews and requiring a tremendous amount of refueling support from tanker aircraft. The planners had to compensate for all of the logistics variables.⁴

Air campaign planners for Operation Enduring Freedom in Afghanistan faced similar limiting factors. Because we lacked secure forward bases in the area of responsibility, F/A-18s flew 10-hour missions from carriers; B-52s flew 15-hour bomber missions from Diego Garcia; B-2s flew 44-hour sorties from the continental United States; and F-15Es flew grueling 15-hour sorties. The lack of secure forward bases will doubtless remain a major



EF-111 Raven

planning consideration for expeditionary air and space forces.

True OER synthesizes information from many disciplines. The air campaign planning staff absorbs vast amounts of it from the intelligence, logistics, and planning communities. Staffers also learn a great deal from open-source materials. For example, as an instructor at the infantry schools in Dresden and Potsdam, Germany, between the world wars, Gen Erwin Rommel studied enemy tactics for insights. In 1937 he published his thoughts in his book *Infanterie greift an* (The infantry attacks),⁵ which “sketched a revolutionary principle for the war of movement in which the infantry was given unheard of momentum and striking power through close cooperation with armored units.”⁶ An American Army officer named George S. Patton read the book with great interest.

Patton also read *Achtung! Panzer!* by armor pioneer Heinz Guderian, “in which he described with defiant candor the evolution of the new armored troops of the Germans.”⁷ Almost alone in the Army hierarchy, General Patton understood the Wehrmacht’s fantastic evolution in mechanized warfare. His study of open-source materials better prepared him to meet the Desert Fox and his Afrika Korps in battle. As he said to Comdr Harry C. Butcher, General Eisenhower’s aide, just be-

fore leading American troops against Rommel in February 1943, “I had spent years preparing myself for him, had read his Goddamn book a myriad of times, studied every one of his campaigns, and thought I had him pretty well sized up. It was the ambition of my life to chase him a bit, then seek him out personally in battle, and shoot him dead with my own hands.”⁸

However, information does not always allow one to understand the enemy’s capabilities. On the eve of the Battle of Britain’s air campaign in World War II, the British military was reeling from its humiliation at Dunkirk, France. Joseph “Beppo” Schmid, leader of the Intelligence Branch of the Luftwaffe Operations Staff, assured Reichsmarschall Her-



EA-6B Prowler

mann Göring—the Luftwaffe commander—and Adolph Hitler that British air forces were out of date, that UK defenses were weak, and that aircraft production was low.⁹ Based on this information, Schmid, along with many of the Third Reich leaders, was certain that the British would sue for peace to avoid an invasion.

Instead of surrendering, however, the British created a layered air defense consisting of an observer corps (30,000 observers at 1,000 posts)¹⁰ and a revolutionary 51-station radar network.¹¹ The plots from these sources, “obtained from even the most remote post[,] could be transmitted to Fighter Command in less than forty seconds.”¹² This “weak” defense network enabled the 700 Hurricanes and Spitfires of the Royal Air Force’s Fighter Command to beat the Germans’ 760 serviceable Bf 109s in the battle for daylight air superiority.¹³ Ultimately, the Battle of Britain cost the Luftwaffe 1,887 aircraft and the Royal Air Force 1,547¹⁴—the German invasion of the British Isles never occurred.

OER Pitfall: Mirror Imaging

Mirror imaging entails seeing an adversary as a mirror image of oneself. When planners mirror-image, they expect the enemy to react as the United States would to the same facts or events. In reality, the enemy’s motivations, objectives, and worldview seldom exactly reflect our own. At best, mirror imaging hampers planning—whether military or diplomatic—and, at worst, renders it useless.

For example, recall Prime Minister Neville Chamberlain’s Munich Pact with Hitler in 1938. Chamberlain, who simply did not understand the German dictator’s perspective, believed that accepting his territorial claims to predominantly German areas of Czechoslovakia would bring “peace in our time.” Far from satisfying the Nazis, however, the weak British reaction to the land grab became a major factor in Hitler’s decision to invade Poland in 1939. When his dream of uniting Europe under the Third Reich became clear, opponents with whom he had dealt at Mu-

nich and considered “worms”¹⁵ could not deter his war plans.

OER Pitfall: Ethnocentrism

Examples of ethnocentrism, a belief in the inherent superiority of one’s own group and culture, accompanied by a feeling of contempt for other groups or cultures and a tendency to view them in terms of one’s own, abound in both ancient and modern times. In the Korean War, United Nations (UN) forces found themselves unprepared for “human wave” attacks by forces of the People’s Republic of China and North Korea. During the Gallic Wars, the confounding tactics of the rebel leader Vercingetorix frustrated Julius Caesar. The former attacked from impenetrable marshes, refused to meet Caesar’s forces on open ground,¹⁶ and starved friends and foes alike in a vigorous scorched-earth policy.¹⁷ Similarly, Gen William Westmoreland could not respond decisively to the “revolutionary warfare” of the Vietcong, who followed Mao’s dictum that one should have no concern for “stupid scruples about benevolence, righteousness and morality in war.”¹⁸ These brutal tactics by an “inferior enemy” stymied the forces of the UN, the Roman Empire, and the United States.

Sometimes, we can better understand an enemy’s motivation by examining our past. The Christian Crusaders of the Middle Ages risked their lives to “rescue” the Holy Land, “with the assurance of the reward of imperishable glory in the kingdom of heaven.”¹⁹ The Crusaders’ fanaticism and brutality in the name of their holy cause bear a striking similarity to the jihad mentality of the terrorists facing the United States today in Operation Enduring Freedom. Although the terrorists’ attitudes are abhorrent to us, obviously at one time in the history of Western civilization, those same attitudes were very much a part of our culture. Understanding our own history can help us better understand our enemy and his attitude towards our war on terrorism.

Objective Determination

Men should either be treated generously or destroyed, because they take revenge for slight injuries—for heavy ones they cannot.

—Niccolò Machiavelli

Objective determination involves deciding what to accomplish in a campaign, thereby allowing one to focus on the desired end state. A good air campaign objective is clear, concise, attainable, measurable, and directly supportive of the JFC's and president's national security goals. Whether the objective is at the national (strategic), air-campaign-planning (operational), or tactical level (where engagements are planned and executed), every military operation should be directed to achieving these goals.

Strategic-level objectives are necessarily broad. August 1941 saw the drafting of Air War Plans Division 1 (AWPD-1), "Munitions Requirements of the Army Air Forces to Defeat Our Potential Enemies," the first US strategic air war plan—the "basic blueprint for the creation of the Army Air Forces and the conduct of the air war against Nazi Germany."²⁰ Following the Air Corps's emphasis on unescorted bombers,²¹ the plan called for using daylight, high-altitude precision bombardment of German industries and required over 3,800 medium and heavy bombers for six months.²²

AWPD-1 planners identified four basic target systems: electric power, transportation, synthetic petroleum production, and the Luftwaffe.²³ They confidently presented an overall strategic objective that "leaned heavily toward victory through airpower, but which provided for air support of an invasion and subsequent combined operations on the continent if the air offensive should not prove conclusive."²⁴ Eighth Air Force bomber crews faced the deadly realities of weather, aggressive fighter attacks, and flak as they put AWPD-1's optimistic theories about unescorted bombers into practice in the skies over Europe.

A more recent example of strategic objectives driving an air campaign occurred during a press conference on 1 April 1999, at which Javier Solana, secretary-general of the North Atlantic Treaty Organization (NATO),

Following the Air Corps's emphasis on unescorted bombers, the plan called for using daylight, high-altitude precision bombardment of German industries and required over 3,800 medium and heavy bombers for six months.

outlined the political goals of Operation Allied Force: "First and foremost, we must stop the killing in Kosovo and the brutal destruction of human lives and properties; secondly, we must put an end to the appalling humanitarian situation that is now unfolding in Kosovo and create the conditions for the refugees to be able to return; thirdly, we must create the conditions for a political solution to the crisis in Kosovo."²⁵ Regarding the same operation, Secretary of Defense William S. Cohen provided the operational-level goal: "Our military objective is to degrade and damage the military and security structure that President [Slobodan] Milosevic has used to depopulate and destroy the Albanian majority in Kosovo."²⁶

After the United States traced the terrorist attack against American military members in Berlin to Libya's Col Mu'ammarr Gadhafi, President Ronald Reagan gave military planners two strategic objectives: to deter future Libyan terrorism and to show the American public that his administration was willing and able to strike back. In the president's words, El Dorado Canyon was designed to "make the world smaller for terrorists."²⁷

At the operational level, the air campaign planning staff links the strategic to the tactical through the joint air and space operations plan: "Activities at this level link tactics and strategy by establishing operational objectives

needed to accomplish the strategic objectives, sequencing events to achieve the operational objectives, initiating actions, and applying resources to bring about and sustain

The United States knew that if the Scud menace to Israel were not diminished, Israel would attack Iraq.

these events.”²⁸ A good example of this connection comes from the Gulf War of 1991. Hunting Iraq’s Scud missiles became a very important tactical-level operation because of its direct linkage to the strategic political objective of keeping Israel out of the war. The United States knew that if the Scud menace to Israel were not diminished, Israel would attack Iraq, resulting in the loss of some of the Arab members of the coalition. At the operational level, air campaign planners had to allocate missions to achieve these linked objectives. Admittedly, the Scud-hunting program was inefficient from a tactical perspective, but abandoning it would have jeopardized the entire campaign.

Failure to effectively identify and link objectives can destroy a campaign before it begins. During the Battle of Britain, the Luftwaffe found itself saddled with an ineffective and ambivalent commander (Göring) and a supreme leader (Hitler) more interested in preparing to invade the Soviet Union. This situation made planning a coordinated air campaign impossible. Field Marshal Albert Kesselring, who commanded Luftflotte II staging from northeastern France and the Low Countries, complained bitterly in his memoirs that “in contrast to our previous campaigns, there was not one conference within the *Luftwaffe* at which details were discussed with group commanders and other services, let alone with the High Command or Hitler himself” (italics in original).²⁹ Kesselring received no tactical instructions, and no arrangements were made for a joint

effort with the army and navy. The air campaign, which had no firm objectives, ultimately failed.

Constraints and Restraints

Objective determination involves constraints and restraints. A constraint obligates a commander to a certain military course of action. For example, in 1943 Soviet armored spearheads encircled Germany’s forces near Stalingrad. Hitler ordered Gen Friedrich Paulus, the commander, to hold the pocket despite heavy losses and an untenable military position. This constraint doomed the German Sixth Army and its 200,000 soldiers.

Often, time is a major constraint on military operations. During the Second Punic War, Hannibal found himself in an increasingly dangerous position, deep in Italy. He faced the Roman army, which outnumbered him two to one, on its home turf. Hannibal needed a quick and decisive victory, or his great expedition from Carthage and through Spain and over the Alps would fail. In 216 B.C., at Cannae, Hannibal drew eight Roman legions into the center of his line and executed a double envelopment, resulting in 70,000 Roman casualties to his 5,000.³⁰ Constrained by time, Hannibal turned urgency into victory.

Restraints place limits on a commander’s actions, as does the Law of Armed Conflict (LOAC). Today, the most significant overall restraint on military operations concerns the avoidance of collateral damage. Strictly speaking, LOAC prohibits “indiscriminate attacks,” defined in part as attacks in which incidental injury to civilians or incidental damage to civilian objects proves “excessive in relation to the concrete and direct military advantage anticipated”³¹—this is also known as the principle of proportionality. LOAC requires planners to avoid planning or to cancel an attack under circumstances that violate this principle.³²

In modern warfare, planners take great pains to avoid civilian casualties, but the principle of proportionality was never meant to

prohibit them. Two factors give this issue paramount importance: (1) the technological leap to smart weapons and (2) continuous media coverage, the combination of which creates an unrealistic expectation of war's efficiency and leads to intolerance of any civilian casualties.

Our enemies are well aware of the restraining impact of potential civilian casualties on our plans. During Allied Force in Kosovo, Serbian civilians painted red targets on themselves and congregated on key bridges over the Danube. During the Gulf War, Saddam Hussein placed civilians at key military targets to act as "human shields." Planners have to consider such restraints when they examine legitimate military options.

Comprehensive, real-time data is undoubtedly a great asset to air campaign planners and commanders. It significantly enhances our ability to avoid collateral damage by allowing us to adjust to civilian population movements that occur in the time between planning and executing a military strike. However, it is not without its drawbacks and can even restrain a commander's actions. For example, Operation Enduring Freedom has seen an incredible increase in data available to the JFACC. The forward-deployed combined air operations center (CAOC) was wired with as many as 100 T-1 lines, providing streaming video feeds from Predator unmanned aerial vehicles (UAV) in the target areas, Global Hawk UAV surveillance information, and direct input from US special operations forces on the ground.³³ This data gave the JFACC the immediate ground picture necessary to move swiftly against time-sensitive targets in Afghanistan; however, it also gave the same information to US Central Command (CENTCOM) in Florida. On several occasions, CENTCOM overrode the CAOC's call for strikes on newly identified targets.³⁴

In one notorious incident, concerns about collateral damage crossed eight time zones to restrain the JFACC in the CAOC. In October 2001, a Predator UAV³⁵ found Mullah Mo-



RQ-4 Global Hawk UAV

ammed Omar, the Taliban leader, fleeing Kabul, Afghanistan, in a convoy. The UAV, operated by the Central Intelligence Agency, carried two Hellfire laser-guided missiles. However, the agency needed CENTCOM approval to "push the button." The Predator tracked the convoy to a building where Omar and his entourage took cover. Rather than hit hard at the building, Gen Tommy R. Franks, CENTCOM commander, and his legal advisors would only allow the UAV to fire a missile in front of the building to see who came out.³⁶ Unfortunately for the war effort, Mullah Omar safely departed the rear of the building.³⁷

Fear of escalating a conflict is often a significant restraining factor. During the Korean War, armed forces of the People's Republic of China and North Korea launched attacks against UN forces from bases in China north of the Yalu River. Nevertheless, General MacArthur was forbidden to use airpower to bomb these legitimate Chinese targets. This restraint stemmed from the fear that such operations would spark a nuclear war between the United States and the perceived monolithic Communist forces of China and the Soviet Union.

Fear of both collateral damage and escalation is a significant restraining issue in our nuclear war plans. At the height of the Cold War, the single integrated operational plan

(SIOP)—the comprehensive US plan for nuclear conflict—contained approximately 16,000 targets and took 14 to 18 months to plan.³⁸ It was of the utmost national importance and shrouded in the highest security controls available. Actually launching nuclear weapons presupposes that deterrence has failed and that we must use devastating military force. A limited nuclear strike against a remote Siberian oil field might satisfy the restraint regarding collateral damage. However, the risk of escalation is implicit in the use of any nuclear weapon, no matter how remote the target area.

In addition to these restraints, SIOP planners are also limited by the US policy against using nuclear weapons in a first strike. They have the difficult task of determining how to ride out a nuclear, chemical, or biological attack, whether limited or comprehensive, and then plan for operations after the attack, using forces that may or may not exist in the postattack chaos.

Finally, ROEs, which give our forces a set of rules to ensure consistent action in unpredictable situations, serve as additional self-imposed restraints on military operations.³⁹ They are not intended to affect the fundamental right of self-defense; nor are they designed to carry criminal sanctions against people who fail to follow them. However, in rare cases, violating ROEs can result in criminal proceedings.⁴⁰

Difficulty Determining an Objective

I doubt seriously whether a man can think with full wisdom and with deep convictions regarding certain of the basic issues today who has not at least reviewed in his mind the period of the Peloponnesian War and the fall of Athens.

—Gen George C. Marshall

Although vitally important, selecting an achievable objective for the end state often-times proves difficult. As General Marshall suggested, reading Thucydides' account of the savage war between the Athenian Empire

and the other city-states allied with Sparta remains instructive. When the war began in 431 B.C., neither side envisioned its duration (27 years), as well as the tyranny, destruction, and social upheaval to come. The Arab-Israeli wars, Iran-Iraq War, Soviet war in Afghanistan, Irish "troubles," Chechnya occupation, and Vietnam War are all examples of military operations without workable end states. Every party to a conflict has its own desired end state, but unless it is achievable, protracted and interminable warfare results.

Formulating an attainable end state to a full-blown armed conflict is a complicated undertaking. In his analysis of Operation Desert Storm and war termination, John Fishel defines *end state* as "what the leadership desires the battlefield and the surrounding political landscape to look like when the war is over. . . . Moreover, end-states suggest descriptions, in fairly great detail, of national policy."⁴¹ Some observers attribute America's inability to fashion proper military end states to our traditional war strategy of annihilation⁴² and describe the US military's application of the concept in a crisis as "haphazard."⁴³

Peacemaking and Peacekeeping

Peacemaking and peacekeeping operations have become the norm in the post-Cold War era. They present a challenge for military planners trying to formulate military objectives and fix a solid objective for the end state. In Somalia in 1992, Operation Restore Hope showed us just how wrong things could go when objectives aren't clearly defined.

Launched under the auspices of the UN, the operation sought to prevent further starvation in Somalia caused by a food shortage, which rival warlords exacerbated by interfering with food distributions. The UN's desired end state called for creating "an environment in which the United Nations and nongovernmental organizations can assume full responsibility for the security and operation of the Somalia humanitarian relief efforts."⁴⁴ Under this vague guidance for the political objectives, Maj Gen Steven L. Arnold, military com-

mander of Army forces in Somalia, could neither develop discrete military objectives nor a clear exit strategy⁴⁵ other than “to be able to eventually leave.”⁴⁶

Some people suggest that the operation failed because of the poor working relationship between the relief organizations and the military, as well as the joint task force’s fear of “mission creep.”⁴⁷ Shifting directions from policy makers and a fatal deficiency of tenable objectives forced the military to improvise from day to day and just “muddle through.”⁴⁸ The operation ended with 30 US soldiers killed in combat and 175 wounded, together with 13 noncombat deaths and one missing in action.⁴⁹ The UN lost 140 peacekeepers, and thousands of Somali citizens were killed.⁵⁰

The US military remembered the lessons it learned in Somalia. In 1994, when the UN decided to restore order in Haiti with Operation Uphold Democracy, the military put those lessons to use. It defined an operation for “quick withdrawal of the US forces and left the actual restoration of democracy to the United Nations,”⁵¹ quickly reducing the 22,000-member landing force assisting the UN to 2,400 troops.

The 1990s saw major peacemaking operations in the Balkans. In Bosnia-Herzegovina, after Bosnian Serbs began attacking Bosnian Muslims, the United States tried to deter further Serbian aggression by implementing Operation Deny Flight in 1993.⁵² This effort failed in the face of an increasingly defiant Serbian enemy willing to take 150 UN peacekeepers hostage to deter air attacks in this brutal civil war.

In 1995, after Bosnian Serb shelling of a Sarajevo marketplace killed many civilians, NATO began Operation Deliberate Force, designed as a “coercive catalyst”⁵³ to stop Milosevic from supporting the Bosnian Serb offensive. According to Gen Hal Hornburg, then a major general and director of the CAOC, air campaign planning started with the desired military end state of halting the Bosnian Serb army’s shelling of UN safe areas for Bosnian Muslims.⁵⁴ Gen Michael Ryan, retired, also a major general at the time, said

the operation would achieve the political end state when the Bosnian Serbs “sue for cessation of military operations, comply with UN mandates, and negotiate.”⁵⁵ In September 1995, the Bosnian Serb government agreed to withdraw heavy weapons from the mountains surrounding Sarajevo and enter into peace talks, thus making Deliberate Force a success.

As we know, Serbian aggression in the former Yugoslavia did not end with Bosnia. Serbs next began attacking ethnic Albanian Muslims in Kosovo, a region of Serbia with a Muslim majority population. Like Deliberate Force, Allied Force used airpower to force President Milosevic to the bargaining table. A North Atlantic Council statement of 12 April 1999 effectively laid out the mission’s end state:

Air strikes will be pursued until President Milosevic . . . ensure[s] a verifiable stop to all military action and the immediate ending of violence and repression; ensure[s] the withdrawal from Kosovo of the military, police and paramilitary forces; agree[s] to the stationing in Kosovo of an international military presence; agree[s] to the unconditional and safe return of all refugees and displaced persons and unhindered access to them by humanitarian aid organisations; [and] provide[s] credible assurance of his willingness to work on the basis of the Rambouillet Accords in the establishment of a political framework agreement for Kosovo in conformity with international law and the Charter of the United Nations.⁵⁶

Allied Force convinced Milosevic “to withdraw thousands of troops, police, and paramilitaries while letting an international peacekeeping force enter Kosovo.”⁵⁷ The 78-day air campaign expelled the Yugoslav forces without a single NATO fatality or the need to launch a ground offensive. It proved that the effective use of airpower alone could attain an end-state objective.

Conclusion

There is no man more faint-hearted than I when I am planning a campaign. I purposely exaggerate all the dangers and all the

calamities that the circumstances make possible. I am in a thoroughly painful state of agitation. This does not keep me from looking quite serene in front of my entourage. Once I have made up my mind, everything is forgotten except what leads to success.

—Napoléon Bonaparte

Advances in technology have increased the speed, lethality, and reach of military power. These same advances have also magnified the risks of miscalculation and have created immediate global awareness of mistakes. As a result, modern air campaign planners must be as “faint-hearted” as Napoléon when it comes to understanding the battle space and the fundamental goals of the campaign. But this is impossible without a thorough grounding in history, both ancient and modern.

Sound OER rests on a brutally honest and realistic view of our enemy, our allies, and ourselves. Equipment and tactics may change radically, but people and their motivations do not. Such underlying dynamics as tactics, ideals, and grudges—which do not appear from nowhere—affect every operation. Studying campaigns of the distant past gives war

planners timeless insights into the practice of warfare. Examples from more recent military history show how potential allies or adversaries have fought (and will fight) wars.

Planners must focus on campaign objectives, from tactical to end state, as they develop every tasking. Goals may evolve as the campaign progresses, but targets chosen along the way must be directly linked to a defined objective. This vital connection between ends and means did not exist for the Luftwaffe during the Battle of Britain or for the UN forces in Somalia. These operations did not fail because the airmen or soldiers were lacking in some way. They failed, for the most part, because they lacked plainly stated, achievable objectives. We learned valuable lessons about defining and concentrating on objectives from these historical missteps.

Because operational environment research and objective determination are crucial components of air campaign planning, planners need a firm historical perspective to do them justice. Our great military leaders have long understood the advantage they have gained in the present by studying the past. □

Notes

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3. Billy R. Shrader, “Targeting National Security: The True Mechanism behind Effective National Coercion” (thesis, School of Advanced Airpower Studies, Maxwell AFB, Ala., 1997), 53.

4. Col Stephen E. Anno and Lt Col William E. Einspahr, “Command and Control and Communications

Lessons Learned: Iranian Rescue, Falklands Conflict, Grenada Invasion, Libya Raid,” Research Report no. AU-AWC-88-043ADA202091 (Maxwell AFB, Ala.: Air War College, May 1988), 49–50. The French Embassy in Tripoli and several of the neighboring residential buildings, although not targeted, were inadvertently bombed during the raid.

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8. *Ibid.*, 236.

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22. Haywood S. Hansell Jr., *The Air Plan That Defeated Hitler* (Atlanta, Ga.: Higgins-McArthur/Longino and Porter, 1972), 78.
23. Watts, 19.
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32. *Ibid.*, Article 57, "Precautions in the Attack," par. 2(b).
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34. *Ibid.*, 39.
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Argentine Airpower in the Falklands War

An Operational View

DR. JAMES S. CORUM

Editorial Abstract: Air warriors can learn many important lessons from the Falklands War. For example, the British experience demonstrated the value of long-range aerial early warning systems, while successful Argentine Exocet attacks revealed the dangers of antiship missiles. The Argentine air force was at a great disadvantage but did surprisingly well. While most of the senior Argentine government and military leadership demonstrated how not to wage war, Argentine airmen exhibited impressive competence and courage at the operational and tactical levels of war.



THE FALKLANDS/MALVINAS War of 1982 is especially notable for airmen.¹ The decisive battle that determined the fate of the islands was fought in the air. In fact, the ground war was largely a sideshow. If the Royal Navy had not

been able to fend off Argentine air attacks and protect its fleet, no British landings on the Falklands would have been possible. Without long-range airlift from the Argentine mainland to sustain the large Argentine ground garrison, those forces would have been cut off and

forced to surrender in spite of any success they may have had on the battlefield.

The Falklands War pitted two modern and capable air forces and naval air arms against each other. Indeed, Argentina's air force was rated as the best in South America. The war, Argentina's first in over a century, represented a grand opportunity to step into the limelight as a serious military power. It is notable that the Argentine air units bore the brunt of the battle during the six-week war and inflicted serious damage and losses on United Kingdom (UK) forces, in contrast to the quite minor losses inflicted on those forces by the large Argentine ground force.

This article examines the tactical and operational effectiveness of Argentine air units in the Falklands War. Several issues will be addressed, including the effect that the Argentine junta's strategic decisions had on air operations; the problems of command at the operational level; and the effect that prewar training, equipping, and organizing had on combat operations.

Phase One: Argentina Occupies the Falklands, and Its Air Force Readies for War, 2–30 April

The act of sending a military force to occupy the Falkland Islands on 2 April 1982 was apparently a spur-of-the-moment decision taken by Argentina's ruling military junta. The Malvinas had been a festering problem ever since Britain had illegally seized the islands in the 1830s. Negotiations between Argentina and Britain were in progress. However, the junta feared that Britain would send a military garrison to the islands after an incident with an Argentine fishing trawler in the also disputed South Georgia Islands.² Seeing a window of opportunity to act before the British sent a significant force to the Falklands, the junta ordered the islands seized in March 1982.

On Friday, 2 April 1982, 500 Argentine troops landed and quickly captured the 84-man garrison of Royal Marines at Port Stan-

ley, which they immediately renamed Puerto Argentino (fig. 1). At this point, the junta expected to open negotiations that would allow Britain the opportunity to cede sovereignty of the islands. The Falklands was a small colony with a population of only about 2,000 hardy shepherders. It was, frankly, a strategic liability, and supporting the colony was a burden for the British taxpayer. To the junta's surprise, the United Kingdom responded with an ultimatum for an immediate Argentinian withdrawal, and that was accompanied by a clear threat of war. When Argentina rejected the demands of Prime Minister Margaret Thatcher, the British government simply announced that the islands would be retaken by force and began a large-scale mobilization to organize a naval task force and ground forces to invade the Falklands.

The Argentine government, although led by professional soldiers, thought of the seizure of the Falklands as a political act to obtain a diplomatic bargaining chip—not an act of war. In fact, the junta was so sure that Britain would accept its action as a *fait accompli* that no plans or special preparations had been made to repel a British task force and defend the islands. Now, with that powerful British task force being assembled and expected to arrive in three to four weeks, the Argentine armed forces had to cobble together a force and create a plan to defend the Falklands. It was to be a truly "come-as-you-are war."

Command Arrangements

Faced with war, the junta set up a complicated command arrangement to direct combat operations. A theater command, the South Atlantic Theater of Operations (TOAS), was created under Vice Adm Juan Lombardo to command Argentine naval units and the Falklands garrison. Subordinate to Admiral Lombardo, Brig Gen Mario Benjamin Menendez was to command all the army, air force, and navy units deployed to the Falklands (which amounted to over 10,000 men by the end of April). On 5 April the air force operational headquarters (Strategic Air Command-TOAS) set up a special force called the Southern Air

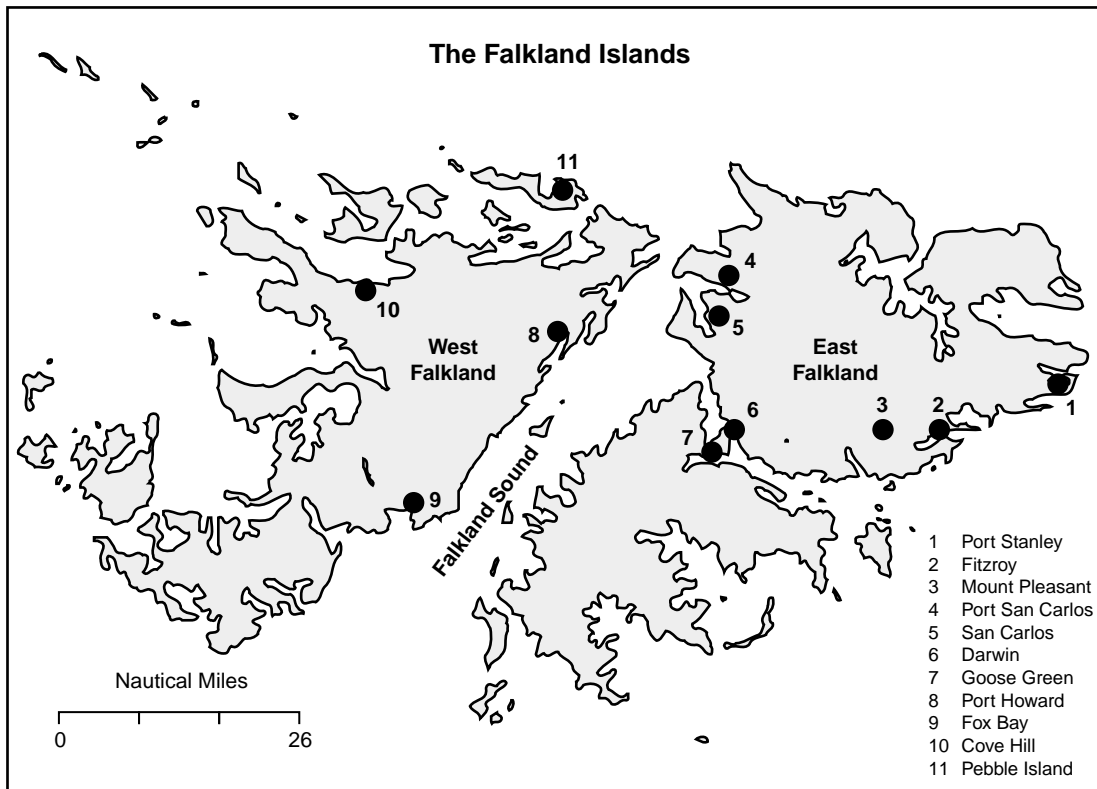


Figure 1. Sites of Operational Activities during the Falklands War

Force (Fuerza Aerea Sur [FAS]) under the command of the air force's Brig Gen Ernesto Horacio Crespo. General Crespo, commander of the 4th Air Brigade, was a highly experienced pilot and commander and was given the pick of Argentina's aerial strike forces with the primary mission of attacking the British fleet. The air force was outside the authority of the theater commander and reported directly to the junta, although it was supposed to coordinate its efforts with the other commands. It was not an effective command arrangement for developing strategy or conducting operations.³

Argentine Air Force/Naval Air Arm

Fuerza Aerea Argentina (FAA) was the country's large, relatively modern, and capable air

force, particularly when compared to the militaries of most mid-sized powers. The FAA possessed some frontline aircraft equal to any in the world—including Mirage III interceptors. During the previous decade, they had acquired Israeli-made Mirage 5 fighters (called Daggers), which can operate at Mach 2 and are effective in both the air-to-air and strike roles. The naval air arm was in the process of acquiring a squadron of Super Etendard fighters from France. The primary attack aircraft of both the FAA and navy were several dozen A-4 Skyhawks that had been bought as surplus from the US Navy in 1972. The A-4s were old (built in the 1960s) but still very capable. In 1982 they were still used by many air forces (including the US Marine Corps) and were appreciated for their agility, toughness,

and accuracy as dive-bombers. The latter was important. Unlike their British opponents, the Argentinians had no precision-guided bomb capability and required skilled pilots and accurate aircraft to hit targets with their "dumb bombs."⁴

The FAA also possessed eight old Canberra bombers, a small transport force, and several squadrons of IA-58 Pucaras. The Pucara was the pride of the Argentine aircraft industry—designed and manufactured in Argentina. It was a twin-engine turboprop attack aircraft built for counterinsurgency work. It could mount a 30 mm cannon and carry a variety of bombs. It was slow but rugged and had the advantage of being able to operate from small, rough airstrips. The naval air arm also had some Aermacchi 339 jet trainers—small aircraft that could be configured as light strike fighters. The pilots of both the FAA and naval air arm were well trained, and the two services had good base infrastructure and maintenance capabilities that could effectively repair and maintain the aircraft.⁵

On paper the FAA looked formidable. However, a modern air force is an expensive proposition, and midsized and smaller nations are financially constrained and required to tailor their air forces to meet the most probable threat. Chile would be Argentina's most likely enemy, and it also had a modern and formidable air force. Chile had long been a rival and had repeatedly gone to the brink of war over a long-standing dispute over ownership of the Beagle Channel located at the southern tip of South America. In 1978 tensions with Chile led to a full military alert in Argentina. For decades, the FAA had developed its force structure and training in anticipation of war with Chile. In such a war, the FAA would have flown short-range missions from bases close to the long Argentinian-Chilean land border. The aircrews of FAA's strike aircraft were well trained for that war and were proficient in close air support (CAS).

The FAA had never considered the possibility of waging a long-range naval air campaign against a major NATO power that

would employ superior technology. The FAA had only two tanker aircraft (KC-130) to serve the whole air force and navy. While the FAA and navy A-4 Skyhawks were equipped for aerial refueling, the Mirage IIIs and Daggers were not, which dramatically reduced their ability as long-range strike aircraft and their time on station to provide fighter cover. Another problem was that the only aircraft capable of long-range reconnaissance were two elderly navy P-2 Neptune propeller planes. The FAA was also lagging behind in navigation avionics—as of April 1982, only one-third of the A-4s had been upgraded with the Omega 8 long-distance navigation system. Armament was the FAA's most serious deficiency. Its primary air intercept missile (AIM) was an early version of the French-made Matra 530 infrared air-to-air missile. It suffered from a six-mile range, a very narrow field of vision (30–40 degrees), and an infrared sensor that could lock onto an enemy fighter only from directly behind.⁶ The British Fleet Air Arm and Royal Air Force (RAF) Harriers could each carry four US-made AIM-9L Sidewinder heat-seeking missiles. The AIM-9Ls were a generation ahead of the Matras, had a very wide field of vision (90–120 degrees), and had a much more sensitive infrared seeker that could lock onto the heat created by the airflow over an enemy aircraft. In short, the AIM-9Ls gave Harrier pilots a great deal more flexibility and allowed them to engage targets head-on.⁷

General Crespo quickly began organizing and preparing his strike force. With only a few weeks to prepare, he trained his force relentlessly. The Argentine navy provided a modern Type 42 destroyer to simulate British warships for training exercises with FAS Daggers and A-4s. It had modern anti-aircraft missiles and radar systems similar to those mounted on the Royal Navy vessels. The Skyhawks and Daggers made simulated attacks against the destroyer while it made evasive maneuvers and simulated a missile defense. The results were not heartening. The navy concluded that FAS strike pilots attacking

modern shipborne air-defense systems would likely suffer losses of 50 percent.

While still training, the FAS deployed to four air bases within range of the Falklands: (from south to north) Rio Grande (380 nautical miles [NM] from Port Stanley) was home to 10 Daggers of Grupo 6 de Caza, four Super Etendards of the navy's 2d Fighter Squadron, and eight A-4Q Skyhawks of the 3d Fighter Squadron; Rio Gallegos (435 NM) was the operational base for 24 A-4Bs of Grupo 5 de Caza and 10 Mirage IIIs of Grupo 8 de Caza; San Julian (425 NM) hosted 10 Daggers of Grupo 6 and 15 A-4Cs of Grupo 4 de Caza; and Comodoro Rivadavia (480 NM) was the wartime home of a detachment of Mirage IIIs from Grupo 8 and 20 Pucarás of Grupo 4 de Ataque. In addition, Trelew naval air base (580 NM) was home to eight Canberra bombers of Grupo 2 de Bombardeo, that also had the range necessary to reach the Falklands (fig. 2).⁸ The Argentines had 122 aircraft available, which included 110 FAS combat aircraft based on the Argentine mainland and 12 additional naval strike aircraft.

The junta made strategic and operational decisions throughout the campaign without consulting its senior service commanders or doing any serious study of the situation. Within days of the invasion it was clear that the British were going to fight, and the junta started reinforcing the Falklands garrison. On 9 April 1982, the president and army commander Lt Gen Leopoldo Galtieri, without consulting the service staff or the officers responsible for the defense of the Falklands, ordered the entire 10th Mechanized Brigade to the islands. On 22 April, after visiting the Falklands, General Galtieri ordered the army's 3d Brigade to the islands. By the end of April, over 10,000 Argentine defenders were spread throughout the Falklands, with the largest force of 7,000 men located on East Falkland Island (which the Argentines called Soledad) in the vicinity of Port Stanley. Resupply and reinforcement of their forces on the islands were complicated by a British naval blockade of the Falklands—enforced by three Royal Navy nuclear attack submarines.

Argentina dared not use the sea to send any reinforcements or supplies. Thus, from the start, Argentinian forces in the Falklands were dependent upon FAA airlift.

Within days of the invasion it was clear that the British were going to fight.

The airfield at Port Stanley was the only hard-surface airfield in the Falklands. Its runway was fairly short—only 4,500 feet long—and therefore suitable for only civilian and military turboprop transport planes. Its short runway could not support operations by large civilian/military jet aircraft or any of the military's high-performance strike aircraft. The whole of the Argentine logistic and reinforcement effort depended on this one small airfield.

The FAA had a small transport force of seven C-130s and a few smaller Fokker F-27 twin-engine transports. Every national airline aircraft that was capable of landing at Port Stanley was pressed into service to ferry the troops and equipment that General Galtieri had blithely ordered to the islands. The FAA transport force performed extremely well—given its limitations. Indeed, the airlift effort of the FAA to support the forces in the Falklands lasted until virtually the last day of the campaign. However, the small transport force and the one short airfield drastically restricted the equipment that could be sent with the troops to the islands. The 10th Mechanized Brigade was sent to the Falklands without its artillery battalion or its vehicles. Virtually all of the army units were deployed to the islands by air and could bring only light weapons and vehicles—most of their equipment was left behind at their home bases on the mainland.⁹

A sizeable air force was also deployed to the Falklands to serve under the command of General Menendez—not under FAS command. To serve mostly in the reconnaissance

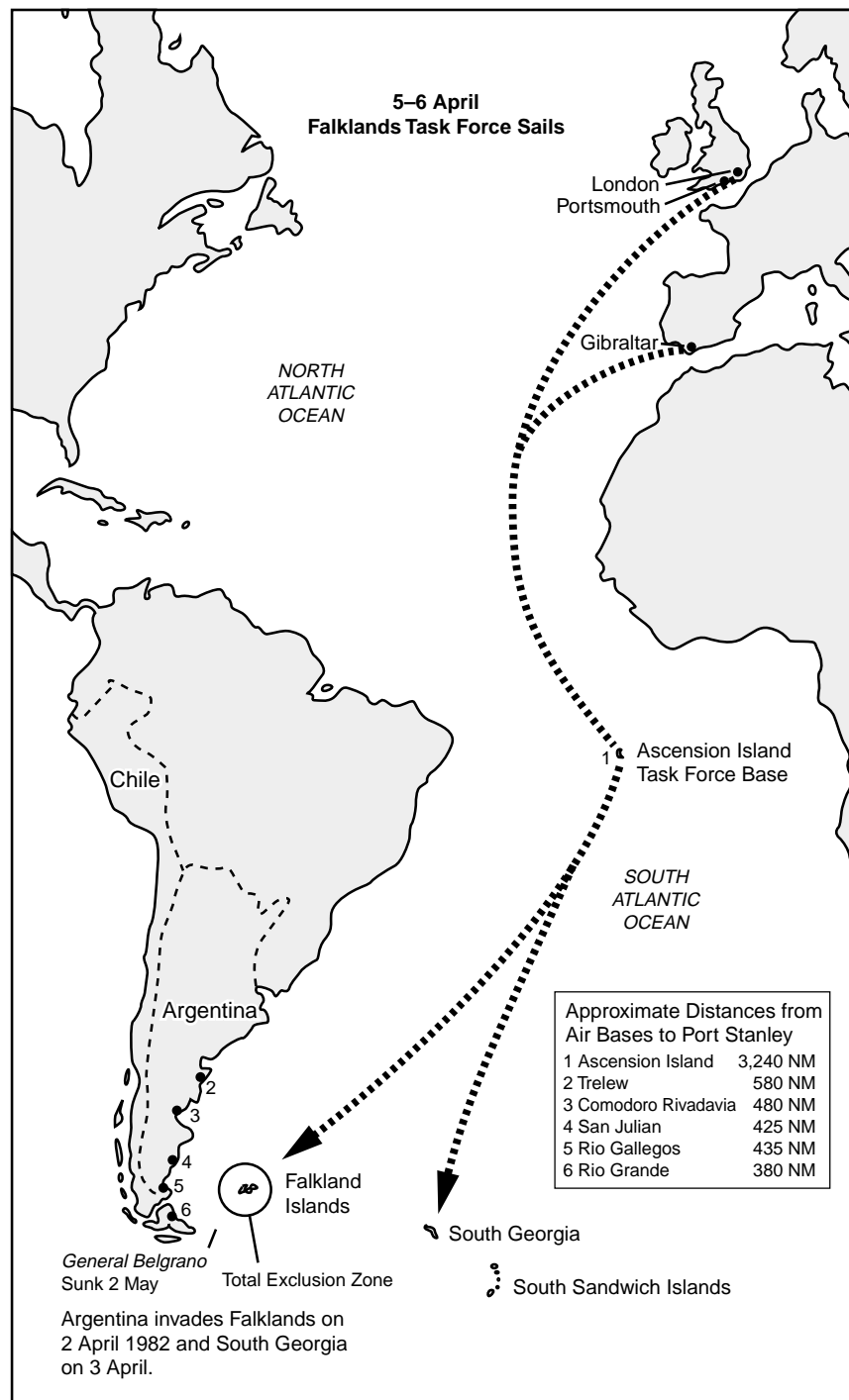


Figure 2. Operating Locations during the Falklands War

and troop transport roles, 19 army, navy, and air force helicopters were sent to the Falklands.¹⁰ In April, 24 Pucaras of the 3d Attack Group were ordered to the islands. The naval air arm sent six Aermacchi 339 light strike aircraft and six T-34B Mentors. Because the Aermacchi jet aircraft needed a hard-surface runway, they were based at Port Stanley. The Pucaras, however, were built to operate in rough conditions, so most of these were sent to a small grass airstrip at Goose Green—a miserable little field that would turn into a quagmire after any rain. Some Pucaras, light transports, and the six T-34s were deployed to a tiny dirt strip on Pebble Island.

Phase Two: The Opening Battles, 1–20 May

The opening shots of the war came on 1 May 1982. The first wave of the British invasion force arrived in Falkland waters and took position approximately 70 NM to the east of Port Stanley. The British task force, under the command of Adm John Woodward, was built around two light carriers (Her Majesty's Ship [HMS] *Hermes* and HMS *Invincible*), over 20 destroyers and frigates, and a host of troopships and support vessels carrying a British brigade with full equipment. The two carriers each carried a complement of Royal Navy Harrier jets and helicopters. In all, the British first wave consisted of 65 ships protected by an array of modern radars and dozens of anti-aircraft missile systems to include the new Sea Darts (effective over long ranges and to high altitudes), Sea Wolves (for low-altitude threats), and an array of 20 mm and 40 mm guns for close-in defense.¹¹ However, the Harrier was the primary weapon system for British strike and defense efforts throughout most of the campaign. The small Royal Navy Harrier force would soon be reinforced by an additional 14 RAF Harriers arriving on the two large cargo vessels, the *Atlantic Conveyor* and *Atlantic Causeway*, that had been modified with flight decks for vertical takeoff and landing (VTOL) Harrier operations. An additional four Harriers were flown all the way

from Ascension Island, with numerous tanker refuelings, to reinforce the British late in the campaign.¹² The Harrier was a more technically advanced aircraft than anything the FAA flew. Although it had a short range, it could fly combat air patrol (CAP) over the fleet for 40–60 minutes, a significant time advantage over the Argentine attackers, who had, at best, a few minutes to find and engage their targets. During daylight hours, the Royal Navy tried to maintain continuous CAP coverage over the fleet with two Harriers armed with AIM 9L Sidewinder air-to-air missiles. However, the limited number of Harriers made maintaining continuous coverage difficult, so the Argentinians' best hope was to strike the fleet while the Harriers were diverted or on deck refueling.

Air Operations: The First Day

The battle began before dawn on 1 May 1982 when a long-range RAF Vulcan bomber, flying from the British base at Ascension Island thousands of miles away, bombed the Port Stanley airfield, cratering the runway and damaging some of the airfield support facilities. Shortly after 0800, 10 Harriers, armed with bombs and cannons, struck both the Goose Green and Port Stanley airfields in a low-level bombing attack. A bomb detonated near one Pucara and killed the pilot and ground crewman. At least two other Pucaras were damaged, and the airfields received moderate damage. The Argentine anti-aircraft fire was intense, and the Argentine forces were cheered by the claim that they had destroyed at least four Harriers during the British attack on Port Stanley. In fact, only one Harrier had received minor damage—a small 20 mm hole that was repaired in two hours. Three British warships joined the bombardment of the Port Stanley installations and began shelling from their station six miles off the coast.¹³

The FAS, now alerted to the British fleet in Falkland waters, began sending waves of strike aircraft covered by interceptors to attack the British ships. The FAS never had the option to send in a large strike force and use an advan-



The FAA's Dassault Mirage III interceptors were the equal of most of the world's frontline aircraft but were severely limited in air-to-air combat by their primary air intercept missile—the French-made infrared Matra 530.

tage in numbers to overwhelm the British air defenses. Skyhawks needed aerial refueling to carry four 500-pound or two 1,000-pound bombs over a combat radius of 600 NM. The entire air refueling capability of the FAS was limited to two KC-130 tankers that could support the launch of only four strike aircraft at a time. Even then, each flight had to be carefully planned and scheduled in order to make the required refueling rendezvous.¹⁴

While the Skyhawks and the Argentine navy's four Super Etendards were capable of air refueling, the Daggars and the Mirages were not. Even using two 550-gallon drop tanks to carry extra fuel, the Daggars and Mirages were flying at the absolute limit of their range to reach the British fleet. The fighters sent to engage the Harrier CAP and cover the strike force would have no more than five minutes over the target area. The Harriers, on the other hand, could loiter for up to an hour and quickly refuel on the nearby carriers. The distance the Argentinians had to fly to engage the British was increased further by the Royal Navy's tactic of positioning its fleet 70–100 NM east or northeast of the Falkland Islands—that added

another 150–200 NM to the distance and created additional fuel requirements for the Argentine missions. Moreover, the Argentine Mirages and Daggars, escort fighters capable of Mach 2, could not use their afterburners to employ their enormous speed advantage against the subsonic British Harriers because of the extra fuel it would consume. If the Argentine fighters were forced to use their afterburners during the course of their missions, they would consume the very fuel they would need to return to base.

The FAS launched almost all of its strike forces into action on 1 May 1982. The first two flights of fighters ingressed at medium altitude, failed to find the British force, reached their "bingo" fuel limits, and had to turn back. In midafternoon, the third flight of four Mirages sent to engage the Harriers found their prey. The flight of two Harriers flying CAP outmaneuvered the Mirages and quickly downed two of the Argentine fighters with Sidewinder missiles. A third Mirage pilot used up too much fuel to return to his Argentine base and tried to make an emergency landing at the Port Stanley airfield. The Argentinian air defenders mis-

identified their Mirage for an attacking British aircraft, successfully engaged, and shot it down, killing the pilot.

The three British warships (one destroyer and two frigates) shelling Port Stanley were attacked by a flight of Daggers that dropped bombs and strafed the vessels with their cannons. This resulted in minor damage to one vessel. However, the elated Argentine pilots' bomb damage assessment (BDA) optimistically reported heavy damage to one ship and varying degrees of damage to two others.

Late in the day, a flight of two Canberra bombers from Trelew Air Base attempted to attack the British ships shelling Port Stanley. Approaching at medium altitude, they were picked up by British radar and intercepted by the Harrier CAP. As the old Canberras turned to run, one was brought down by a Harrier's Sidewinder, and the other—badly damaged by a Sea Dart missile—limped back to base.

The perceptions of the first day's battle largely set the tone for the whole campaign. The Argentinians claimed a triumph in damaging three ships and shooting down at least five Harriers. They also claimed that they had repulsed a British landing attempt when several Royal Navy helicopters flying towards East Falkland Island turned around and headed back to the fleet. Heartened by their perceived success, the FAS prepared to mount additional strikes, despite the loss of five aircraft and others damaged.¹⁵

In reality, the day had gone very well for the British. The task force had lost no planes and suffered only minor damage to one ship. The helicopter-borne "invasion force" that was repelled was actually a group of antisubmarine helicopters conducting a search for Argentine submarines in Falkland waters. Throughout the campaign, the Argentinians fought largely in the dark without much intelligence capability. Apart from pilot reports, the FAS had no means of getting an accurate BDA to evaluate its attacks. It had to rely on notoriously inaccurate pilot and antiaircraft gunner reports—which consistently overestimated the effect of both the Argentine defense and air strikes. On the other hand, the British

could collect real-time intelligence by tasking Harriers to fly photoreconnaissance missions over Argentine forces in the Falklands. One must also assume that the United States provided the British with satellite imagery of Argentine air bases that allowed them to count and identify enemy aircraft on mainland runways.

One of the most serious FAS limitations throughout the campaign was the shortage of modern long-range reconnaissance assets. Unless the British fleet showed itself by moving close for a shore bombardment, the Argentinians had few means to locate the British ships. The FAS long-range reconnaissance assets consisted of two elderly P-2 Neptunes whose radar and passive systems could pick up ships at more than 50 NM. The other major Argentine intelligence asset was a very modern Westinghouse AN/TPS-43F radar and a supporting Cardion AN/TPS-44 tactical surveillance radar installed at Port Stanley and manned by Argentine air force crews. The Westinghouse radar was a state-of-the-art machine with a long-range capability that could "see" over the horizon. The very competent Argentine air force radar crews were often able to pick up the Royal Navy Harrier CAP at over 40 miles. By plotting the Harriers' flight patterns, the radar crew could often determine the approximate location of the British fleet.¹⁶ However, a combination of factors affected Argentine success.

For example, the shortage of reconnaissance assets caused a near void of accurate and timely intelligence. Furthermore, long distances between takeoff and targets were a significant limitation on the Argentine aircraft's ability to loiter/search in the target area, choice of tactics, and options for employment speed and maneuvers. Additionally, the weather in late autumn in the South Atlantic was generally poor. Since most Argentine aircraft and most of their weapons required daylight and visual meteorological conditions (VMC) for employment, the Argentinians were limited to a small window in which to attack. As a result of the combined effects of all of these limitations, approxi-

mately one-third of all Argentine aircraft sent to strike the British returned home without making any contact.

The greatest British weakness was the lack of long-range aerial early warning (AEW) aircraft that could identify enemy aircraft coming in at low altitude. When the Argentines ingressed at or above midaltitude, as they did on the first day, they proved to be easy prey for the Harrier's onboard radar. However, that radar could not easily acquire enemy aircraft flying at low level. During the rest of the campaign, the FAS aircraft exploited this weakness and attacked the British fleet from wave-top level, where they were very difficult to spot. This meant that the Argentines would fly at the normal altitudes between 20,000 and 30,000 feet until about 100 NM to the target and then drop to about 100–200 feet above sea level (ASL) for the last leg of the attack and the initial egress. These were some of the most stressful and dangerous missions in the history of aerial warfare.

The First Exocet Attack

When the Argentines landed in the Falklands, the naval air arm was in the process of standing up a new air squadron, the 2d Escuadrilla. The squadron's aircrews had recently completed training in France and had accepted five of the 14 French Super Etendard fighters. Light strike fighters developed in the 1960s, the Super Etendards would soon go out of production in France. The Etendards were significant because they were configured to carry the state-of-the-art Exocet antiship missile.¹⁷ The radar-guided Exocet, a large missile that carried a 950-pound warhead, could be fired at nearly 25 NM. It would streak along just above the wave tops at almost Mach 1, and once it acquired its target, it was very difficult to shoot down. If it struck its target, the result was likely to be devastating. It was an ideal standoff weapon, and its range allowed the strike aircraft to avoid closing with the enemy CAP. The best defense against the Exocet was to create a strong radar return (by shooting large amounts of chaff [small metal strips] over the

sea and away from the ships being attacked) on which the Exocet's guidance system would detect and engage, missing the real target.

The pilots of the 2d Escuadrilla, trained in France in 1980–81, were fully qualified with the aircraft. However, at the time the conflict in the Falklands began, only five of the Super Etendards and five Exocet missiles had been delivered from France. The Common Market nations and NATO immediately initiated an arms embargo on Argentina, therefore halting the French shipments of planes and missiles. Throughout the conflict, the Argentine government tried desperately but unsuccessfully to obtain more Exocets on the world market. Argentina would have to fight the war with only five Etendards and Exocet missiles. Since spare parts for the Etendards were cut off by the NATO arms embargo, the FAA decided to hold one of the five fighters in reserve and use it for parts to support the remaining four aircraft.

The Argentines had no previous experience with antiship missiles, and the Exocet was a complicated and cranky weapon. The Argentines experienced a lot of trouble fitting the Exocet launch system and rails to the Super Etendards. In November 1981, Dassault Aviation, owned by the French government and builder of the Super Etendard, sent a team of nine of its own technicians (and some additional French Aerospatiale specialists) to work with the Argentine navy to supervise the introduction of the Etendards and Exocets. Although France complied with the NATO/Common Market weapons embargo, the French technical team remained in Argentina and apparently continued to work on the aircraft and Exocets, successfully repairing the malfunctioning launch systems. Without the technical help and collusion from the government of France—Britain's NATO "ally"—it is improbable that Argentina would have been able to employ its most devastating weapon.¹⁸

Action on 2–3 May

On 2 May 1982 the decisive naval action of the war occurred when the British nuclear attack submarine HMS *Conqueror* sank the Argentine

cruiser *General Belgrano* outside the 200-mile exclusion zone that the UK had established around the Falklands. A possible sortie of the *General Belgrano*, which was equipped with ship-mounted Exocets, represented enough of a threat to their task force that the British decided to torpedo the cruiser, killing 321 of the Argentinians aboard. From this point forward, the Argentine decision makers would not consider any further naval sorties, and the Argentine navy's one carrier remained in port. All hope of naval resupply for the Falkland garrison was ruled out, and the Argentine forces remained completely dependent on airlift.

Poor weather around the Falklands on 2 May forced the cancellation of all air activity, but on 4 May one of the Neptune reconnaissance planes identified what it believed to be the British carrier HMS *Hermes* east of Port Stanley. Two 2d Escuadrilla Super Etendards, each armed with one Exocet, took off for the long flight. While still at a fairly long range, the Etendards picked up not the HMS *Hermes* but the HMS *Sheffield*, a Type 42 destroyer, stationed well out from the fleet for aerial warning and defense (the Type 42 destroyers carried the new Sea Dart anti-aircraft missiles).¹⁹ The Argentinians fired both Exocets (some sources say the missiles were fired at the extreme limiting range of 26 NM; other sources say the missiles were launched at six NM). Once the missiles were fired, both aircraft prudently executed a low-level egress. One Exocet went astray, but the other found its target, crippled the *Sheffield*, and caused heavy casualties. The *Sheffield* was later abandoned and sank six days later while being towed. Ironically, due to their lack of reconnaissance capability, the Argentinians had no idea whether either Exocet attack had been successful. However, the British policy of keeping the press and public informed of casualties actually provided the Argentinians an accurate BDA. The Argentine high command learned within hours that an Exocet had crippled the *Sheffield*. Had the British not announced the loss, the Argentinians would have likely concluded that their Exocets were still malfunctioning and called off further Exocet attacks.

Softening Up the Falklands

During the first 20 days of May, the British task force carried out a systematic campaign of bombing and shelling Argentine installations and forces in the Falklands. The first Harrier was lost to anti-aircraft fire on 4 May while attacking the airfield at Goose Green. British aircraft sank two small Argentine ships, Port Stanley came under naval ship bombardment, and British helicopters and Harriers carried out air reconnaissance and dropped Special Air Service (SAS) teams to conduct reconnaissance behind enemy lines. On 15 May, a brilliantly conducted SAS raid destroyed six Pucarás, six T-34s, and one Skyvan transport at the small airfield on Pebble Island.²⁰ Both sides suffered losses due to weather. On 6 May, two British Harriers from the HMS *Invincible* were lost when they collided in fog.²¹

Whenever the weather cooperated, FAS sent flights of aircraft to hit the British task force. This task was made more difficult on 10 May when the two Neptunes were both taken out of service for repairs, reducing the Argentine long-range air reconnaissance assets to nil. The FAS then had to wait until the British showed themselves by moving in close to the islands for shore bombardment or close enough to be seen by the island's Argentine radar. The British had a formidable and layered air defense that used Harriers, missiles, and gun systems. General Crespo was forced to employ a combination of tactics to get at the British fleet. After the failure of the initial high-altitude attacks on 1 May, all further Argentine antiship missions were carried out at very low altitude in order to slip by the Harrier CAP and avoid the ship's radar. Most of the Argentine strike missions were also carried out in the late afternoon, when Argentine aircraft attacking from the west would have the setting sun at their backs. Another tactic employed by General Crespo, with some success, was the creation of an improvised squadron of FAA using commandeered civilian Learjets. The "Fenix" Squadron was based at Trelew—the Canberra bomber base. The unarmed Learjets would simulate an in-

coming Canberra raid by flying at high altitude in the general direction of the British fleet in hope of being picked up by the British radar and causing an unnecessary defensive response. At a safe distance from the British fleet and its response, the Learjets would turn and run for home. General Crespo hoped the unarmed Learjets would divert the British CAP and allow his Skyhawks and Dagers to get at the British fleet. At the very least, the Fenix Squadron forced the British to regularly scramble their Harriers and increased the British pilots' ops tempo and fatigue.²²

On 12 May 1982, FAS Skyhawks attacked the HMS *Glasgow* and HMS *Brilliant* while they were bombarding Port Stanley. The *Brilliant's* Sea Wolf missiles destroyed two Skyhawks, and another crashed while taking evasive action. However, one of the Skyhawks put a 1,000-pound bomb into the *Glasgow*. Luckily for the British, the bomb did not explode. However, the kinetic energy of the 1,000-pound bomb traveling at over 400 knots still badly damaged the *Glasgow* and caused it to withdraw from the scene. Many of the Argentine bombs in the campaign failed to explode when they hit the British ships. The failure was probably caused by releasing the bombs from such a low altitude that the fuse-arming-delay time exceeded the weapon's short time of flight; thus the fuse failed to arm and the bombs did not detonate.

On 18 May the second wave of the British invasion force joined the fleet, arriving with more warships, a second infantry brigade, and 14 RAF Harriers carried on the *Atlantic Conveyor*. Even with attrition, the British had more than 30 Harriers available to protect the fleet and fly ground-attack sorties. The British were now ready to land forces on East Falkland Island.

Phase Three: The Landing at San Carlos Bay, 21–26 May

The British picked a landing site at San Carlos Bay on the northwest side of East Falkland Island opposite Port Stanley, which lies on the east side of the island. San Carlos Bay

was chosen as the landing point because the bluffs and high hills surrounding the bay would mask the landing ships from Exocet missile radars. Indeed, the Exocet was the one weapon system that the British truly feared, and that concern governed their selection of strategy and dictated other operational choices to minimize the Argentines' opportunity to employ their Exocets. The British lost a Harrier and two Royal Marine Gazelle helicopters to ground fire during aggressive air strikes on Argentine airfields and installations in the Falklands on the morning of 21 May 1982. Now alerted to the British landing, the Argentines sent virtually the whole FAS air strength—about 75 aircraft—to attack the British ships during the day. Staging in flights of four, the Argentine Skyhawks and Dagers dropped to a 100-foot altitude for the last 100 NM to San Carlos Bay. The high hills not only screened the British ships from Exocets, but also screened the Argentine aircraft from detection until the last moment. The Argentine Dagers and Skyhawks popped up over the hills and bored straight into the British ships. The British had dozens of air defense missiles (Sea Wolves, Sea Darts, Sea Slugs, Sea Cats, and shore-mounted Rapiers) as well as numerous anti-aircraft guns to defend the ships. However, coming in at low level and popping up over the hills, the Argentines gave the British no more than 20–30 seconds to acquire, track, lock on, and shoot before they released their bombs and headed for home.

It was a frightful day of combat. The frigate HMS *Ardent* was damaged in an early attack and sunk by a second Argentine attack late in the day. Argentine bombs—some of which mercifully did not explode—damaged four other ships. The HMS *Antrim* suffered heavy damage while the HMS *Brilliant*, *Argonaut*, and *Broadsworde* sustained moderate damage. The Argentines paid a fearful price for their moderate success. The British downed nine FAS aircraft, including five Dagers and four Skyhawks. They also shot down two Pucaras and two helicopters from Argentine air units based in the Falklands. As the British landing continued, the FAS mounted further

strikes. On 23 May, bombs released by Skyhawks flying from Rio Gallegos sank the frigate HMS *Antelope*. On 24 May two Harriers encountered a flight of four Grupo 4 Daggers and, in only moments, destroyed three of them with Sidewinders. In other action another Argentine Dagger was lost. That day the British landing ships *Sir Galahad* and *Sir Lancelot* both sustained moderate damage from the kinetic energy of bombs that did not explode. The *Sir Bedivere* also suffered slight damage.

On the 25th of May, Argentina's Independence Day and its greatest national holiday, the FAS mounted a major air effort. Although it lost three aircraft in the morning while trying unsuccessfully to get at the British fleet, in the afternoon, FAS Skyhawks succeeded in hitting the destroyer HMS *Coventry* with three bombs, causing it to sink in half an hour. At about 1630, Super Etendards of the 2d Escuadrilla launched two Exocet missiles at the HMS *Invincible*, stationed north of the landing site. As before, one Exocet went astray after possibly being hit by British anti-aircraft fire. Initially the second Exocet's radar locked

onto the *Invincible*; however, large amounts of chaff caused it to break lock. The Exocet then searched, acquired, and locked onto the cargo ship *Atlantic Conveyor* that had no chaff protection; consequently, it was hit, crippled, and later sank. The British lost 12 men and the 10 helicopters the *Atlantic Conveyor* was transporting. That loss included one heavy-lift Chinook, which made army logistics much more difficult as the British relied heavily on helicopter resupply due to the Falklands' few roads and boggy terrain.

The 25th of May had been the worst day for the British in the campaign. However, by its end, most of the two ground-force brigades were ashore with their equipment and supplies and ready to mount the final offensive against the Argentine ground forces.

Phase Four: 26 May–14 June

The British were well established on shore in the area of San Carlos Bay by 26 May 1982 and ready to begin their advance on the Argentine Army positions. At this point in the campaign, there was little that the FAS could



The British cargo ship *Atlantic Conveyor* was hit by an Exocet missile, crippled, and later sank. The British lost 12 men, a heavy-lift Chinook, and the nine other helicopters it was transporting.

do to stop an inevitable British victory. Even if the FAS had taken out one of the British carriers, the British could have operated—and in fact did operate—the VTOL Harriers from unprepared surfaces on the island. General Menendez, who commanded all Argentine forces on the Falklands, placed his troops in an extended defensive line, occupying positions on high ground across the eastern end of the island to defend Port Stanley. None of the Argentine battalion and regiment defense posts, however, were in a position to support the others. While the FAA's airlift had been effective in bringing 10,000 troops to garrison the Falklands, the available airlift had been able to bring only a small number of military vehicles and heavy weapons. The forces under General Menendez had a total of 159 vehicles of all types, including only 10 light armored cars.²³ Most of the artillery had been left behind on the mainland, and the Argentine troops had very limited ammunition reserves. The two well-armed British brigades began their offensive on 28 May when they surrounded and forced the surrender of the isolated Argentine garrison at Darwin. The British then methodically rolled up the Argentine Army, position by position, until the last forces were cornered in an area around Port Stanley on 8 June 1982.

Although things were going badly for the Argentine forces and the air units had taken heavy attrition, the FAS pilots' morale and aggressiveness remained very high in a very tough situation. One possible reason is that the Argentine forces continued to overestimate the damage and casualties that they had inflicted on the British forces. The Argentine high command announced, and apparently believed, that as of 25 May 1982 they had sunk or disabled 19 British ships and shot down 14 British Harriers. In fact, the British had only five ships sunk and three heavily damaged—less than half the damage the Argentinians had claimed. Likewise, the British had lost only four Harriers instead of the 14 the Argentine anti-aircraft crews had claimed. Basing their logic on perception, however inaccurate, the Argentinians concluded that

the Royal Navy would have to soon withdraw in the face of such attrition.²⁴ On 30 May 1982, the 2d Escuadrilla made its last Exocet attack on the carrier HMS *Invincible*, following up with an attack by a flight of Skyhawks. Argentine forces, to this day, claim that they hit and crippled the *Invincible* with both the Exocet and the Skyhawks' bombs. Apparently, the Exocet was shot down by Royal Navy anti-aircraft fire and the hulk of the *Atlantic Conveyor* was mistaken for the HMS *Invincible* and attacked by the Skyhawks. Despite Argentinian claims, no British damage resulted from their last Exocet attack.²⁵

The Harriers now began carrying out numerous CAS missions to help the British troops execute their campaign. The 24 FAA Pucaras based in the Falklands had been steadily whittled down by British strikes on the Port Stanley airfield and in air-to-air combat. Even so, the few flyable aircraft remaining at Port Stanley still tried to carry out strikes against the British troops. The Pucaras were generally ineffectual, and several were lost to British ground fire, Harriers, and portable anti-aircraft missiles (Blowpipes). However, one Pucara did score the only Argentine air-to-air kill during the war when it shot down a patrolling British helicopter with its cannon. The FAS, in spite of its severe losses, was still game for the fight and ready to strike the British fleet whenever the weather was clear. On 8 June 1982 the troopships, Royal Fleet Auxiliary (RFA) *Sir Galahad* and RFA *Sir Tristram*, were unloading troops of the Welsh Guards near Fitzroy, about 17 NM southwest of Port Stanley, when five Daggers from Grupo 6 and five Skyhawks from Grupo 5 came in over the Falkland Sound. The frigate HMS *Plymouth* was covering the cargo vessels when the Argentine fighters roared in, strafed it with cannon fire, and hit it with four bombs that failed to explode. The Skyhawks continued their attack and successfully put bombs into both the RFA *Sir Galahad* and RFA *Sir Tristram*. Both ships caught fire and were abandoned; 50 men were killed on the RFA *Sir Galahad*. Later that afternoon four Grupo 4 Skyhawks caught the landing craft *LCU F4*

transporting British vehicles from Goose Green to Fitzroy. The vessel was attacked and quickly sunk with the loss of six British lives. The Harrier CAP caught the Skyhawks and promptly shot down three with Sidewinders.

The FAS flew aggressively to the end. As the Argentine Army was collapsing in the Port Stanley area, the Skyhawks of Grupo 5 and Canberras from Trelew flew CAS missions in an attempt to assist their embattled army. Those strikes were ineffectual, and a Sea Dart probably downed the Canberra that was lost during the strikes. With little artillery left and no hope for relief, General Menendez surrendered with over 8,000 men at Port Stanley on 14 June 1982. The British had won the war.

Conclusion

The Falklands War provides some important lessons for the conduct of a modern air war. The British learned the importance of having an aerial long-range early warning system to protect the fleet. The successful Exocet attacks alerted all the world's navies to the dangers of antiship missiles. Britain's 20 air-to-air kills by Harriers carrying AIM-9L Sidewinders illustrated the importance of keeping a technological edge over the opponent in missile sophistication. Even a slight edge (and the Sidewinders had more than a slight edge over the Matra 530s) can translate into decisive air superiority.²⁶

For the Argentinians it was less an issue of learning lessons than dealing with the shame of defeat. The senior military leadership was guilty of a string of poor decisions that resulted in the deaths of many brave and dedicated Argentine soldiers, airmen, and sailors—men who deserved far better leaders than they had. General Galtieri and the military junta had blundered into a war without a plan or a strategy. From the start, the junta's strategy of seizing the Falklands was delusional. Immediately after the Argentinian seizure of the Falklands and the British announcement that they would mount a campaign to retake the islands, the Argentine military contacted the

US government and requested that the United States provide Argentina with full intelligence support in a conflict with Britain. When the US intelligence officials denied the Argentinian requests and declared that the United States would stand by its British ally, the Argentine leadership was dumbfounded.²⁷ So convinced were they of the nobility of their cause that they simply assumed the United States and the whole world would line up with Argentine national ambitions. The Argentinians felt bitter about the rebuff, as the junta had never seriously considered that the United States would not wholeheartedly support an Argentine dictatorship and abandon its closest ally.

General Galtieri demonstrated a remarkable lack of understanding of modern military operations by insisting that the Falklands would be defended by a large land force, largely composed of half-trained conscripts, with few heavy weapons, cut off from sea supply and completely dependent upon a tenuous airlift capability. He and most of the senior military leaders also seem to have had little concept of the use of modern technology in war. For example, the Argentine Army and air force could have lengthened the airstrip at Port Stanley by 2,000 feet and forward based the Skyhawks and Daggers in the Falklands. On the mainland the Argentinians had the engineers, equipment, and pierced-steel planking that would have allowed them to extend the runway within a week or so of starting work.²⁸ However, to get the engineers, materiel, and equipment to Port Stanley would have required reallocating much of the limited airlift capacity. General Galtieri's strategy to defend the islands with a large number of ground forces committed all the airlift to transporting troops and ruled out any reallocation—and there was simply not enough airlift to do both. In April 1982, in contrast to General Galtieri's decision, professional air force and naval officers in the United States and Europe thought lengthening the runway on the Falklands was the obvious thing to do.



A Harrier takes off at the airfield at Port Stanley just after the Argentine surrender. The wrecked Pucarás in the background fought valiantly—but ineffectively—and most were destroyed or disabled by the end of the war. They were no match for the British Harriers, ships, and troops armed with the latest anti-aircraft missiles.

Admiral Lombardo, the theater commander, does not come across much better than General Galtieri as an operational commander and strategist. His decision to base a large air force (24 Pucarás, six Aermacchi 339s, and six T-34s) in the Falklands is difficult for a professional soldier to comprehend. What did he think that a force of light counterinsurgency planes could do in an aerial environment full of Harriers with Sidewinders, British ships bristling with the latest anti-aircraft missiles, and ground forces armed with Rapier and Blowpipe anti-aircraft missiles? It was an exceptionally lethal environment for aircraft designed for fairly benign counterinsurgency operations. Many of the operations of the Falkland-based Argentine air units demonstrated a touch of the ethos reflected in Tennyson's *Charge of the Light Brigade*. The T-34 Mentors were basic-training aircraft armed with a light machine gun and some rockets suitable for artillery spotting. The Aermacchis were also lightly armed and not suited for antishipping strikes. However, this did not prevent one navy Aermacchi 339 from carrying out a valiant pass with its cannon against the British fleet, slightly damaging one vessel. That was, in fact, the total

damage that the Falkland-based 36 fixed-wing aircraft and 19 helicopters inflicted upon the British fleet. The T-34s flew a few reconnaissance missions and managed to survive by hiding in the clouds. The Pucarás fought valiantly—but ineffectually—and most were destroyed or disabled by the end of the war.

Another of Admiral Lombardo's major operational decisions was to sortie the *General Belgrano* (an ancient 43-year-old cruiser) towards the British fleet with little antisubmarine defense. It was sunk by the British nuclear submarine HMS *Conqueror* and caused the greatest single loss of life in the war. The *General Belgrano's* sortie accomplished nothing offensively for the Argentinians, and its loss forced a change in strategy that caused them to keep their navy's capital ships in port for the rest of the war.

General Menendez, the commander of the Falkland garrison, demonstrated a poor grasp of the basics of the operational art. He deployed his poorly trained and poorly armed infantry units into an overextended and badly sited defense line. The British easily overran Menendez's positions one by one. Indeed, miserable weather and logistics problems caused the British Army and Royal Marines

far more trouble than did the Argentine Army. One has to question how General Galtieri ever thought that half-trained, lightly armed soldiers could hold their own in battle against some of the best infantry in the world—the Gurkas, the Paratroop Regiment, and the Royal Marines. General Galtieri and the junta apparently felt that patriotism and valor could overcome all of their military disadvantages.

Indeed, the only Argentine senior commander who demonstrated real competence and professionalism in the Falklands War was the FAS commander, General Crespo. He had to minimize the effect of Argentina's liabilities: the technological inferiority of the Argentine air force and naval air arm, operations at his attack aircraft's maximum combat range, the lack of adequate air-refueling capability, and the lack of early warning and reconnaissance assets. Considering these limitations, General Crespo did very well with the forces and capabilities he had available. He used the three weeks prior to the beginning of hostilities to organize and train his strike force to conduct a naval air campaign—a mission in which only two of his small naval air units were previously trained. He learned from his mistakes—apparently the only Argentine senior commander who did. After 1 May, he avoided high-altitude ingress beyond the point where British radar could detect his forces and made great use of low-altitude attacks to avoid detection and achieve surprise. His improvised Fenix squadron creatively baited the British with decoys, forced a response, and stretched their CAP coverage to improve the chances of survival and success of his attack force. The professional competence of his headquarters staff was demonstrated by their ability to plan numerous long-range air strikes and coordinate the very limited air-refueling support.

The record of the FAS in the Falklands War is impressive. The pilots of the Skyhawk, Dagger, Mirage, and Etendard squadrons demonstrated remarkable piloting and navigation skills. The low-level attacks were exceptionally difficult and dangerous. One flight of Sky-

hawks flew so low during their ingress to attack the British fleet that on arrival at their home base they had to make instrument approaches to landing because a coating of salt (deposited by the spray off the ocean's waves) obscured their canopies. Argentine official historians continue to claim that the Argentine airmen inflicted far more damage on the British fleet than the British officially admit. However, the losses the British do document are still impressive considering the FAA's limitations and lack of antishipping training before the war. The destroyers HMS *Sheffield* and HMS *Coventry*, the frigates HMS *Ardent*, HMS *Antelope*, the support ship *Atlantic Conveyor*, the landing ship RFA *Sir Galahad*, and the landing craft *LCU F4* were all sunk by Argentine bombs and Exocets. The destroyers HMS *Glasgow* and HMS *Antrim*, the frigates HMS *Argonaut* and HMS *Plymouth*, and landing ship RFA *Sir Tristram* all sustained heavy damage, and another six ships received minor damage. In all, the Fuerza Aerea Sur inflicted the heaviest damage and casualties suffered by the British task force. For that, the FAS paid a very heavy price, losing 22 Skyhawks—19 from Grupos 4 and 5 and three more from a naval Skyhawk squadron. Grupo 8 lost two Mirages, and Grupo 6 lost 11 of its 30 Daggars. The 2d Bomber Squadron lost two Canberras. In all, the FAS lost 41 percent of its aircraft to combat and operational accidents. This is an astounding attrition loss—but it never broke the FAS's high morale and fighting spirit.

The FAA Transport Command also performed superbly. During April, the small transport force mobilized everything that could fly and airlifted almost 8,000 troops and 5,037 tons of supplies, weapons, vehicles, and fuel into the Falklands.²⁹ Even after the arrival of the British fleet and its proclamation of a full air blockade of the Falklands, the transports continued to fly into Port Stanley by night, bringing in supplies and airlifting out the wounded. FAA transports continued to slip past the British through the last night of the war. These were very dangerous missions—as

evidenced by the loss of one C-130 transport to a Harrier sidewinder.

The Argentine air force's anti-aircraft gunners and radar operators performed their jobs with great bravery and competence throughout the campaign. Argentine ground-based air defenses destroyed seven British aircraft, including four Harriers.³⁰ The FAA's radar operators at Port Stanley were Argentina's most effective asset for locating and monitoring British ships and planes. They warned Argentine Skyhawk and Dagger pilots of the location of defending British Harriers during their antiship attacks and were cred-

ited with preventing the loss of several FAS pilots and their aircraft.

In short, the Argentine air force did surprisingly well in the face of many great disadvantages. Old-fashioned words like *courage*, *galantry*, and *honor* are the only ones that can be used to describe and explain the combat wartime performance of the Argentine air force and naval air personnel. While the junta and most of the senior Argentine military leadership offer a model of how *not* to wage war, the Argentine airmen provide a positive and impressive model of competence and courage at the operational and tactical levels of war. □

Notes

1. For about 200 years designated the "Falkland Islands" by the British and "Islas Malvinas" by the Argentinians, this group of islands in the south Atlantic is located 300 miles east of the Argentinian coast, has a population of approximately 2,100 people, and occupies about 4,700 square miles.

2. For a general view of the Argentine claims to the Falklands, see Mariano César Bartolomé, *El Conflicto Del Atlántico Sur* (Buenos Aires: Circulo Militar, 1996); and Carlos Augusto Landaburu, *La Guerra de las Malvinas* (Buenos Aires: Circulo Militar, 1988).

3. For an excellent overview of the Argentine command arrangements and the problems they caused the Argentinians, see Alejandro Corbacho, "Improvisation on the March: Argentine Command Structure and Its Impact on Land Operations during the Falklands/Malvinas War (1982)" (paper presented at the Society for Military History Conference, Quantico, Va., April 2000).

4. For a general history of Argentine units and aircraft in the war, see the official history: Direccion de Estudios Historicos, Vcom (Lt Col) Ruben Moro, ed., *Historia de la Fuerza Aerea Argentina*, Tomo VI, vols. 1 and 2 (Buenos Aires: Ejercito Nacional, 1998).

5. Several books provide details about the Argentine air force's organization, equipment, and aircraft. See Roy Braybrook, *Battle for the Falklands: Air Forces* (London: Osprey Publishing, 1982); and Salvador Mafe Huertas and Jesus Romero Briasco, *Argentine Air Forces in the Falklands Conflict* (London: Arms and Armour Press, 1987). On the Argentine air force training schools, see Jose Antonio Bautista Castano, "La Escuela de Caza y Bombardeo Argentina," *Revista de Aeronautica y Astronautica*, November 2000, 916-21.

6. One of the best discussions of the weapons and technology employed in the Falklands War is found in Lon Nordeen, *Air Warfare in the Missile Age* (Washington, D.C.: Smithsonian Institution Press, 1985), 191-206, 233.

7. Much of this information comes from the USAF Armaments Museum personnel, Eglin AFB, Fla.

8. Victor Flintam, *Air Wars and Aircraft* (New York: Facts on File, 1990), 372-73.

9. Corbacho.

10. Enrique Mariano Ceballos and Jose Raul Buroni, *La Medicina en la Guerra de Malvinas* (Buenos Aires: Circulo Militar, 1992), 23. This work is probably the best source for exact figures for all the army, navy, and air force units that were stationed in the Falklands.

11. The best general history of the war from the Argentinian side is Comodoro (Col) Ruben Moro, *Historia del Conflicto del Atlantico Sur* (Buenos Aires: Escuela Superior de Guerra Aerea, 1985). For British weapons systems, see 157-58.

12. Capt Joseph Uдеми, "Modified to Meet the Need: British Aircraft in the Falklands," *Airpower Journal* 3, no. 1 (Spring 1989): 51-64.

13. The whole issue of combat losses and damage is a very complex one. Both sides exaggerated the damage and losses inflicted upon the other, with the Argentinians having a greater degree of exaggeration. The following narrative of combat actions and losses has been pieced together by the author from both the official Argentine histories and reports. For the Argentinians' version, see Comodoro Ruben Moro's works. For the British version, see the official after-action report, Secretary of State for Defence, *The Falklands Campaign: The Lessons* (London: Ministry of Defence, December 1982). Both sides have carefully documented their own losses and provided aircraft losses by circumstance, tail number, unit, and pilot. I have taken each side's account of its own losses as the definitive one and have discounted claimed damage for the opponent.

14. The two volumes of *La Fuerza Aerea en Malvinas* (1998) provide several examples of mission orders complete with maps showing the tanker-refueling plans for

the FAS strikes. While short on operational narrative, this official history of the Argentine air force offers a wealth of detail on the tactics of each air strike.

15. For an Argentinian version of the 1 May 1982 battle, see Moro, *Historia del Conflicto*, 176–97.

16. Uдеми, 60.

17. On the Super Etendard, see Christopher Chant, *Super Etendard: Super Profile* (Somerset, England: Winchester Publishing, 1983).

18. *Ibid.*, 48–49.

19. Moro, *Historia del Conflicto*, 229–33.

20. Braybrook, 24.

21. *Ibid.*

22. Moro, *Historia del Conflicto*, 229–30.

23. Ceballos and Buroni, 22.

24. On the Argentinian claims, see “The Argentine Gazette,” pt. 2, in *The Royal Air Force Air Power Review* 3, no. 4 (Winter 2000): 87–108.

25. For an Argentinian version of this encounter, see Moro, *Historia del Conflicto*, 416–27.

26. Secretary of State for Defence, *The Falklands Campaign: The Lessons*, provides a detailed (302 paragraphs) lessons-learned account of the Falklands War to serve as a basis for future military doctrine and technology developments.

27. Stephen Schwab, retired CIA Latin American analyst, interviewed by author, 24 May 2001.

28. Earl Tilford, “Air Power Lessons,” in *Military Lessons of the Falklands War: Views from the United States*, ed. Bruce Watson and Peter Dunn (Boulder, Colo.: Westview Press, 1984), 37–50.

29. Moro, *Historia del Conflicto*, 140.

30. Secretary of State for Defence, *The Falklands Campaign: The Lessons*, Annex C. Additionally, 14 British helicopters were lost when their parent ships were sunk, and 12 more aircraft, including four Harriers, were lost to operational accidents.

The airplane is the only weapon which can engage with equal facility, land, sea, and other forces.

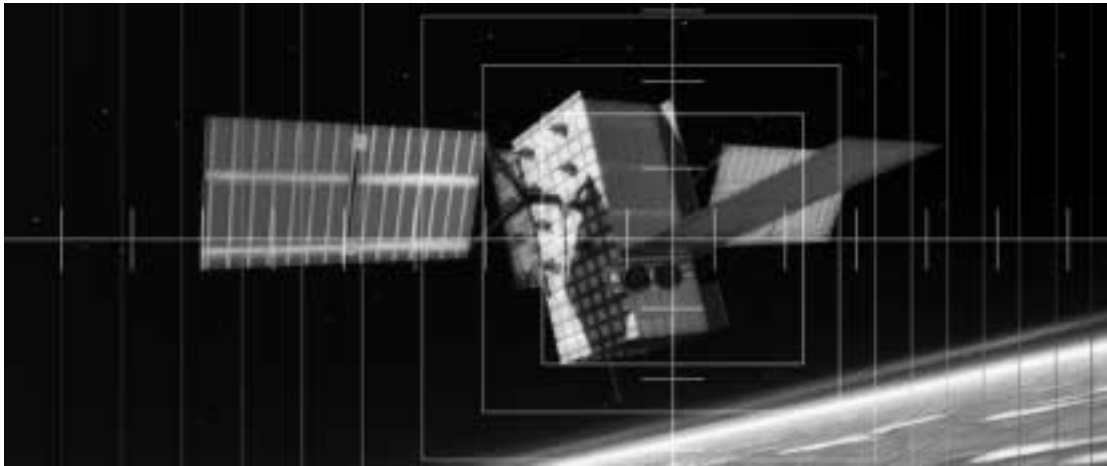
—Maj Gen Frank M. Andrews

A Sea of Peace or a Theater of War?

Dealing with the Inevitable Conflict in Space

COL JOHN E. HYTEN, USAF

Editorial Abstract: How will the military use space? This question has been studied for over 40 years, most recently by the 2000 Commission to Assess United States National Security Space Management and Organization. Colonel Hyten assesses current US space policy and makes recommendations aimed at keeping inevitable space conflicts from exploding into full-fledged space warfare, while still protecting the nation's interests in this most important medium.



IN MANY WAYS, the future of the United States is tied to the development of space. Given the many issues facing this development and the potential for conflict, one would expect widespread and vigorous debate on the subject. Such is not the case, however. Even though debate has begun within limited political and military circles, no one has addressed space in any real depth on a national level.

During the 1970s and 1980s, in the midst of an active Soviet space threat, the debate was loud and vigorous, involving not only leading military officers, presidents, and congressmen, but also many members of the sci-

entific and academic communities. Significantly, the national media gave close attention to this discussion. Today, however, the debate lacks any such national attention and committed involvement, as evidenced by the lack of response to a major speech delivered at Tufts University's Fletcher School of Law and Diplomacy in November 1998 by Sen. Bob Smith (R-N.H.), then the chairman of the Strategic Forces Subcommittee of the Senate Armed Services Committee. In this address, he proposed in very strong terms the need for space weapons and perhaps even a separate space force to develop and operate these weapons.¹

Media response to these bold and radical proposals was almost nonexistent. For many weeks, the only media coverage to be found was in primarily defense-related periodicals such as *Inside the Air Force*.² The first mainstream American newspaper that even mentioned this speech was the *Washington Times* in an editorial by James Hackett on 11 January 1999 (nearly two months after the speech).³ Senator Smith, however, continued to press his ideas in the Senate, and Congress passed legislation, included in the Defense Authorization Bill for fiscal year 2000, which established a special Space Commission to evaluate many of these proposals.⁴ Still, the general public has largely ignored the issue.

The Space Commission

Formally called the Commission to Assess United States National Security Space Management and Organization, the Space Commission began its work in the summer of 2000 and issued its report on 11 January 2001. Donald Rumsfeld chaired the commission until President George W. Bush nominated him to serve as secretary of defense as the commission was finalizing its report, which recommended numerous actions by the executive branch of government and specifically by the Department of Defense (DOD). Due to congressional interest, the report likely would have spurred some changes in any administration, but due in great part to the position and leadership of Secretary Rumsfeld, DOD has pursued many of the commission's findings. Changes did not occur immediately, and many of the recommendations and initiatives have still not taken effect; nonetheless, significant change is under way.

All of national-security space has undergone reorganization within DOD. The most significant change has been the naming of a single military service—the Air Force—as DOD's executive agent for space. Peter B. Teets, undersecretary of the Air Force, now has direct responsibility for all national-security space, including the National Reconnaissance Office. For the first time, one person has the authority

to lead and direct all US national-security space activities. The executive agent is also responsible for establishing a virtual major-force program for space that will clearly identify, for the first time, the true magnitude of the resources expended on national-security space efforts.

One of the most important aspects of the Space Commission's report, however, is the clear and logical way it describes how essential space has become to all aspects of our existence. It explains the importance of the civil, commercial, defense, and intelligence space sectors in detail—as well as US vulnerabilities. In some of its more vivid language, the report points out that with the growing commercial and national-security use of space, US assets in space and on the ground offer many potentially vulnerable targets.⁵ In discussing the future, the commission concludes that “history is replete with instances in which warning signs were ignored and change resisted until an external, ‘improbable’ event forced resistant bureaucracies to take action. The question is whether the US will be wise enough to act responsibly and soon enough to reduce US space vulnerability. Or whether, as in the past, a disabling attack against the country and its people—a ‘Space Pearl Harbor’—will be the only event to galvanize the nation and cause the US government to act. We are on notice, but we have not noticed.”⁶

The events of 11 September 2001 add to the importance of these words. Once again the United States experienced an improbable event—and responded. The nation will pursue the war on terrorism for a long time to come, but it must also continue to understand and work to protect its other potential vulnerabilities. The Space Commission pointed out that threats to US space systems could arise under a variety of conditions “in peacetime, as a terrorist act.”⁷

In more normal times, the report of the Space Commission, combined with an active and involved secretary of defense keen on implementing many of its recommendations, would spawn active, public debate. However, many of the critical issues necessary to define

the path of this nation in space are still not being addressed in any significant way in public. In light of the notable changes currently taking place in both the substance and management of national-security space, now is the critical time for just such a debate.

“To best prepare for the future, we have to energize our thinking too.”

Unfortunately, the limited public discourse thus far seems to focus on two very strong, opposing positions: the need for space weapons versus the need to maintain space as a sanctuary. But the focus should be on choices that can help define the future of this nation, and the world, in space. Many aspects of conflict in space, certainly in the near term, can be assuaged without requiring the controversial development and use of space weapons—or even military intervention in space. To do so, however, requires the aggressive implementation of other instruments of national power—specifically, of an economic and political nature. Like public debate on space, this has yet to occur.

Gen Richard B. Myers, chairman of the Joint Chiefs of Staff, observed in early 1999, “Just as we can’t expect to successfully fight the next war with the equipment of the last war, we surely won’t see victory in the next war using the policies of the last war. To best prepare for the future, we have to energize our thinking too. We need the national debate on the existing policies and open questions affecting military capabilities and possibilities in space. And we need resolution of that debate sooner rather than later.”⁸ Over three years later, however, we still lack both resolution and debate.

In the past few years, some significant steps have taken place, although they were not well publicized or noticed by the public at large. In the national-security strategy of December

1999, President Bill Clinton for the first time declared the unimpeded access to and use of space *a vital national interest of the United States*.⁹ Shortly thereafter, the Space Commission described the nation’s interests in detail. Despite such progress, the United States still lacks a coherent, long-term space vision. Although the current national space policy (1996) provides top-level guidance for each of the nation’s space sectors—civil, commercial, intelligence, and military—it does not fully integrate the US space program or provide a long-term vision. If conflict in space were not inevitable or already occurring, such a stance would be appropriate.¹⁰ These divergent approaches, however, make it difficult to deal with the foreseeable conflicts of the future.

Conflict

The pressures on space are enormous—from both an economic and a military perspective. Even one of these pressures is severe enough to create conflict. Combined, they create the risk of war—either on Earth, in space, or both. On the economic front, conflict has already occurred due to crowding in geostationary orbits and through saturation of the available radio spectrum.¹¹ On the military front, the United States has managed to avoid clashes because of the effective monopoly it would exert on the use of space during conflict.

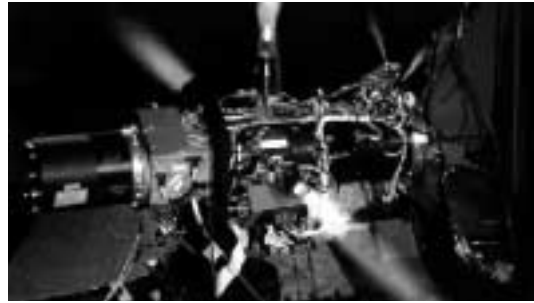
In the year 2000, the commercial space industry alone generated over \$80 billion in worldwide revenue.¹² Conflicts in this arena are beginning to grow as crowding increases due to the finite number of unoccupied geostationary slots and the limited amount of unallocated spectrum. Militarily, one cannot imagine the United States allowing an enemy either to threaten US space capabilities or use space systems to put Americans at risk. Space systems could become a significant part of any future military conflict involving the United States.

The military leadership is fully convinced that the United States will need weapons to deal with space-related conflict.¹³ Although other nations and many Americans who see

such a plan as disastrous have called for the United States to negotiate both bilateral and multilateral treaties, currently none are under consideration. The Clinton administration determined that the current limits on placing weapons of mass destruction in space were sufficient and did not consider negotiations regarding the peaceful uses of outer space in the best interest of the nation.¹⁴ The Bush administration has not modified this position—at least publicly. In short, national space policy remains confusing.

The issue of antisatellite (ASAT) weapons provides an interesting example of the United States sending mixed signals to the international community. In the fall of 1997, the Clinton administration allowed the testing of the US Army's mid-infrared advanced chemical laser (MIRACL) against an orbiting Air Force satellite, the stated objective of which involved collecting "data that will help us improve computer models used in planning protection measures for U.S. satellite systems."¹⁵ Despite the fact that this decision to test a high-powered laser against a space object came under heavy criticism from President Boris Yeltsin of Russia, some members of the US Congress, and many people in the scientific community, all of whom viewed it as an ASAT test, the administration allowed it to proceed. Almost at the same time, President Clinton used his line-item veto to implement policy for the first time (an action since ruled unconstitutional) when he vetoed three programs with the potential for exploring space-weapon technology—the Clementine II microsatellite program, the Army's kinetic-energy ASAT system, and the military space plane. The administration argued that (1) the MIRACL test was not an ASAT demonstration, (2) one could achieve space control without weapons,¹⁶ and (3) the United States did not need the three programs for its future defense. Understandably, the media and much of the world concluded that the Clinton administration did not have a clear policy for space control.¹⁷

This lack of clarity remains a problem. During a press conference on 8 May 2001 to



The Army's kinetic-energy ASAT system, designed to neutralize hostile satellites

announce implementation of the Space Commission's report, Secretary of Defense Rumsfeld fielded a question about putting weapons in space:

What I brought along was some space policy, the National Space Policy, which it might be useful to read. It's just an excerpt. This is from September 19th, 1996. It is the policy today, and it says basically that: "DoD shall maintain the capability to execute the mission areas of space support, force enhancement, space control and force application. Consistent with treaty obligations, the United States will develop, operate and maintain space control capabilities to ensure freedom of action in space, and if directed, deny such freedom of action to adversaries. These capabilities may also be enhanced by diplomatic, legal and military measures to preclude an adversary's hostile use of space systems and services." That, I would say, is the policy of the United States government. And it has been, and it is today.¹⁸

This excerpt shows that the national space policy is very broad, allowing any number of responses. But the actions of the United States have not been consistent—and national debate still has not occurred. Thus, the vision for the future of the United States in space remains unclear.

Similarly, concerning the commercial aspects of space, neither Congress nor recent administrations have dealt effectively with the growth of space business and its impact on national security. Even though Congress, after much delay, passed the Commercial Space Act in 1998, it did not fully resolve the

critical issue of remote sensing (imagery). Matters regarding commercial imagery satellites (e.g., Space Imaging's Ikonos) with one-meter (or better) resolution remain confusing at best.¹⁹ During the ongoing Afghanistan

Usually, ships of war and ships of commerce look quite different, but in space, satellites of war and satellites of commerce may be one and the same.

conflict, the US government initially decided to buy up all satellite imagery of the area of interest from Space Imaging for about \$2 million per month. Shortly thereafter, the government discontinued these purchases but did not provide the media clear reasons for doing so.²⁰

Neither has anyone fully addressed the true impact of global satellite communications from constellations such as Iridium and Globalstar. Again, the commercial sector has the potential for affecting national security—not only of the United States but of other countries as well. Every new step that exploits the benefits of space has tremendous reverberations throughout society. No one can make effective decisions regarding commercial, civil, and military space systems without considering their full impact.

The "Commons" of Space

Space has been described as both a frontier for exploration/exploitation and a fuel for the economy, but perhaps a more accurate descriptor is the term *commons*—an area for use by the community as a whole. In a legal sense, it also refers to an area open to use by one nation without interference from another. As a frontier, space is a commons because of its availability to any nation with the desire and wherewithal to explore it. As a fuel, it is a commons because no national restrictions exist re-

garding its exploitation. That is, the use of space, as both a frontier and a fuel, is open to the community of nations as a whole and is not restricted to any single nation. Therefore, one must deal with areas of conflict such as geostationary spacing or spectrum allocations from the viewpoint of the commons, as well as that of an individual nation.

The international nature of the space commons makes dealing with space conflict difficult. In the absence of a coherent national strategy, the US military, as a minority player in space, has problems developing the means to deal with space issues as they relate to national security. In reality, it is a national problem that the executive branch must address by integrating all the elements of US power into a coherent policy.

As a commons, space demands continued engagement in the international arena. One must continually explore and update laws, treaties, and agreements to allow for effective growth while minimizing conflict. The United Nations (UN) International Telecommunications Union (ITU) is well positioned to negotiate many of these multinational issues. As is the case with the commons of the sea, however, disagreements and conflicts will continue to occur whenever one nation achieves a distinct advantage and other nations want to challenge that advantage. Exploration of the sea gave rise to new international laws, treaties concerning fishing rights and defense, and a new legal framework—all of which served to resolve conflict. When these measures did not work, however, nations defended their rights to the seas with military power.

At sea, however, strategic military advantages and economic advantages are more easily discernable. Usually, ships of war and ships of commerce look quite different, but in space, satellites of war and satellites of commerce may be one and the same. Similarly, the national response to a threat from a ship of war is clear, but such a response to a satellite that has both military and commercial uses ("dual uses") is not so clear. The twenty-first century in space will be driven by dual-use technologies, which will greatly affect fu-

ture conflict. To maintain an advantage in space, the nation must pursue ways to deal with these technologies effectively. Again, the military cannot do it alone.

The UN offers opportunities to advance US interests in dealing with dual-use technologies. These include such forums as the Conference on Disarmament and other UN committees that look at commerce and outer space. Possibilities exist for exploring negotiated agreements for controlling these kinds of systems and technologies. Perhaps more likely, however, are opportunities for negotiating international “rules of the road” for space that can better define the operating framework.²¹ Like other nations of the world, the United States will always have the right to defend itself from attack—which should remain the driving principle behind US operations in space. Engaging other nations within the structure of the UN makes progress possible—at least in terms of defining some of the additional laws and agreements necessary to operate in the commons of space.

One should not view the UN and other arenas for peaceful negotiations as a panacea. The current competitive advantage enjoyed by the United States gives it the opportunity to continue to develop the commons of space commercially and to serve as the leading provider of space services around the world—from telecommunications, to navigation, to remote sensing, to anything produced by space industry in the coming years. It is essential that the US government not take any action or implement regulations that would encourage other nations to develop a particular space market. This requirement raises continuing conflicts with national-security interests, once again stressing the need for an integrated approach from the US government.

Every nation, the United States included, has its own unique national-security interests in space. As the world’s most space-dependent nation, the United States must prepare itself to respond to threats to its national interests should negotiations fail. These threats might involve attacking—directly or indirectly—space systems, denying commercial space capabilities,

threatening forces/citizens with space weapons, or using international space capabilities in some fashion. Political and economic means could effectively control certain of these threats while others might require military intervention, possibly consisting of non-lethal action (e.g., jamming), lethal action confined to terrestrial targets, or, ultimately, lethal action against targets in space. Most likely, the United States would respond to a purely commercial conflict through non-lethal means, using lethal space weapons only when foreign space systems threatened American lives or property. Each of these threats is significantly different, and the nation must consider each one as it develops a strategy for the twenty-first century.

Recommendations

As a critical element of the future, space will play an essential role in allowing for economic growth and enhancing national security. In order to take full advantage of this future, however, the United States must integrate all of its elements of national power into an effective national strategy. The following recommendations are designed to help develop such a strategy and respond to these challenges.

Reconstitute the National Space Council

The Space Commission’s top recommendations concerning organization and management recognize the critical leadership role of the president in “developing a long term strategy for sustaining the nation’s role as the leading space-faring nation.” It also suggested the creation of two organizational constructs to advise the president on space matters—a Presidential Space Advisory Group to provide independent advice and a Senior Interagency Group within the National Security Council—as well as the establishment of a closer relationship between the secretary of defense and the director for central intelligence.²² Although the secretary and director have certainly developed a much closer relationship regarding national-security space, the two recommended groups have not been implemented.

The original National Space Council (disbanded in 1992) effectively integrated different elements of the executive branch and helped develop coherent strategies. Since the vice president chaired the council, it had the authority it needed to make tough decisions. We should charter a similar body with the power and authority to make critical policy recommendations to the president. It should include senior representatives from all the affected segments of the government, including DOD, the Department of State, the Department of Commerce, the Central Intelligence Agency, the National Aeronautics and Space Administration, and the National Security Council. The space council should first define the nation's overarching space policy and include a clear vision for the next century. This vision must call for more than a simple commitment to "the exploration and use of outer space by all nations for peaceful purposes."²³

The Space Commission attempted to produce these results by recommending the formation of both an advisory and interagency group, mentioned above. These organizations have yet to receive the charter and visibility necessary to adequately address the complex issues involving space. Combining these efforts into a National Space Council would give them the necessary standing in the government to function successfully.

Develop a New National Space Policy

The current national space policy is out of date. The issues that need attention are so complicated that only a national body within the executive branch, such as a National Space Council, could possibly consolidate the various positions and integrate the policy. The new policy must effectively encompass all the instruments of national power, allowing continued economic expansion and pursuit of vigorous research and exploration, while at the same time protecting US national security.

On paper, the National Science and Technology Council is still "the principal forum" for resolving issues related to national space policy.²⁴ Unfortunately, very few of the critical

decisions regarding the future of space are issues of science and technology. Rather, they cross the boundaries of many agencies in government, affecting everything from national security to economic prosperity. Addressing these issues in the context of science and technology gives them the wrong focus.

In March 2001, a Space Policy Coordinating Committee was established under the National Security Council, including senior-level representatives from all federal departments and agencies. Although the committee intended to issue a report in six to nine months, only sporadic activity has occurred.²⁵ We still need an integrated national strategy documented in a new national space policy.

Recently, however, promising efforts appear to be addressing these needs. In May 2002, Dr. Condoleezza Rice, the national security advisor, announced plans to conduct a thorough review of US space policy, stating that "many of the national policies governing our space program have been in place for several years, during which time there have been a number of changes and developments." She then requested that departments and agencies consider by January 2003 whether existing policies should be revised, consolidated, or eliminated. The Space Policy Coordinating Committee is expected to lead this effort with support from throughout the government.²⁶

The nation must effectively utilize all of its instruments of power as it moves forward in space—an effort that requires new direction. For that reason, a new national space policy is essential. The remaining recommendations address the political, military, and economic aspects of this problem.

Negotiate the Future of Space

Through international agreements, the United States can move forward in a number of areas, most significantly in further defining the international norms for behavior in space—"the rules of the road." The US position on space has remained consistent for many years. Specifically, the United States does not claim any sovereign right to space, rejects any nation's claim to such sovereignty, and pro-

motes the availability of space for use by all humanity. At the same time, this country considers the use of space a vital national interest—one that Americans are willing to protect if called upon to do so.

During any negotiations in which it might participate, the United States should be careful to preserve its current strategic advantage, taking no action that would lessen the precision or effectiveness of US military forces. For example, if an enemy denied Global Positioning System (GPS) signals to our precision weapons, should the United States attack to prevent this denial or simply revert to older, less precise weapons—with the resulting increase in collateral (civilian) damage? Preserving this strategic advantage should be a guiding principle for future US initiatives.

Potential enemies (nations, groups, or individuals) need to understand that if they use space systems to target, exploit, or attack US citizens or resources, the United States will respond. In addition to taking political or economic actions, this country could attack ground assets, communication links, or, if necessary, space assets as well. But this does not mean that negotiations leading to either informal understanding or formal agreements cannot prove beneficial to both the United States and the international community. Opportunities exist to further define the commons of space, the legal framework for operating in space, and the conditions that would allow a nation to defend itself.

Achieve Space Superiority

Just as all military campaigns today rely on operational plans to achieve air superiority, so should they include plans to achieve space superiority. The nation's political and military leaders must recognize that without space superiority, American forces will operate under greater risk in a theater of operations. Space-superiority plans should specify the appropriate application of both nonlethal and lethal force in the particular medium to ensure the availability of space for US and allied forces and to deny it to enemy forces.

Like air or maritime superiority, space superiority does not exist all the time. Rather, military forces must establish it during a specific

The United States does not claim any sovereign right to space, rejects any nation's claim to such sovereignty, and promotes the availability of space for use by all humanity.

conflict and maintain it only for the duration of that conflict. Space superiority differs from the air and maritime versions because of the unique physical characteristics involved. In a conflict, one can achieve air and maritime superiority over the limited geographic area (e.g., air superiority over the Persian Gulf or maritime superiority in the Mediterranean Sea). Space presents a more complicated problem. Orbiting space systems have the potential to affect an enormous portion of the globe; therefore, one must evaluate space superiority from the perspective of all of space, not just a limited theater of operations.

Thus, in its efforts to achieve space superiority, even for the limited duration of some future conflict, the United States must consider the overall impact of its actions on the commons of space. If the United States impinges upon the commons, establishing superiority for the duration of a conflict, part of the exit strategy must include the return of full access to all nations. This requires two approaches: (1) development of a complete spectrum of military options (nonlethal to lethal) and (2) development of doctrine and concepts of operation employing the military option that best achieves the desired effect with minimum impact upon the commons.

Develop Capabilities for Space Control

As history has demonstrated, concentrating on political means without properly preparing to use military force often results in failure. For that reason, the United States should

aggressively pursue programs that will give future decision makers options to deny, disrupt, degrade, and, if necessary, destroy space systems that could threaten US interests in the twenty-first century. For the time being, this country can achieve space superiority *without* deploying weapons in space and *without* the use of weapons that create permanent effects on the commons of space.

In 1999 Dr. John J. Hamre, then deputy secretary of defense, testified before Congress that DOD initiatives for space control emphasized the temporary denial of space to an enemy rather than the destruction of space systems: "We want our space jamming capabilities to be localized and temporary. . . . For example, we would want to jam a global positioning system signal around an air base that might be under attack, but we would not want to shut down the whole system." He acknowledged, however, that a great deal of research and development remained before we could field such a capability.²⁷ That year, however, the Air Force began pursuing space-control technology efforts and just recently initiated acquisition programs to develop capabilities for countercommunications as well as counter-surveillance and counterreconnaissance with temporary/reversible effects.

One may handle future threats in space by means of a progressive pattern of responses that focus on denial and disruption but do not degrade or destroy. However, if peaceful negotiations fail and military planners cannot develop terrestrial means to ensure space superiority, the only alternative may entail the deployment of some types of space-based weapons. The United States must be ready to respond to this scenario.

The United States needs a full spectrum of capabilities to give decision makers options for resolving conflict at the lowest level possible. Full preparation requires developing and testing the critical systems and technologies necessary to field such capabilities. Failure to do so could leave the United States vulnerable to surprises from other nations. On many occasions, Gen John L. Piotrowski, former commander of United States Space

Command, has observed that the United States can't afford to find itself in second place in terms of space weapons.²⁸

The military also needs to develop more fully the doctrine necessary to operate and use space-control capabilities. Because the concept of space superiority is still relatively new to military planners, significant work still needs to be done on effectively and efficiently achieving it. Understandable concepts and doctrine will allow military leaders to give political leaders sound advice on how to achieve space control across the spectrum of conflict.

We also need to pursue better methods for characterizing potential attacks and defending current space assets—for example, improved situational-awareness capabilities for space to ensure better knowledge of future activities there. We also need better ways of confirming disruptions to or attacks upon satellites. An anomalous event that affects a satellite can have many causes: the harsh space environment, onboard system problems, or hostile action. The correct response depends upon knowing the specific cause. Today's satellites are relatively incapable of confirming an attack; to maintain our advantage in space control, we must remedy that deficiency.

The United States should use space-based weapons only as a last resort but should not consider such use an unthinkable option. American leaders have long believed this and have used military force when the situation demanded. Certainly, one would prefer to control the future through peaceful agreements that are in the mutual interests of the parties involved. At the same time, the United States must prepare itself to deal with a wide spectrum of potential conflicts in space by developing and testing a number of military capabilities—up to and including space-based weapons, preferably those with temporary/reversible effects.

Fund the Military Space Program

In November 1998, Senator Smith noted that in their rhetoric, both the Department of Defense and the Air Force have acknowledged the importance and promise of spacepower. In his

1998 report to Congress, Secretary [of Defense] Cohen stated that “spacepower has become as important to the nation as land, sea, and air power.” In 1995, the Air Force made clear in *Global Engagement* that: “The medium of space is one which cannot be ceded to our nation’s adversaries. The Air Force must plan to prevail in the use of space.” . . . Compared to the magnitude of the technical challenges involved—and these programs’ potential military value—the investments being made by the Air Force in these areas are paltry.²⁹

This criticism is based on Senator Smith’s perception of Air Force budget decisions on space in the mid-1990s. He and others in Congress believe that the space threat is growing and that DOD should respond accordingly. A study by the Air Force Scientific Advisory Board in 1998 indirectly explained the very reasons why this perception developed and proposed an aggressive increase in Air Force space funding for the coming decade. Interestingly, it also showed the actual Air Force space budget for the previous five years (fig. 1). Note that actual Air Force expenditures on space declined slightly or stayed fairly level during the period—the data to which Senator Smith referred in his criticism of the Air Force’s investment in space. The senator believed that the Air Force had ample opportunity to step up to the future but failed to meet this obligation.

In April 2002, the Congressional Research Service completed an analysis of the nation’s space program, pointing out that tracking DOD’s space budget proved very difficult since it is not reported as a single line item in the budget.³⁰ Interestingly, the Congressional Research Service quotes the trade press as saying that DOD’s budget request for unclassified space activities is \$7.8 billion.³¹ Since the Air Force executes a significant portion of the unclassified space budget (an average of 83 percent, according to the General Accounting Office),³² it appears that the Air Force budget request for 2003 is somewhere around \$6.5 billion. A comparison with the Air Force budget included in the Scientific Advisory Board report of 1998 (less than \$5 billion) suggests that the Air Force has stepped up to an increased level of support for space, at least to some ex-

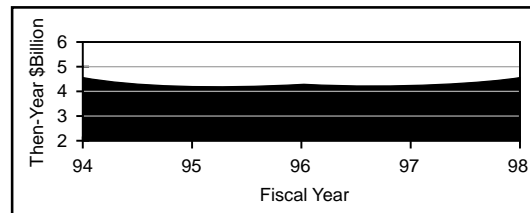


Figure 1. Air Force Space Budget for Fiscal Years 1994 through 1998 (Derived from data provided in J. Borky et al., *Report on a Space Roadmap for the 21st Century Aerospace Force* [Washington, D.C.: USAF Scientific Advisory Board, November 1998], 35–36)

tent. However, further analysis at the program level provides additional insight.

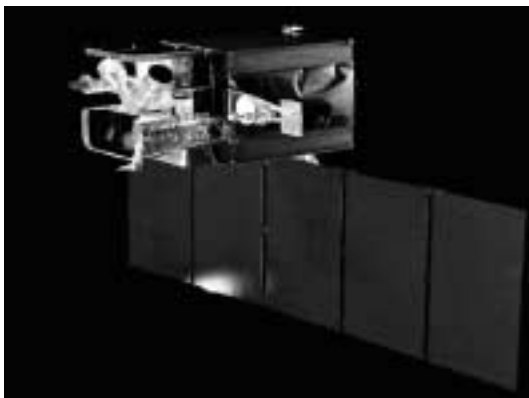
In early 1999, the Air Force was under fire for deciding to delay for about two years both the high and low portions of the Space-Based Infrared System (SBIRS), the new missile-warning satellite programs. It did so for a number of reasons—technical, programmatic, and funding. Many members of Congress interpreted this action as another instance of the Air Force’s failure to support space. The publication *Inside the Air Force* reported that key members of Congress were “concerned about the Air Force’s practice of using the SBIRS program . . . to pay its bills.”³³ Sen. John Warner (R-Va.), chairman of the Senate Armed Services Committee, called on Defense Secretary William Cohen to cease making any changes to the SBIRS programs until Congress had an opportunity to consider them.³⁴

Less than four years later, the Air Force again finds itself facing criticism about SBIRS—but now from a number of sources. Because of technical and programmatic problems, Congress, in the Defense Appropriations Act of 2002, denied all \$94 million requested for procurement of the “high” element of SBIRS but increased funding for research, development, test, and evaluation from the requested \$405 million to \$445 million. In the 2003 budget, the president requested \$815 million for SBIRS-High, an 83 percent increase over the 2002 request.³⁵ For a variety of rea-

sons, ranging from earlier delays to technical and programmatic concerns, the SBIRS program is experiencing serious problems.

In the spring of 2002, due to budget overruns in excess of 25 percent, the SBIRS-High program breached the limits put in place by legislation known as the Nunn-McCurdy Amendment, thereby placing the future of the entire program at risk. In late April, Edward C. "Pete" Aldridge, undersecretary of defense for acquisition, technology, and logistics, recertified the SBIRS-High program as essential for national security and still the best technical approach for meeting the mission. Consequently, however, DOD's independent cost estimates judged the Air Force budget too low, so the service agreed to fund the program at a much higher level—another significant increase.³⁶

Essentially, a comparison of the Air Force budget over the last few years to the budgets of the mid-1990s reveals a slight increase overall, but most of it went to pay for a few expensive programs that have run into trouble. Even though little has changed in its overall space portfolio in the last decade, the Air Force has stepped up to a leadership role by supporting a number of broken programs essential to national security—such as SBIRS-High. However, if the Air Force is truly to be the executive agent for space and if space really is a vital na-



An artist's conception of the satellite component of SBIRS, which will provide missile warning, missile defense, and battle-space characterization for war fighters.

tional interest of the United States, then the Air Force must support space at a level beyond its current programs. Space can help lead the transformation of DOD—but not unless the budget transforms as well.

Senator Smith and others have proposed a separate space force or space corps to adequately support DOD's space efforts. A strong push for such an organization will continue unless the Air Force, as executive agent in conjunction with the other services and agencies, can meet both the actual *and perceived* need to be a good steward of military space. The Air Force must take the lead and help transform DOD's efforts in space, an initiative that will require an ever-increasing commitment—not only in terms of rhetoric but also a greater share of the overall DOD budget. It must also reestablish credibility with Congress concerning a number of space programs, including SBIRS-High, and increase its commitments to transformational initiatives (e.g., space-based radar and space control). If the Air Force and DOD fail to meet this challenge, Congress could legislate the creation of a space service well before its time and well before many of the critical policy and doctrine questions have even been addressed.

Structure Laws and Regulations Governing the Commercial Use of Space

All space industries are global in nature. Navigation, weather, imagery, and communications from space—all of these capabilities were developed in the United States. The US space industry, once a free-world monopoly, now faces increasing competition from around the world. Complicating matters even further, nearly every one of these commercial developments has significant military implications. Commercial navigation, weather, imagery, and communications can help a potential enemy close the gap with the information-dominant United States.

Any US government action that prevents US companies from competing in international markets represents a threat to national security. If those companies are industry leaders and the world comes to them for a particu-

lar space service, the country at least maintains some insight and control over this service in times of conflict or crisis.

At the same time, any attempt by US companies to transfer critical technologies overseas also represents a threat to national security. Even if the technology is “only” for communications satellites, that technology still advances the state of the art overseas and allows international companies to provide improved capabilities in competition with those of the United States. In a global economy, however, no nation can isolate itself and remain competitive. The United States must trade overseas with space services; therefore, industry deserves some leeway in the exchange of technical information.

In March 1999, the State Department, in order to comply with the National Defense Authorization Act of 1999, assumed responsibility for satellite-export controls. However, according to John Holum, then the acting undersecretary of state for arms control and international affairs, the department found it extremely difficult to staff this critical function: “Congress mandated new staff . . . but there wasn’t any money provided for that.”³⁷ International customers responded negatively. Indeed, as reported by *Space News*, “three large satellite operators from Canada, Europe, and Asia said new U.S. technology-transfer regulations will make it difficult, and perhaps impossible, for them to purchase U.S. satellites.”³⁸ The clear implication was that these operators, previously American customers, would go to other international markets to obtain these services. Evidently, these policies have not changed during the Bush administration.

Given these circumstances, the *new* national space policy should allow US industry to maintain a leadership role in the space marketplace. The United States cannot afford to miss out on international opportunities because of government bureaucracy. An integrated national strategy should make such difficult and controversial issues as remote sensing and imagery resolution easier to resolve. Furthermore, the United States should be able to capture the ma-

jority of space commerce in the twenty-first century—a prospect that is good for both business and national security.

Conclusion

Space science, like nuclear science and all technology, has no conscience of its own. Whether it will become a force for good or ill depends on man, and only if the United States occupies a position of pre-eminence can we help decide whether this new ocean will be a sea of peace or a new, terrifying theater of war.

—President John F. Kennedy, 1962

The United States has an opportunity to implement a vision that will help shape the world in the twenty-first century. Space is only one of many places where this opportunity presents itself, but it is unique in many ways. Enveloping Earth and reaching to the stars, space has the ability to affect, in some way, the life of every person on this planet. Without a peer competitor, the United States has the opportunity now to take advantage of the unique attributes of space, but the nation has not yet stepped up to the challenge.

Conflict in space is inevitable. No frontier exploited or occupied by humans has ever been free from strife, but the United States has a chance to mold and shape the resolution of such conflict in the future. Opportunities exist through both formal and informal negotiations to define the commons of space and the rules of the road.

At the same time, the United States cannot afford to be caught off guard in the future—and cannot afford to allow another country to deploy a space-based weapon first. To ensure that this doesn’t happen, it must develop a robust program for an entire spectrum of space-control capabilities—deferring the decision to deploy operational, space-based weapons until a clear requirement exists.

If the United States remains strong; if space truly is a vital national interest; if we negotiate openly with the nations of the world; if we allow our industry to exploit space fully and become the unquestioned leader of the

information age; and if we develop the means and methods to deal effectively with inevitable conflicts in space, perhaps the new ocean to which President Kennedy referred could remain a "sea of peace." If, however, the United States continues without an integrated national strategy; if we fail to define a vision of space for the future; if we decide to develop space-control capabilities in a vacuum, apart from the rest of the space community; if we refuse to negotiate with other nations; or if we fail to establish a comprehensive, commercial space policy, then the ocean will undoubtedly become "a new, terrifying theater of war."

The opportunity exists now but won't last forever. It requires vision and decisions, national effort and debate on the issues (neither the Air Force nor any other military service can go it alone), understanding of a wide variety of very complex issues, and, most importantly, integrated national strategy. In order to exploit fully the tremendous riches and opportunities in space, the United States must be willing to combine all the instruments of national power in a concerted effort towards the realization of a future vision. If the nation prepares now, this vision has no limits. If we fail to prepare, others will define that vision—and not likely in a way the United States would prefer. □

Notes

1. Sen. Bob Smith (R-N.H.), "The Challenge of Spacepower," address to the Fletcher School/Institute for Foreign Policy Analysis Annual Conference, Tufts University, 18 November 1998.

2. In addition to conducting a survey of major newspapers, magazines, and the Internet during the course of this research, the author found that the Air Force Space Command Office of the Legislative Liaison (Headquarters AFSPC/XPPL), Peterson AFB, Colo., performs an ongoing, detailed search for anything of interest to military space. This office, which publishes such articles every week in its "Legislative Update," found no media response by the mainstream press either.

3. James Hackett, "Space Control Horizon," *Washington Times*, 11 January 1999.

4. House, *Conference Report on S. 1059, National Defense Authorization Act for Fiscal Year 2000*, 106th Cong., 1st sess., 5 August 1999, H.R. 106-301, sec. 1621-30, "Commission to Assess United States National Security Space Management and Organization"; and *Report of the Commission to Assess United States National Security Space Management and Organization* (Washington, D.C.: The Commission, 11 January 2001).

5. *Report of the Commission*, xii-xiii.

6. *Ibid.*, 25.

7. *Ibid.*, 24.

8. Gen Richard B. Myers, USAF, combatant commander, United States Space Command, address to the United States Air Force Warfighting Symposium, Orlando, Fla., 4 February 1999.

9. Executive Office of the President, *A National Security Strategy for a New Century* (Washington, D.C.: The White House, December 1999).

10. For example, during January 1996, the United Nations International Telecommunications Union sup-

ported the Pacific Telecommunications Conference, which addressed both geostationary crowding and frequency allocations and developed a number of suggestions to alleviate these problems. Only a few months later, as reported by the United Nations itself, severe crowding in the geostationary orbital slots over Asia "led to the jamming of a communication satellite by PT Pasifik Satellite Nusantara (PSN) of Jakarta, Indonesia, in defence of an orbital position claimed by Indonesia. This incident focused global attention on a worsening problem of orbital crowding and caused the matter to be brought before the October-November 1997 World Radio-communication Conference (WRC) of the 187 member-nation [International Telecommunications Union] in Geneva." United Nations, *Highlights in Space: Progress in Space Science, Technology, Applications, International Cooperation and Space Law, 1996* (Vienna: United Nations, 1997), 38; and *idem*, *Highlights in Space: Progress in Space Science, Technology, Applications, International Cooperation and Space Law, 1997* (Vienna: United Nations, 1998), 51. After nearly six weeks, the conference made only minor modifications to the procedures for reserving orbital slots and offered no resolution to the Indonesian jamming incident. When contacted by the author in September 1998 about the incident, Rhea McGraw, spokesperson for PSN, provided the following amplifying information: "There was (and continues to be) some confusion over 'ownership' of the slot at 134 degrees East. . . . Both PSN and APSTAR IA [China] claim ownership of that position. PSN did carry out testing that may have resulted in the temporary suspension of broadcasting for APSTAR; however, this was in no way intentional, was halted immediately, and has not occurred since. The [International Telecommunications Union] did not get involved in the dispute settlement process, claiming bilateral negotiations

were appropriate. The discussions are ongoing, with no clear resolution in sight." She later indicated that the PSN (Indonesian) satellite project was halted due to the monetary crisis in Asia. Indonesia, therefore, felt no immediate urgency to resolve the dilemma.

11. The frequency-crowding problem is so severe that the United States government has had to consider methods for sharing critical frequencies originally reserved for military operations. The government has done this with both the Global Positioning System (GPS, the military navigation satellite) and the Defense Meteorological Satellite Program (DMSP, the military weather satellite). For more information, see Office of Spectrum Management, National Telecommunications and Information Administration, *A Preliminary Analysis to Determine Interference Effects to GPS from Other Radio Services*. For a report on GPS issues concerning interference, see <http://gps.losangeles.af.mil/interference>. For a description of the DMSP problem, see *In the Matter of the Application of LEO ONE USA CORPORATION*, file no. 57-DDS-P/LA-94(48) (Washington, D.C.: Federal Communications Commission, 13 February 1998).

12. *Report of the Commission*, 11.

13. For example, see "Long Range Plan" (Peterson AFB, Colo.: United States Space Command, March 1998); and J. Borky et al., *Report on a Space Roadmap for the 21st Century Aerospace Force* (Washington, D.C.: USAF Scientific Advisory Board, November 1998).

14. According to Ambassador Robert T. Grey Jr., US permanent representative to the UN Conference on Disarmament, "We've got an agreement that bans the emplacement of weapons of mass destruction in outer space. We think that's enough; we don't anticipate any other problems." "U.S. Interests and Priorities at the CD: An Interview with U.S. Ambassador Robert T. Grey," *Arms Control Today*, October 1998, 3-8.

15. Briefing, Kenneth Bacon, Pentagon spokesman, 24 October 1997.

16. *Ibid.*

17. Briefings, Kenneth Bacon, Pentagon spokesman, 4, 11, 18, and 25 September 1997, and 2, 9, 16, 23, and 30 October 1997; press release, Sen. Tom Harkin (Iowa), subject: ASAT Policy and the MIRACL Test, 10 October 1997; and numerous criticisms from arms-control organizations published on the Internet. See, for example, http://www.armscontrol.org/act/1997_11-12/index97.asp; and *Federation of American Scientists*, on-line, Internet, 29 May 2002, available from <http://www.fas.org>.

18. United States Department of Defense, *News Transcript*, "Secretary Rumsfeld Outlines Space Initiatives," 8 May 2001, on-line, Internet, 29 May 2002, available from http://www.defenselink.mil/news/May2001/t0508200_t0508spa.html.

19. Bob Drogin, "Sale to Public of Satellite Photos Debated," *Los Angeles Times*, 15 January 2000.

20. Joanna Glasner, "U.S. Ends Afghan Image Contract," *Wired News*, 2002, on-line, Internet, 29 May 2002, available from http://www.spaceimaging.com/newsroom/news/wirednews_1-18-02.htm. According to Glasner, "NIMA [National Imagery and Mapping Agency] had renewed the contract once in November but let it expire

on Dec. 5. Over the past several weeks, the agency and Space Imaging discussed the possibility of extending an agreement but ultimately rejected such a plan. 'NIMA did not renew it simply because after several months the situation had changed, and we re-evaluated,' said Joan Mears, a spokeswoman for the agency. With a contract no longer in effect, the bulk of images shot for the Pentagon and NIMA will now be available for sale to the public, said Mark Brender, Space Imaging's director of government affairs. However, he said the company is still negotiating with the government for rights to a small portion of the satellite data. Part of the government's decision to end the imaging contract was probably financially motivated, said Tim Brown, an analyst at the military think tank GlobalSecurity.org. 'It's \$2 million a month, and I believe that for the most part it was something of an experiment,' he said. 'The Defense Department's not immune to wasting money.' "

21. The Space Commission addressed the need for rules of the road as well. See *Report of the Commission*, 17-18.

22. *Ibid.*, 82-86.

23. Rudi Williams, "Rumsfeld Announces Revamping of U.S. Space Program," *American Forces Information Service News Articles*, 10 May 2001, on-line, Internet, 29 May 2002, available from <http://www.iwar.org.uk/news-archive/2001/space/05-10-01.htm>.

24. The White House, *Fact Sheet: National Space Policy* (Washington, D.C.: National Science and Technology Council, 19 September 1996), 2, on-line, Internet, 29 May 2002, available from <http://www.ostp.gov/NSTC/html/fs/fs-5.html>.

25. Office of Space Commercialization Technology Administration, US Department of Commerce, "Promoting Space Tourism," 25 June 2001, on-line, Internet, 29 May 2002, available from <http://www.ta.doc.gov/space/library/speeches/2001-06-STA.ppt>.

26. Quoted in Amy Butler, "Rice Wants President to Initiate Sweeping Space Policy Review," *Inside Defense*, 14 May 2002.

27. Quoted in TSgt Timothy Hoffman, "Senate Committee Focuses on Military Space Programs, People," *Air Force News*, 25 March 1999, on-line, Internet, 29 May 2002, available from http://www.af.mil/news/Mar1999/n19990325_990499.html.

28. The author heard General Piotrowski make these kinds of remarks on numerous occasions in the 1990s. In most instances, the general was specifically referring to a space-based laser.

29. Smith, "The Challenge of Spacepower."

30. Marcia S. Smith, Congressional Research Service, *U.S. Space Programs: Civil, Military, and Commercial*, 9 April 2002, 8, CRS order code IB92011. Institution of the virtual major-force program for space should resolve this difficulty.

31. *Ibid.*, 1, 8.

32. *Defense Acquisitions: Improvements Needed in Military Space Systems' Planning and Education*, GAO/NSIAD-00-81 (Washington, D.C.: United States General Accounting Office, May 2000).

33. "Congress Critical of Air Force's Decision to Put Off SBIRS High Launch," *Inside the Air Force*, 29 January 1999, 8-9.

34. Sen. John Warner (R-Va.) to Secretary of Defense William Cohen, letter, subject: SBIRS Programs, 4 February 1999.

35. Smith, *U.S. Space Programs*, 10-11.

36. United States Department of Defense, *News Transcript*, "Under Secretary of Defense Aldridge Roundtable,"

2 May 2002, on-line, Internet, 29 May 2002, available from http://www.defenselink.mil/news/May2002/t05022002_t0502aldrige.html.

37. Warren Ferster, "Satellite Export Licensing Caught in Budget Dispute," *Space News*, 29 March 1999, 1.

38. Peter B. de Selding, "Satellite Buyers Blast U.S. Rules: American Firms Faceirate Customers," *Space News*, 5 April 1999, 1.

War should never be thought of as something autonomous, but always as an instrument of policy.

--Carl von Clausewitz



Editor's Note: PIREP is aviation shorthand for pilot report. It's a means for one pilot to pass on current, potentially useful information to other pilots. In the same fashion, we will use this department to let readers know about air and space power items of interest.

A Global Engagement Enhancer The International Health Specialist

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NOW THAT THE Cold War has ended, the national security of the United States requires effective leadership overseas to promote global stability. Paralleling this trend, the Department of Defense's (DOD) roles and missions have evolved in complex and nontraditional ways. One finds both an ever-increasing emphasis on transforming the nation's military into expeditionary forces and a growing discussion over military personnel taking on more direct roles as "ambassadors in uniform."¹

The 2001 *Quadrennial Defense Review Report* proposed a national military strategy that emphasizes the importance of such dynamic international relationships as assuring allies, deterring aggression, dissuading opponents, and decisively winning any military engagement.² Although these are not radically new concepts to military leaders and military plan-

ners, they nevertheless underscore the importance of military functions beyond traditional war fighting. Assumption of a diplomatic role that requires direct interactions with partners from other countries will facilitate successful military engagement around the globe in increasingly complex, nontraditional military operations.

Our military has always had the "tools" to participate directly in shaping the international environment through nontraditional means. But these tools are usually regarded as support functions to war fighters. An editorial in a recent issue of *Aerospace Power Journal* noted that military capabilities traditionally considered support functions (e.g., medicine, logistics, civil engineering, etc.) might become supported functions in future nontraditional military operations.³ In support of global engagement, the Air Force Medical Service (AFMS) is transforming itself to develop

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the necessary expeditionary culture. Lt Gen Paul K. Carlton Jr. and others stated that the “ ‘vision’ for the AFMS emphasizes that Air Force medical personnel must be able to support the Air Force mission throughout the full continuum of military operations in which airpower may be employed.”⁴ This global vision is embodied in the AFMS core competency of “interfac[ing] with the world healthcare system”—a key component to the AFMS’s support for global engagement.⁵ One finds this new AFMS core competency in the international health specialist (IHS) program.⁶

International Health Specialist Capabilities

The Air Force’s IHS program, developed by General Carlton, focuses on building medical partnerships with other countries in peacetime, before they need assistance. IHS members are educated in the language, culture, and politics of their specific areas of responsibility (AOR). Teams support the combatant commander’s theater engagement plans, create partnerships with medical colleagues from nations within their region, facilitate military-to-military and military-to-civilian interactions, and support medical-planning operations and deployment execution within their AOR. These skill sets reflect the notion that Air Force medics often represent the “tip of the spear” as instruments of national policy.⁷

The Air Force’s foreign area officer (FAO) program, which cultivates a pool of officers with “foreign language competency and regional expertise for effective interactions with foreign militaries and organizations,” serves as a model for the IHS program.⁸ The FAO program places officers educated in political-military affairs and proficient in both the regional culture and appropriate language in positions as military diplomatic advisors, as well as in DOD international jobs to support the theater combatant commanders.⁹

Similarly, the IHS program seeks to establish a cadre of medics fully qualified in their primary role as either AFMS health-care providers or support staff who have (1) additional language and cultural competency, (2) expertise in regional medical threats and infrastructure, (3) knowledge of joint and interagency coordination processes, and (4) the ability to build medical “bridges” to support coalition partnerships. As in the FAO program, IHS team members would act as advisors to the regional combatant commander for medically related issues in his or her theater engagement plan and as advanced-echelon personnel for exercise and real-world site surveys; they also would facilitate humanitarian assistance, disaster response, and traditional contingency operations and missions in their assigned region of expertise.

As of April 2002, the Air Force had 47 IHS team members aligned with four unified commands (European Command [EUCOM], Pacific Command [PACOM], Central Command [CENTCOM], and Southern Command [SOUTHCOM]) and in academic positions at the Uniformed Services University of the Health Sciences (USUHS) in Bethesda, Maryland, as well as the USAF School of Aerospace Medicine (USAFSAM) at Brooks AFB in San Antonio, Texas. These team members will instruct future DOD and Air Force medical leaders in global medical issues and groom them as staff liaisons with Special Operations Command, the Air National Guard (ANG), and Air Force Reserve Command (AFRC).

IHS teams consist of medics of any rank and Air Force specialty code. The typical team includes eight members who represent the five medical officer corps (medical, dental, nursing, biomedical services, and medical services) and enlisted career fields, thus encompassing a wide variety of backgrounds.¹⁰ Most members are experts in the culture and language in their AOR and have a wealth of experience in humanitarian assistance and disaster response. Many of them are well versed in the linguistic, cultural, political, military, medical, and economic issues of their AOR at the time of first assignment. Others receive training in these areas through Air Force or civilian courses.

In addition to full-time IHS staff and team members, the IHS program has compiled a database of over 300 volunteer AFMS members with a variety of linguistic, cultural, and deployment experience who may be called on a case-by-case basis for selected missions. The combined expertise of these subject-matter experts provides 49 different foreign languages for military commanders. Of these members, 114 officers and 23 enlisted personnel have received a special-experience identifier for Air Force-wide utilization.

The IHS program has also partnered with the Air Force's FAO office to support and explore language-training opportunities—a collaborative effort to have medics meet and sustain the chief of staff of the Air Force's goal of having 10 percent of all officers proficient in a second language by 2005. The program has also extended its language-training opportunity to enlisted personnel through the Base Education Office Tuition Assistance program. Furthermore, IHS team members have enthusiastically participated in the FAO Language Area Studies Immersion program.

The IHS program directly supports the Air Force's transformation to an expeditionary force. Regional teams have linguistic and cultural competency, expertise in regional medical threats, understanding of the joint coordination processes, and the capability to build effective international medical partnerships. These skills are invaluable for theater commanders in the era of global engagement and the expeditionary air and space force.

International Health Specialist Scorecard

Only one year from start-up, IHS teams have been actively engaged within their AORs, optimizing military-to-military and military-to-civilian partnerships. Building upon the AFMS's traditional readiness strengths in war-winning operations, the IHS focuses on humanitarian/civic assistance and disaster response to meet the challenges of the new millennium. By improving interoperability among the AFMS, sister services, and coalition nations' medical systems, we enhance our focused logistics capability, a tenet of *Joint Vision 2020*.¹¹ The diverse cultures, competing interests, and differing priorities of each local organization have made the development of unity of effort within each AOR a challenge—one that IHS teams have successfully met.

SOUTHCOM

June 2001 saw the establishment of the first IHS team in support of SOUTHCOM. Part of the 59th Medical Wing at Lackland AFB, Texas, this team has the goal of becoming the focal point for all international activities tasked to the wing, including critical-care air-transport team missions, joint/combined exercises, humanitarian/civic assistance missions, humanitarian assistance missions, National Disaster Medical System taskings, and implementation of Expanded International Medical Education and Training (E-IMET) courses in SOUTHCOM's AOR. Other roles include serving as liaisons and translators for host nations and deployed teams, as well as participating in readiness planning, deployment processing, and other operations.

Based in San Antonio, this team has deployed seven humanitarian/civic assistance missions and two humanitarian assistance missions to Latin America in its first year. Operationally, the team has facilitated the deployment of Air Force active duty personnel from multiple medical centers and US Army reservists in support of E-IMET courses to Bosnia, Chile, El Salvador, Russia, Turkey, and Czechoslovakia. Recognized for their cultural, regional, and deployment expertise, team members have joined the teaching cadre of the Combat Casualty Care Course at the Defense Medical Readiness Training Institute as lecturers and group facilitators for the Humanitarian Field Exercise. Most recently, SOUTHCOM's command surgeon has tasked the team to assist with the development of exportable courses in air and space medicine and site visits, as well as participate in the annual update of the theater engagement plan.



Left: Citizens of Nicaragua wait outside a clinic to see SOUTHCOM's IHS team. Right: Members of the team provide pediatric humanitarian/civic assistance in Nicaragua.

EUCOM

Located at Headquarters United States Air Forces in Europe (USAFE), Ramstein AB, Germany, the IHS team in support of European Command—the next team to reach operational status—has actively engaged in training, supporting international engagements, and conducting embassy briefings. It is the point of contact for USAFE working groups regarding training and medical engagements. Team members have served as faculty members and support officers for E-IMET courses and the EUCOM Training Program Management Review; they also have participated in four major total-force and triservice exercises, including MEDFlag and Medical Central and Eastern Europe (MEDCEUR).

PACOM

The team aligned with PACOM has members forward-deployed throughout the Pacific at the unified-command and numbered-air-force levels, Headquarters Pacific Air Forces, Hickam AFB, Hawaii; soon they will be at the Center of Excellence in Disaster Management and Humanitarian Assistance in Honolulu as well. This team has responsibility for the IHS Unit Type Code Manpower and Equipment Force Packaging System, ensuring that the IHS program is visible to the AOR combatant commanders. The most successful engagements to date have occurred with our allies in Japan and Russia. Over 200 joint-service medics have participated in the Russia Far East program in the past five years. Team members have briefed internationally in Guam, at the 24-country Asia-Pacific military-medical conferences in New Zealand and Malaysia (serving as the lead for an international-health breakout session), and at other international medical conferences throughout the region.

CENTCOM

CENTCOM's IHS team works in the command's Surgeon General Directorate in close contact with the J-5's (plans and policy) Humanitarian Assistance Branch. Developing a five-year regional medical-engagement program that meets the objectives of CENTCOM's commander, the team introduces DOD medical personnel to varied cultures of medicine in the AOR and conducts activities that benefit the host country's medical infrastructure—a "win-win" situation for all. The CENTCOM command surgeon's Engagement Branch has oversight for component and joint medical-engagement projects and coordinates host-nation medical agreements and exchanges. The branch also promotes remote-care, managed-care programs and leads cooperative defense initiatives in weapons of mass destruction and consequence management. The command's

IHS members were key workers in the Coalition Medical Operations Planning Conference in Tampa, Florida, sponsored by the Engagement Branch in December 2001. To improve the quality and efficiency of health care in the theater of operations, medics from coalition nations supporting Operation Enduring Freedom worked together during this meeting to set ground rules for interoperability relative to medical standards, logistics, and aeromedical evacuation.

ANG

ANG's IHS program focuses on enhancing the existing international state-partnership program. One major task involves restructuring the overseas annual-training program to promote international exposure and interactions. Having the overall goal of promoting the total-force concept, the ANG program will formalize and coordinate the Guard's engagement in active duty and Reserve exercises and responses. To enhance mission continuity, ANG is developing a template for its humanitarian deployments and international exercises, eventually to be shared with the total force. The IHS team also formally tracks ANG's international activities for increased visibility.

A training plan is being developed to train ANG personnel for IHS participation. Plans also call for development of a database—interactive with active duty and Reserve databases—to track ANG members with IHS qualifications. Furthermore, qualified guardsmen have received special-experience identifiers that ensure their identification as IHS members.

AFRC

As with ANG, the main focus of AFRC's IHS program concerns the development of an interactive database, establishment of the IHS special-experience identifier, and development of IHS training opportunities. Promoting the total-force concept, the Reserve IHS program also identifies training and exercises that will combine ANG, Reserve, and active duty efforts. For example, AFRC provides Air Force planners for Exercise MEDLite in Tunisia, which combines didactic instruction on planning responses to disaster situations and international standards of trauma medicine, executes a mass-casualty field-training exercise, and provides medical support for Exercise Atlas Drop conducted by the Joint Chiefs of Staff. This exercise produces improved host-nation capability and many lessons learned in interoperability.

USUHS

Uniformed Services University of the Health Sciences includes an international health program office led by the academic director of the IHS program. This office has developed an elective track in international health, now an approved focus of study for the Master of Public Health degree pro-



Left: IHS team members translate for operation planners. Right: The team conducts a trauma course during MEDLite 2000 in Tunisia, North Africa.

gram. Plans are under way for IHS personnel and international partners to access specifically designed international-health courses available through multiple advanced distributed-learning modules, exportable worldwide. These courses, which will focus on humanitarian assistance, disaster response, and air and space medical topics, are designed to “train the trainer” and will help cement relationships between our future medical officers and their counterparts from various host nations. USUHS’s IHS office also serves as a hub for networking with civilian government and nongovernment international-health agencies, academic programs, and other US military international-health programs.

USAFSAM

The Air Force’s School of Aerospace Medicine provides medically oriented training for our international allies’ military medical personnel as well as US Air Force personnel. USAFSAM’s IHS chief also serves as program director for the six-month-long course entitled Advanced Aerospace Medicine for International Medical Officers, offered annually and attended by 15 or more international flight surgeons who are rising stars in their home nation’s military. USAFSAM’s IHS office is developing exportable courses as well as an IHS core curriculum to enhance its team members’ international-partnering skills. Students attending formal training courses at USAFSAM receive informational briefings about the IHS program and have the opportunity to meet members of an IHS team. Lastly, the team offers briefings to medical dignitaries from other nations who frequently visit USAFSAM; these sessions address how the IHS program can improve interoperability with their countries. Both USUHS and USAFSAM ease the process of establishing medical partnerships with foreign countries, civilian academic health centers, and sister services.

Conclusion

Never before has the AFMS found itself in a position to directly support the Air Force mission of global engagement so profoundly as through the expression of its core competency of using international health specialists to interface with the world’s health-care system. IHS teams provide the Air Force with additional capability for global reach that directly affects AFMS support across the entire spectrum of military operations, including peacetime humanitarian assistance and disaster response.

Exercises and real-world responses have proven the value of the IHS program in establishing and building international coalition partnerships, facilitating disaster-preparedness training among allied nations, and developing effective disaster-response systems on a regional level. As individuals with IHS skill sets become increasingly valuable to theater commanders, the IHS program will mature as part of the Air Force culture and as an exciting career track for many AFMS personnel. The IHS program serves as a cornerstone, ensuring that the AFMS can carry out its diverse expeditionary medical services and engage the full spectrum of military operations now and in the future. □

Notes

1. Several articles and books deal with the diplomatic role performed by military members. Some of the most recent include the following: Charles C. Moskos, John Allen Williams, and David R. Segal, eds., *The Postmodern Military: Armed Forces after the Cold War* (New York: Oxford University Press, 2000); Jocelyn Coulon, *Soldiers of Diplomacy: The United Nations, Peacekeeping, and the New World Order*, trans. Phyllis Aronoff and Howard Scott (Toronto: University of Toronto Press, 1998); Lt Gen Paul K. Carlton Jr., “New Millennium, New Mind-Set: The Air Force Medical Service in the Air Expeditionary Era,” *Aerospace Power Journal* 15, no. 4 (Winter 2001): 8–13; and William L. Dowdy, *Expeditionary Diplomacy: POL-MIL Facilitation of AEF Deployments*, ARI Paper 2001-02 (Maxwell AFB, Ala.: Airpower Research Institute; College of

Aerospace Doctrine, Research and Education, June 2001), on-line, Internet, 13 June 2002, available from http://research.maxwell.af.mil/papers/special_collection/arr/2001-02.pdf.

2. Donald H. Rumsfeld, *Quadrennial Defense Review Report*, 30 September 2001, on-line, Internet, 13 June 2002, available from <http://www.defenselink.mil/pubs/qdr2001.pdf>.

3. Col Eric Ash, "Medicinal Thoughts," *Aerospace Power Journal* 15, no. 4 (Winter 2001): 5-6.

4. Carlton, 9.

5. The Air Force surgeon general recently approved five AFMS core competencies: fixed-wing aeromedical evacuation, medical care in military operations, interface with world health care, human-performance sustainment and enhancement, and population health. A revision of Air Force Doctrine Document (AFDD) 2-4.2, *Health Services*, 13 November 1999, is incorporating these core competencies into operational-level doctrine. Although not doctrine per se, core competencies enable doctrine to achieve objectives. The AFMS core competencies should flow from and support the Air Force core competencies outlined in AFDD 1, *Air Force Basic Doctrine*, 1 September 1997. The IHS program is an application of the AFMS core-competency interface with world health care.

6. For more information related to the IHS program, see *United States Air Force International Health Specialist (IHS)*, on-line, Internet, 13 June 2002, available from <https://www.afms.mil/afihs>.

7. Carlton, 12.

8. Air Force Instruction (AFI) 16-109, *Foreign Area Officer Program*, 1 June 1998, 3, on-line, Internet, 13 June 2002, available from <http://afpubs.hq.af.mil/pubfiles/af/16/afi16-109/afi16-109.pdf>.

9. Ibid.

10. The Medical Corps is composed of physicians of many specialties. The Dental Corps includes dentists; the Nurse Corps includes nurses; and Biomedical Sciences encompasses a variety of professionals such as optometrists, psychologists, lab officers, social workers, pharmacists, bioenvironmental engineers, health physicists, and public health officers. The Medical Service Corps includes specialists in health-care administration, manpower, and resourcing.

11. *Joint Vision 2020* (Washington, D.C.: Joint Chiefs of Staff, 2000), 30-32, on-line, Internet, 13 June 2002, available from <http://www.dtic.mil/jv2020/jv2020.doc>.

He who has command of the sea has command of everything.

--Themistocles



Review Essay

The Military Use of Space: A Diagnostic Assessment by Barry Watts. Center for Strategic and Budgetary Assessments (<http://www.csbaonline.org>), 1730 Rhode Island Avenue NW, Suite 912, Washington, D.C. 20036, 2001, 130 pages, \$20.00.

On the Edge of Earth: The Future of American Space Power by Steven Lambakis. University Press of Kentucky (<http://uky.edu/UniversityPress>), 663 South Limestone Street, Lexington, Kentucky 40508-4008, 2001, 365 pages, \$39.95.

Astropolitik: Classical Geopolitics in the Space Age by Everett C. Dolman. Frank Cass Publishers (<http://www.frankcass.com>), 5824 NE Hassalo Street, Portland, Oregon 97213-3644, 2002, 208 pages, \$24.50.

Space Weapons, Earth Wars by Bob Preston et al. RAND Corporation (<http://www.rand.org>), 1700 Main Street, P.O. Box 2138, Santa Monica, California 90407-2138, 2002, 201 pages, \$25.00.

Ten Propositions Regarding Spacepower by M. V. Smith. Forthcoming, Air University Press (<http://www.maxwell.af.mil/au/aul/aupress>), 131 West Shumacher Avenue, Maxwell AFB, Alabama 36112-6615, on-line, Internet, available from <http://research.au.af.mil/papers/student/ay2001/saas/smith.pdf>.

No doubt Arthur C. Clarke would appreciate the fact that 2001 saw the emergence of five major works on military-space issues. The interrelationships between space and security remain a critical issue even though right now our collective subconscious would be more likely to contain nightmarish visions of airliners, buildings, and bombing rather than dreams of bones morphing into space planes and space stations to the accompaniment of Richard Strauss's *Thus Spake Zarathustra*. Coming on the heels of the congressionally mandated Report of the Commission to Assess United States National Security Space Management and Organization (Space Commis-

sion) of 11 January 2001, chaired by the once and future secretary of defense Donald H. Rumsfeld, these publications afford a lofty vista from which to assess both narrow issues such as the implementation of the Space Commission's recommendations and many broader concerns. The five publications are also highly complementary in the sense that each focuses primarily on one of the three determinants of defense policy: (1) technology and operations (Watts, Preston, and Smith), (2) domestic politics (Lambakis), and (3) world politics (Dolman). Cumulatively, they give us one of the best opportunities in many years to reassess America's vision for space. In the end, however, when it comes to the interrelationships between space and national security, the nation still faces many more questions than answers.

Barry Watts's *The Military Use of Space* is must reading for any serious student of military space. It is an outstanding assessment of how the use of space is likely to affect US national security through 2025; in many ways, it is the most comprehensive and nuanced of the five publications. Watts is a retired Air Force F-4 pilot and an experienced defense analyst who has written extensively on a variety of topics, including measures of effectiveness, military innovation, Clausewitzian friction, and airpower doctrine. In addition, he coauthored the "Effects and Effectiveness" part of the 1993 *Gulf War Air Power Survey*. He formerly directed the Northrop Grumman Analysis Center and currently is director of program analysis and evaluation in the Office of the Secretary of Defense. Watts's monograph uses the comparative-analysis style of net assessment developed by his mentor and former boss Andrew W. Marshall, the Pentagon's director of net assessment since 1973: "In Marshall's view, net assessment is a discipline or art that relies, above all else, on genuine understanding of the enterprise or business involved rather than sophisticated models, complex systems analysis or abstract theory" (p. 5).

The major findings in Watts's technologically informed assessment are carefully derived and merit close attention even though they are unlikely to excite the mainstream; furthermore, they undoubtedly will be attacked by hawks and doves who believe the United States should be doing a lot more or a lot less in space. This centrist position is

undoubtedly Watts's main message: the United States has its priorities about right in military space; it should continue to upgrade its ability to provide actionable, real-time intelligence, surveillance, and reconnaissance (ISR) data directly to war fighters; and it is unlikely that force application will become a more important space mission than force enhancement before 2025. Watts's specific key judgements include the following:

- The United States has continued and will continue to derive far more military capability from space than any other state, but these significant, space-derived capabilities also create substantial risks and potential vulnerabilities in projecting American military power.
- During the 1990s, the United States began transforming its space-derived ISR from primarily preconflict support for central nuclear war to real-time ISR enhancement of ongoing, nonnuclear conflicts, but it still probably has not realized more than a small fraction of space's potential for force enhancement.
- Growth in commercial and dual-use space technologies is likely to make it harder for the United States to sustain its relative military advantage derived from access to space systems.
- There is a better-than-even chance that force enhancement will remain the predominant military use of space through 2020–25, but it is also not difficult to imagine both trigger events and more gradual paths toward space-force application.
- Although the strategic logic of space power argues that states will eventually feel compelled to field weapons in space to defend their strategic interests and control space, “that day may lie further in the future than is generally thought, especially by space enthusiasts” (pp. 1–2).

Watts also highlights two key implications derived from these judgements. First, a wide gap exists between US Space Command's (USSPACECOM) “assigned responsibilities for space control and its capabilities to execute this mission” (p. 3). Second, a considerable amount of ambiguity is associated with the concepts and definitions of space control and force application. Watts argues that some USSPACECOM and Air Force definitions are neither very useful nor intuitive because, for example, they label conventional or unconventional attacks on terres-

trial targets such as satellite-control facilities as space control rather than force application. More generally, this conceptual ambiguity makes it hard to define what constitutes a “space weapon.” It also foreshadows the notion that any path toward space weaponization is more likely to be a slippery slope with many shades of gray instead of a black or white step, as is too often portrayed. As Watts is careful to point out, his assessment that force application is unlikely to become more important than force enhancement before 2025 applies only to a narrow definition of force application: “Indeed, if force application is construed broadly enough to include terrestrial-based applications of military force aimed at affecting orbital systems or their use, one can argue that space warfare has already arrived even though no space-based weapons are currently deployed” (p. 109).

Beyond his overarching assessments, Watts's monograph is rich in technical detail and filled with useful insights. It is, for example, a great explanation of how space systems have enabled recent air campaigns. His description of the Air Force's use of joint direct attack munitions enabled by the Global Positioning System over the former Yugoslavia during Operation Allied Force in spring 1999 illustrates just how far the United States has come in its use of space power since the Gulf War. Another fascinating insight is the analogy Watts draws between railroads and space: both are very expensive, inflexible networks that had transformational effects on all military operations, yet neither (at least thus far) has emphasized direct-force application or even overt military applications. Likewise, Watts includes a disturbing discussion of how just one high-altitude nuclear detonation could rapidly destroy billions of dollars worth of satellite systems in low earth orbit (LEO) by pumping up the radiation belts through which the satellites orbit. Finally, Watts's analysis and insights regarding the foundational components that led to his overarching assessments are perhaps the most interesting and important part of his monograph. Some of the most important of these observations include the following:

- Breakthroughs in launch technology and radical growth in launch demand are not likely to occur in the next 10 to 15 years.
- Distributed architectures that use much smaller satellites for a variety of functions are likely to begin emerging within the next one to two decades.

- Commercial forces will play an increasingly large role in shaping space systems and services.
- Commercial systems will increase global transparency; governments will have a difficult time controlling these systems; and the security implications of increased transparency are unclear.
- Access to data streams from space may be far less important than the trained people and organizations required to use such data effectively. The United States has a decade-plus head start in this area, but new users of space data are likely to be innovative and unencumbered by Cold War thinking and structures.
- Staring, all-weather, global-surveillance systems are unlikely to be available before 2020.
- Space weapons such as hypervelocity rods for striking terrestrial targets and space-based lasers (SBL) are unlikely to be available before 2025.
- The most likely paths to space weaponization may come from slippery-slope responses to degradation or destruction of ISR rather than a need for ballistic missile defense or a response to high-altitude nuclear detonations; in any event, the United States is likely to have the largest role of any state in the decision to place weapons in space.
- The current overall approach of the United States to the military use of space is best described as “dilatatory drift” because of the legacy of Cold War thinking on our operational concepts, doctrines, and organizations.
- Although the strategic logic of space power favors development of space weapons in the long run, the critical link in this argument is “the assumption that near-earth space will be an economic and military center of gravity for the United States in the foreseeable future. Yet it is precisely this assumption that seems open to question—at least between now and 2025” (p. 111).

Policy makers would be well advised to take careful note of Watts’s comprehensive and well-supported assessments about the military use of space. Because his analysis examines primarily the technological and operational dimensions of

military-space issues, however, we should also look at these matters from other perspectives.

Steven Lambakis’s *On the Edge of Earth*, by far the longest of the five publications, provides a wealth of details on a wide range of factors that contribute to space power. A senior national security and international affairs analyst at the National Institute for Public Policy, Lambakis has published a number of articles on military-space issues, as well as *Winston Churchill: Architect of Peace*. *On the Edge of Earth* contains a broad survey of military-space issues and is a good starting point for readers unfamiliar with military space and defense policy; it is particularly strong in describing the domestic political landscape for military-space issues. Unfortunately, because the book is far more descriptive than analytical, it too often engages in lengthy, general discussions of almost every conceivable space-related topic without boiling them down or blending them into coherent assessments of key space issues. Lambakis’s tendency toward thick description stands out—especially when one contrasts his approach with the more focused, analytical style of Watts, Dolman, Preston, and Smith. Clearly, Lambakis would like to see the United States think more seriously about military-space issues and use space more effectively, but his assessment of the current military-space balance is less clear than Watts’s; likewise, Lambakis’s proposed path forward is less clear than the one prescribed by Dolman.

Lambakis’s book is divided into three parts. The first, “The Vital Force,” is a broad survey that explains the importance of space in terms of its impact on many facets of modern life, the increasing number of space actors worldwide, and the critical kinks between space and US national security. The second part, “In the Arena,” not only describes the complexities of space threats to the United States in terms of our potential adversaries’ use of space, but also explains in considerable detail the threats to US space systems. According to Lambakis, US space policy must overcome complacency concerning threats to our use of space because today’s threats are immature, sparse, evasive, and “viewed generally to be nonlethal” (p. 110). The final part of the book, “Confronting Janus,” uses the two-faced god of Roman mythology to critique “our national dysfunction in space” (p. 205). The first face of US space policy considers space an important military medium—just as land, sea, or air raises the possibility of combat operations in space—and contemplates the prospect that military use of space will one day have a decisive effect on terrestrial combat. By contrast, the second face of our space policy opposes

space weaponization or even greater militarization of space because it sees greater benefits in preserving space as a peaceful sanctuary that provides transparency and other stabilizing functions.

Lambakis shows that our Janus-like approach to space policy has deep, consistent roots by providing an administration-by-administration review of that policy, stretching back to President Eisenhower's "space for peaceful purposes" approach, which he crafted before the opening of the space age. Lambakis's penultimate chapter delves into the domestic politics surrounding current military-space issues by discussing controversial matters such as the changing definition of *space control*, President Clinton's line-item veto of the kinetic-energy antisatellite system, and the testing of the midwave infrared advanced chemical laser. He also examines the spectrum of opinion among political leaders on these issues. Finally, Lambakis's last chapter argues that a comprehensive review of US space policy is long overdue and lays out his ideas on the foundational components that would contribute to such a review.

Lambakis's description of the domestic political landscape for military-space issues is highly detailed and nuanced. It provides great background data for analyzing almost any current military-space issue. But his broad-ranging descriptions are both an advantage and a liability. On the one hand, they provide readers many details and insights into the complexities of domestic politics for military-space issues. On the other hand, because he provides so much description with so little analysis, readers may wonder about the importance of what he says and the way it all fits together. In the end, due to the author's dearth of analysis and his focus on domestic politics, we must again cast our nets more widely in our quest to understand the full range of interrelationships between space and national security.

Everett Dolman, currently a professor at the School of Advanced Airpower Studies at Maxwell AFB, Alabama, has actively studied space issues since 1982 as a space-systems and foreign-area analyst for the US government. His book *Astropolitik* stands in stark contrast to Lambakis's study. Instead of becoming mired in the pulling and hauling of US domestic politics for military space, Dolman's intellectual tour de force jumps straight to world politics at the highest level. He explains how the physical attributes of outer space and the characteristics of space systems shape the application of space power and then uses this *astropolitical* analysis to develop a compelling vision for America to

promote free-market capitalism in space and use space to help provide global security as a public good. His book is intellectually grounded in the best traditions of geopolitics, has something genuinely new to say, and makes vital contributions to the dialogue about the interrelationships between space and national security. Truly a seminal work, it is easily the most important book on space and security since the publication of Walter A. McDougall's Pulitzer prize-winning *The Heavens and the Earth: A Political History of the Space Age* in 1985.

Dolman begins by undertaking the yeoman's task of resurrecting the Nazi-tainted discipline of geopolitics. He then applies geopolitics to space, deriving the astropolitical dicta that guide his analysis. Dolman defines *astropolitik* as "the study of the relationship between outer space terrain and technology and the development of political and military policy and strategy" (p. 15). Following Halford Mackinder's approach, Dolman divides our solar system into four regions: (1) *terra* (Earth and space to a point just below sustained, unpowered orbit); (2) *terran* space (lowest viable orbit to just beyond geostationary altitude); (3) *lunar* space (just beyond geostationary orbit to just beyond lunar orbit); and (4) *solar* space (everything else in the solar system) (pp. 69–70). He argues that "*future lines of commerce and military lines of communications in space will be the Hohmann transfer orbits between stable spaceports*" (emphasis in original, p. 73). Since Hohmann transfer orbits begin in LEO—and all spaceflight must traverse LEO—Dolman identifies this orbit as the first and most important astropolitical strategic narrow or Mahanian choke point. He also describes the astropolitical importance of the geostationary belt, the Lagrange libration points, and the Van Allen radiation belts, as well as explains the advantages and limitations of particular launch sites and satellite fields of view. Dolman captures this analysis in his primary astropolitical dictum: "Who controls Low-Earth Orbit controls Near-Earth space. Who controls Near-Earth space dominates Terra. Who dominates Terra determines the destiny of humankind" (front dust jacket).

In the remainder of the book, Dolman explains the actual evolution of the legal and political regime for space that is dominated by the Outer Space Treaty (OST) of 1967, analyzes how this regime relates to his astropolitical dicta, and lays out a new path forward. He also develops a number of sophisticated social-science arguments on issues such as collective action, the Coase theorem, and the tragedy of the commons, relating them to how a legal and political regime for space ought to operate. Not surprisingly, Dolman finds that both the theory

and practice behind the current OST-dominated space regime are inimical to his astropolitical dicta. He argues that this regime has already stunted the development and use of space and that the United States, as the lone superpower and preeminent space power, should establish a benign hegemony of free-market sovereignty in space. Dolman advocates three immediate steps for the United States: (1) withdraw "from the current space regime and announce it is establishing a principle of free-market sovereignty in space"; (2) use "its current and near-term capabilities . . . to seize military control" of LEO; and (3) establish "a national space coordination authority" to "define, separate, and coordinate the efforts of commercial, civilian, and military space projects" (p. 157). Throughout, however, he is careful to emphasize that America's priorities in space must remain in balance:

The ultimate goal of astropolitics and Astropolitik is not the militarization of space. Rather, the militarization of space is a means to an end, part of a longer-term strategy. The goal is to reverse the current international malaise in regard to space exploration, and to do so in a way that is efficient and that harnesses the positive motivations of individuals and states striving to improve their conditions. It is a neoclassical, market-driven approach intended to maximize efficiency and wealth (emphasis in original, p. 183).

Astropolitik is a stunning intellectual achievement and the first book that can legitimately claim to present a comprehensive theory of space power. It challenges conventional thinking about the status quo for space and will undoubtedly generate a great deal of controversy and provoke many responses. To be sure, many issues are open to debate, such as whether space will really be a virtually limitless source of wealth, as Dolman asserts. Likewise, he spends little time on the technical means by which the United States might assert dominance over LEO and devotes almost no analysis to how and why domestic political forces might align with his astropolitical prescriptions. But one mark of a great book is that it helps to define and structure subsequent debate, and *Astropolitik* has clearly laid down the gauntlet by providing the language and lines of argumentation for future discourse.

The authors of *Space Weapons, Earth Wars* undertake a much more narrowly focused study than does Dolman, but they provide an important, comprehensive, and timely discussion of key technical considerations for near- and mid-term space weapons in terrestrial conflict. This RAND study is

a useful primer on the technological feasibility of space weapons. It helps form the essential foundation for the analysis of paths toward space weaponization, but, perhaps most interestingly, it provides only limited support for the technical efficacy of space weapons. The authors' lack of enthusiasm for these weapons pervades their book. They clearly spell out the assumptions about space-weapon system performance that underlie their analysis, emphasizing that this analysis is sensitive to changes in these assumptions. It is less clear that they give sufficient weight to creative ways in which these systems might be employed, to the synergies that are likely from operating a "system of systems" comprised of dissimilar types of space weapons, and especially to the likely synergies from operating both space and terrestrial weapons. Likewise, because their analysis focuses solely on the potential of space weapons in terrestrial conflict, the authors say far too little about the targets, technologies, and operations for warfare *in* space—despite the fact that the nature of space and of these weapons makes these subjects inherently interrelated and indicates that they should be examined together. Even a very modest space-based ballistic-missile defense system is likely to have a significant antisatellite capability, and any decision to develop and deploy such systems must consider their design and residual capabilities in all mediums and across the spectrum of conflict.

Preston and his coauthors define terms carefully, providing a number of comprehensive and complex technical analyses (the technical appendices with detailed parameters for notional systems are almost as long as the text). They begin by disaggregating the term *space weapons* ("things intended to cause harm that are based in space or have an essential element based in space" [p. 23]) into the four distinct classes of potential weapons of most interest: (1) directed-energy weapons, (2) kinetic-energy weapons (KEW) against missile targets, (3) KEWs against terrestrial targets, and (4) space-based conventional weapons against terrestrial targets. They then analyze each of these four classes of potential weapons in terms of their targets, the medium in which they operate, the weapon itself, and sizing and basing considerations.

The report focuses in particular on assessing the effectiveness of two types of systems against specific terrestrial target sets: (1) SBLs for boost-phase defense against ballistic missiles and (2) KEWs against surface targets. For the first in-depth case, the RAND report assesses the sensitivity of overall system effectiveness based on a number of variables, including the number, type, altitude,

and power of the lasers; various defense-system configurations, including relay mirrors; and different numbers, ranges, and hardness of attacking missiles. Within this range of variables, RAND finds that laser boost-phase defense systems may be able to kill as few as two to as many as 18 salvo-launched ballistic missiles. The authors emphasize that since large satellites such as SBLs “would be extremely difficult to hide or to maneuver enough to be unpredictable,” the orbital parameters of an SBL system would be “predictable and readily available to any opponent sophisticated enough to have ballistic missiles” (p. 33). Armed with this knowledge, opponents would choose the timing and scale of salvo attacks to minimize their losses and, therefore, “only a claim of minimum performance is reasonable” for SBL systems (p. 34). In their second in-depth case, the authors assess a complex set of trade-offs among the variables associated with KEWs against surface targets. They find that “thermal design is the most challenging aspect of this weapons class” and indicate that slender tungsten rods about one meter long “dropped” vertically from elliptical orbits seem to produce the “most bang for the buck” for this class of weapons (p. 139).

Following these technical assessments, the report examines operational and political issues concerning how space weapons might be employed and how the United States and other nations might acquire them. In discussing employment issues, Preston and his coauthors emphasize the importance of attributes of command such as responsiveness, flexibility, precision, cost, and communication in shaping the system’s effectiveness. The report uses four paths to analyze how both the United States and other nations might acquire space weapons: (1) response to a threat by an undeterred adversary, (2) response in kind, (3) acquisition in concert with others, and (4) unilateral acquisition in advance of a compelling threat. The authors further illuminate these paths by discussing how deliberate or incidental outcomes; incremental or monolithic decisions; and issues of scope, sequence, and visibility of implementation can all affect paths toward space weaponization. Finally, they reiterate the overall advantages and limitations of space weapons, concluding that “there is no compelling reason for the United States to acquire them at this time” (p. 107).

M. V. Smith’s *Ten Propositions Regarding Space-power* is a unique study of space power from the perspective of an Air Force officer who has spent several years integrating space-related capabilities

into numerous exercises and real-world combat. Specifically, his study seeks to answer the philosophical question “What is the nature of space-power?” (p. 1). To answer this central query, Smith begins with a crisp history of American space power, tracing its evolution since the end of the Second World War. He makes a very compelling argument that three distinct geopolitical events shaped American space-power doctrine. The first—the Cold War—enticed America into space as a means to spy on the Soviet Union, which also drove America’s early support for space treaties that ensured freedom of access to space. The second event, he argues, was Operation Desert Storm, which demonstrated the military utility of space in conventional warfare. This event occurred in the waning days of the Cold War, when nuclear tensions were greatly reduced. Since that time, the US military has freely sought to exploit space systems as a means of enhancing terrestrial war fighting—and this trend is not expected to accelerate. Finally, Smith points to a future in the wake of the Space Commission wherein military control of space will be essential for success, both economically and militarily. His work is very consistent with Dolman’s on this issue.

Next, in the central part of his work, Smith describes the nature of space power by presenting 10 propositions, supporting each one with historical evidence:

1. Space is a distinct operational medium. Like Dolman, he uses the lower boundary of a satellite in circular orbit as the lower limit of space. Interestingly, he points to the enormous gap between the ceiling of aviation and the floor of space operations, calling this the “transverse region,” an invisible dividing line between the earthly media and the space environment (p. 5).
2. The essence of space power is global access and global presence. Having made the case earlier that, during the Cold War, space provided access to denied areas, he argues that achieving access to all parts of the globe remains perhaps the most compelling reason for putting a satellite on orbit. This point is made by the other authors as well (p. 84).
3. Space power is composed of a state’s total space activity. Space power requires a large national and commercial infrastructure. Smith argues that each element of a state’s space activity must be nurtured to assure progress as a space-faring nation (p. 84).

4. Space power must be centrally controlled by a space professional. Space power is different from other forms of military power because its missions are global in scale. Thus, it would be wrong to manage its assets from a theater perspective, as is the case with most terrestrial forces. Doing so would handicap space power in the same way airpower was handicapped at the outbreak of the Second World War, when it was broken into penny packets under Army control (p. 84).
5. Space power is a coercive force. The mere presence of space-power assets such as reconnaissance and surveillance satellites has already influenced and will increasingly influence actors who wish to conceal certain activities. This flows from the deterrent potential of collection assets that have long been used as national technical means of treaty verification. It is quite likely that some actors are deterred from certain courses of action in the presence of spy satellites. Increasingly, space-power assets are integrating into the sensor-to-shooter loop of active combat operations. This, plus the inevitable emergence of weapons on orbit, signals the expansion of space power's coercive force into the role of compellence in addition to deterrence (p. 84).
6. Commercial space assets make all actors space powers. The advent of commercial vendors selling military-related space products has created a new form of mercenary. The types of asymmetric advantages the super-powers once enjoyed because of their space prowess is quickly eroding because anyone who is able to pay the price can receive certain kinds of space support. Military and law-enforcement planners must take into account the potential for any opponent to exploit these commercial services (p. 84).
7. Space-power assets form a national center of gravity. The fact that more and more segments of society are turning to space-based assets for services makes the relatively few satellites on orbit very lucrative targets for an adversary who has the will and means to strike them. Although access to satellites is seldom a single point of failure, losing access to the vital information collected and carried by them will increase the fog, friction, and cost of operations. In certain circumstances, this may turn the tide against space-faring states, such as the United States (p. 85).
8. Space control is not optional. The increasing reliance on space-power assets by the government, intelligence, military, and business segments of society makes it essential to secure access to satellite services. At the same time, it is equally important to deny adversaries access to their space systems in order to increase their fog, friction, and cost. Adversaries will likely compete for relative control of the space medium; therefore, the United States must take measures to secure its interests in space (p. 85).
9. Space professionals require career-long specialization. Going to space is still difficult. Despite more than 40 years of space-faring experience, we still face numerous technical challenges. Moreover, space operations are so different from any form of terrestrial operations that developing space experts requires highly specialized and recurring education, as well as careful career management (p. 85).
10. Weaponizing space is inevitable. Smith presents the most pessimistic view on this issue, pointing out that wherever mankind goes, weapons follow. Some rock-solid reasons exist for not weaponizing space, but they fail to take into account the technological imperative that often drives human behavior in ways frequently beyond rational thought. When weapons will appear in space is anybody's guess, but political and military pragmatists must assume that someone will put them there and plan accordingly (p. 85).

Smith's work concludes with a brief space-power theory that focuses more on military applications than does the one offered by Dolman. Most importantly, he goes against the current tide inside the Department of Defense by arguing that space power will not usurp missions from other forces, pointing out that even though space systems perform many missions similar to those of their terrestrial counterparts, such as reconnaissance and communications, this in no way eliminates the need to perform these missions in terrestrial mediums as well (p. 94). The fact that space-power assets are always present, even when terrestrial forces are not, he argues, makes the nature of missions performed in space different from the regionally focused missions performed in air, on land, and at sea.

Reviewing these five books draws out points of agreement and disagreement, thus highlighting enduring issues for US national-security space policy. All of the authors agree that space has been and will continue to be important to our national security. In this regard, they independently echo one of the main findings of the Space Commission: “The present extent of U.S. dependence on space, the rapid pace at which this dependence is increasing and the vulnerabilities it creates, all demand that U.S. national security space interests be recognized as a top national security policy” (p. ix). Beyond agreeing on this fundamental point, however, the books have little in common. Two of the greatest points of disagreement concern the economic potential of space and the efficacy of space weapons. Dolman and, to some extent, Lambakis emphasize the economic potential of space; at

least implicitly, both see great potential and utility in space weapons. By contrast, Preston questions the efficacy of space weapons, which, Smith argues, are inevitable, while Watts—an agnostic on space weapons—questions whether space will become an economic center of gravity in the near term to midterm. Cumulatively, as these fundamental disagreements show, national-security space issues provide one of the best illustrations of the complexity of interactions among technology and operations, domestic politics, and world politics that shape American defense policy. Any analysis that attempts to divine America’s future in space in a comprehensive way must assess all of these factors and consider how they interrelate.

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Endure and persist. The pain will do you good.

—Ovid

Luftwaffe Bomber Aces: Men, Machines, Methods by Mike Spick. Greenhill/Stackpole Books (<http://www.stackpolebooks.com/cgi-bin/StackpoleBooks.storefront>), 5067 Ritter Road, Mechanicsburg, Pennsylvania 17055, 2001, 256 pages, \$34.95.

Luftwaffe history is replete with legends of indomitable German fighter pilots. Names of day pilots such as Marseille, Hartmann, and Galland and night pilots such as Wittgenstein, Schnauffer, and Lent are common to students of the Luftwaffe. Little is written, however, about Luftwaffe bomber pilots and crews. These men, many with careers equally as distinguished and important as those of their fighter-pilot brethren, are nevertheless relatively unknown within aviation circles. Like the fighter pilots, they did not enjoy the luxury of combat tours—these men flew until they died or became unfit for combat duty. Several flew over 1,000 missions; when viewed against the backdrop of Allied air superiority and inferior German aircraft performance and pilot training in the latter stages of the war, their feats become even more impressive. Perhaps there is more glory or interest in a man who shoots down 352 aircraft than in crews who leveled the English city of Coventry, but men like Hajo Hermann and Stuka pilot Hans-Ulrich Rudel, the most decorated German airman with 2,530 sorties, made significant contributions to the German war effort.

In *Luftwaffe Bomber Aces*, well-known aviation historian Mike Spick makes a valiant attempt to bring out the legacy of Luftwaffe bomber aviation, taking the reader from the Condor Legion in Spain, the blitzkrieg in Poland, the assault in the West, the Battle of Britain, the war in the Mediterranean and North Africa, the devastating war in Russia, and the Battle of the Atlantic, to Germany's final stand in the West. The final two chapters are devoted to the "bomber aces" as well as the Stuka pilots and crews. Even though Spick includes short combat biographies and highlights the exploits of the pilots and crews, I expected a bit more infor-

mation on these men, considering the title of the book. In light of the author's expert explanations of formations, tactics, and specific missions, however, the omission of additional details about crew members only marginally detracts from this study.

Although I don't believe this volume is quite as readable or polished a work as its companion, *Luftwaffe Fighter Aces: The Jagdflieger and Their Combat Tactics and Techniques* (1996), the author still delivers a decent historical analysis. Adding to the book's appeal are 30 illustrations and 25 diagrams covering men, machines, and tactics of the Luftwaffe bomber arm, in addition to Spick's successful use of detailed explanations and pilot accounts. The author includes in-depth discussions of many weapons, such as the Fritz X guided bomb, the Hs 293 glider bomb, and the Mistel piggyback bomber, but I was a bit surprised at the absence of accompanying photographs. The anemic picture selection leads one to believe that illustrations were not a high priority in the production of this book.

My only complaint is that, in trying to analyze so many different Luftwaffe bomber methodologies, the author at times seems to lose his focus by interspersing too much information. For example, he might have been better off dedicating a single chapter to bomber navigation and blind-bombing techniques. German advances in this area throughout the war, much like those within the Royal Air Force's Bomber Command, were dynamic and inventive. Giving them a chapter of their own would have made for better comparisons and allowed for much more detailed descriptions of the technical aspects of bombing and navigation.

Overall, *Luftwaffe Bomber Aces* is a good book. Greenhill/Stackpole Books and Mike Spick have come through again with a solid publication, and I give them high marks for this effort. Although it may not be a "must buy," it is definitely a "must read" for anyone interested in Luftwaffe bomber tactics, aircraft, or weapons.

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Mason Patrick and the Fight for Air Service Independence by Robert P. White. Smithsonian Insti-

tution Press (<http://www.sipress.si.edu>), 750 Ninth Street NW, Suite 4300, Washington, D.C. 20560-2300, 2001, 192 pages, \$24.95 (hardcover).

It is a sad commentary that airpower historiography has not paid more attention to Maj Gen Mason Patrick, one of the great American airpower pioneers. Bob White's biographical study of Patrick is long overdue. Other than an excellent but unpublished master's thesis by Bruce Bingle and Patrick's own book, published in 1928, we have little more than a tangential historical focus on Patrick. This historical oversight was probably due, in part, to the fact that Patrick alienated some big guns who have claimed most of the historical spotlight.

Ardent, activist promoters of airpower saw in Patrick a sea anchor to progress. One of them, Brig Gen William "Billy" Mitchell, received obvious fanfare that served to eclipse attention toward his superior. Patrick, a careful, politically savvy, and methodical leader, objected to the flamboyant publicist in Mitchell. Patrick also butted heads with Gen Benjamin "Benny" Foulois, who certainly ended up in highly influential positions of leadership. The other famous Patrick contemporary was none other than General of the Air Force Henry "Hap" Arnold, who also did not hold Patrick in high regard, even though he was gracious and professional in recognizing Patrick's seminal accomplishments benefiting the Air Corps. Although Mitchell, Foulois, and Arnold may not have deliberately squelched historical attention on Patrick, historians have obliged such a desire, relegating Patrick to the sideline role of airpower antagonist.

Patrick did have support but generally not from airmen. The man who launched him into prominence was West Point classmate Gen John "Blackjack" Pershing, commander of the American Expeditionary Force in World War I. Pershing recognized a problematic situation of "good men running in circles" on the western front due to stubborn personalities and clashing egos, and he called in his old friend to take command and keep the flyboys in line, providing solid support to the ground effort. Patrick fitted the bill perfectly, supporting Pershing just as Maj Gen Hugh Trenchard supported Gen Douglas Haig, commander of the British Expeditionary Force. Not until years after World War I did Patrick change course in his thinking about airpower and internalize a vision of "air-mindedness."

White argues soundly that Patrick was largely responsible for aerial independence by taking a low-profile, practical, and gradualist approach to

creating effective systems of military airpower, civilian air service, and aerial manufacturing. Well advanced in years compared to most other airmen at the time—he still holds the record for the senior American airman to receive his wings (at age 59)—Patrick provided a steady hand on the yoke at crucial times, such as the transition from the Air Service to the Air Corps in 1926. According to White, Patrick worked within the system rather than against it, using time as his ally.

Mason Patrick and the Fight for Air Service Independence reflects solid research of primary and secondary sources, and it enhances our understanding of an important personality in the early history of American military airpower.

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The Great War and the Twentieth Century edited by Jay Winter, Geoffrey Parker, and Mary R. Habeck. Yale University Press (<http://www.yale.edu/yup>), P.O. Box 209040, New Haven, Connecticut 06520-9040, 2000, 336 pages, \$30.00.

The Great War continues to be fertile ground for historical analysis. Even after more than 80 years, the effects of that war shape the world geographically, culturally, politically, economically, emotionally, demographically, technologically, and militarily. Also after 80 years of analysis, attempts to understand the Great War and its effects still leave many unanswered questions, controversies, and speculation. *The Great War and the Twentieth Century* is an important part of the continuing inquest into this fascinating and unresolved story.

Setting a slightly different course than many World War I historical studies that tend to focus narrowly on familiar areas like the western front, this collection of articles looks through broader lenses to help the myopic student of history. Its intention is to explore different historical perspectives of the "causes, conduct, and consequences" of this near-total-war event. In so doing, the book effectively brings together important interactions of factors: war and society, strategy and politics, and personality and technology. Mary R. Habeck's piece is a particularly interesting and entertaining treatment of that last pair.

The book's broad perspective spans time as well, flaring into the atmospheric context of contemporary world geopolitics and returning full circle to

bedrock elements of the war to end all wars. Editor Geoffrey Parker says the articles display present-mindedness—and they do. Fortunately, they do not display historicism as well.

As noted in the acknowledgments, it took six years for this book to come out. No doubt the editors struggled with trying to bring together a collection of articles and their corresponding themes into some coherent whole. They succeeded fairly well, but the delay was unfortunate. Perhaps by design, some of the book's real gems, such as Holger Herwig's "myths" piece, appear toward the back of the book.

Regardless of the particular topic of the Great War, the themes of tragedy and sacrifice haunt all others. This was a gruesome, hideous war. Yet, as Sir Michael Howard opines, considering the alternatives, the tragedy of the Great War was a worthy sacrifice for the future of Europe and the world. Hopefully so.

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Liaison 1914 by Edward Spears. Sterling Publishing Co., Inc. (<http://www.sterlingpublcom/search/SearchBookDisplay.asp?BookKey=66929>), 387 Park Avenue South, New York, New York 10016, 2001, 624 pages, \$21.95.

This book is the work of (then) Lt Edward Spears (later general) and is basically a memoir of his experiences as the British liaison officer with the French Fifth Army in August and September 1914. The Fifth Army was on the far left flank and faced the brunt of German invading forces that were executing the Schlieffen Plan. Spears's eyewitness narrative gives a detailed discussion of this dramatic time at the beginning of the Great War and is filled with penetrating observations, analyses of leadership and operations, as well as numerous humorous and tedious anecdotes. For those readers interested in airpower, there are also a few illuminating discussions of the early days of aviation.

Spears's lengthy memoir begins with a description of a resigned and stoical attitude that was pervasive in France at the outbreak of the war. The general absence of enthusiasm for the war is now a view that modern-day, scholarly historians such as Jean Jacques Becker have adopted over six decades after the conflict. Spears argues that prewar army

training did not prepare the French to fight the Germans.

One of the lessons that today's military professionals can draw from Spears's memoir is to note the difficulties involved with coalition warfare. There were very poor relations between the British commander, Field Marshal Sir John French, and the Fifth Army commander, Gen Charles Lanrezac. When they met on 16 August, the British commander, through a translator, asked the French commander if he thought the Germans were going to cross the Meuse River at Guy. Lanrezac responded impatiently, "Tell the Marshal . . . that in my opinion, the Germans have merely gone to the Meuse to fish" (p. 75). The relationship between Lanrezac and French continued to deteriorate until the eve of the Battle of the Marne. Throughout the month of August, the French Fifth Army continued to retreat, leaving the British Expeditionary Force (BEF) dangerously exposed. By the time of the Battle of the Marne, the British thoroughly distrusted the French, and it took an intervention by the secretary of war, Lord Herbert Kitchener, to get the BEF to fight in the Battle of the Marne. All of this is chronicled in Spears's memoirs. Spears does not discuss this part of the battle with overtly pro-British bias or strong animus against the French, and, in fact, he shows strong sympathies for the French Fifth Army. In the end, we can see that the failures of coalition warfare led to the initial successes of the Schlieffen Plan.

In this detailed work, there are several glimpses of airpower. Of French airpower, Spears says, "The French had very few aeroplanes at this time, some of these were not particularly reliable and the aviators were being worked to death" (p. 72). It was difficult to deploy aircraft because French infantrymen tended to shoot at everything that flew. Nonetheless, Spears does show that Allied air reconnaissance played a crucial role. Gen Joseph Joffre was able to develop a counteroffensive attack against Gen Alexander von Kluck at the pivotal Battle of the Marne, partially because of air reconnaissance. Not only is the author able to demonstrate the impact of airpower at the strategic level, he shows its importance at the tactical and operational levels as well. He also shows how the Germans used aircraft for effective artillery spotting (p. 144).

Another valuable contribution made by Spears in *Liaison 1914* is his illuminating and detailed discussion of staff work. He discusses the very difficult conditions under which British and French staffers

worked, especially doing staff work while retreating. The atmosphere was depressing and exhausting—"Many officers collapsed completely" (p. 234). He does point out that General Lanrezac, a highly unsuccessful army commander, was a professor at the French staff college before the war.

There are several criticisms that can be made of Spears's *Liaison 1914*. Scene-setting introductions written by a professional historian would be helpful to readers. In places, Spears departs from his narrative of the events of August–September and discusses aspects of the Great War that happen much later in the conflict. At times, the reader is dropped in medias res with no introduction of key players or context. In places, the author disrupts the narrative flow with humor or tedious anecdotes that distract from and obfuscate some of the points he is trying to make.

In the end, this book is a valuable primary source for the professional historian of the Great War. Not only is the text of the memoir valuable, but the 80-plus-page appendix is filled with printed orders and orders of battle. Throughout the text there are numerous clear and helpful maps that geographically orient the reader. Numerous analytical lessons can be drawn from this text, and contemporary military professionals can profit from reading it. Thus, this work remains a classic—a valuable resource for military professionals and scholars alike.

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Wingless Eagle: U.S. Army Aviation through World War I by Herbert A. Johnson. University of North Carolina Press (<http://uncpress.unc.edu>), 116 South Boundary Street, P.O. Box 2288, Chapel Hill, North Carolina 27515-2288, 2001, 320 pages, \$34.95.

Despite the groundbreaking flights at Kitty Hawk in 1903, US military aviation started with a cough and a stutter. Orville and Wilbur Wright had heroically launched the adventure into flight, but their subsequent legal battles over claims to the patent on heavier-than-air craft seriously delayed future development, particularly on the part of potential competitors. The understandable public and congressional reaction to numerous crashes and fatalities involving early flying created further obstacles to military aviation. In addition, military

aviators' concerns about careerism as well as their lack of professionalism and personality clashes added to the friction against progress. Consequently, after years of ample warning in terms of wide publicity in books and the media, after the embarrassing aerial fiasco during the punitive expedition against Pancho Villa across the Mexican border, and after years of observing aerial combat in war-torn Europe, America still found itself woefully unprepared to fly or fight in the air in April 1918, a year after declaring war.

Herbert A. Johnson's *Wingless Eagle* is an important study of these and many other struggles during the birth of military aviation. Through extensive research of primary sources, he analyzes the culture of early flying to determine why the United States trailed the rest of the modern world in aerial progress. The answer lies in personalities, technology, politics, and organization. It involves a lack of vision, misperception, and parochial bickering. But as Johnson points out, some of the traditional story about the Army General Staff's inertia is unsound. More accurately, fickle public perception leading to lagging presidential and congressional support, along with organizational inefficiencies and unprofessional attitudes within the Signal Corps, stunted the growth of military aviation.

Johnson's efforts reflect an impressive amount of research, but its packaging suffers slightly due to the organizational challenges of trying to mix themes and chronology. Parts of the resulting product are disjointed and potentially confusing. For example, his coverage of the air war in Europe, mostly a recap of British official history, is so shallow that it misleads readers and detracts from his thesis. But minor organizational problems do not negate the book's strength of research and analysis of often-overlooked aspects of the infancy of airpower. *Wingless Eagle* adds to the scholarship of studies on early American aviation and should be a part of professional and personal libraries.

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Hell in Hürtgen Forest: The Ordeal and Triumph of an American Infantry Regiment by Robert Sterling Rush. University Press of Kansas (<http://www.kansaspress.ku.edu>), 2501 West 15th Street, Lawrence, Kansas 66049-3905, 2001, 400 pages, \$34.95.

The guns had barely cooled from World War II when the US Army's performance came under scrutiny. Historian S. L. A. Marshall set the tone in 1947 with his *Men against Fire: The Problem of Battle Command in Future War*, which argued that, at best, only 25 percent of soldiers had fired their weapons—and these men were elite troops, like rangers and paratroopers! Later studies such as Col Trevor N. Dupuy's *Numbers, Prediction, and Wars: Using History to Evaluate Combat Factors and Predict the Outcome of Battles* (1979), Russell F. Weigley's *Eisenhower's Lieutenants: The Campaign of France and Germany, 1944–1945* (1981), Martin van Creveld's *Fighting Power: German and US Army Performance, 1939–1945* (1982), and John Ellis's *Brute Force: Allied Strategy and Tactics in the Second World War* (1990) argued that the Allies bludgeoned their way to victory with superior numbers.

Nearly all of these authors criticize the US Army for its replacement system and the number of divisions fielded. Known as the 90-division gamble, the plan involved creating a small number of divisions but keeping them at full strength with a huge replacement pool. In theory this was a great idea, but in practice it did not work well. Fighting on four fronts (Italy, France, the Central Pacific, and the Southwest Pacific) forced commanders to keep units there too long, and the latter rarely had the opportunity to pull back for rest and refit. Consequently, as the argument goes, replacements went directly into combat with little opportunity to acclimate themselves either to the unit or to combat conditions, resulting in a reduction of effectiveness.

With the publication of Keith E. Bonn's *When the Odds Were Even: The Vosges Mountains Campaign, October 1944–January 1945* in 1994, this image has undergone reevaluation. The terrain, weather, and enemy strength favored the Germans, yet US troops successfully overcame these disadvantages to defeat a battle-hardened and tenacious foe. Besides Bonn's work, the University Press of Kansas has published a trilogy that directly challenges the Army's detractors. Michael D. Doubler's *Closing with the Enemy: How GIs Fought the War in Europe, 1944–1945* (1994) argues that the US Army entered France on D day as a green, untested force, but its ingenuity, imagination, and flexibility enabled it to adapt to new and unforeseen situations quickly and defeat the Germans. Instead of exhibiting a "how stupid they were attitude," Doubler presents an army that expanded from roughly 160,000 men in 1940 to over 8 million by 1944, successfully invaded France, and within 11 months destroyed the German army in the west.

Peter R. Mansoor's *The GI Offensive in Europe: The Triumph of American Infantry Divisions, 1941–1945* (1999) takes Doubler's work a step further by examining the performance of US infantry divisions. Contrary to the stance of van Creveld and others, Mansoor maintains that the American Army was more effective than the armies of its adversaries. He agrees that the replacement system was not ideal but argues that the Army took steps to mitigate its disadvantages and generate the combat power necessary to defeat the enemy.

Robert Rush completes the triune with *Hell in Hürtgen Forest*, which examines the 22d Infantry Regiment of the 4th Infantry Division. He argues that the US replacement system, though flawed, was superior to the German system. In the book's first section, Rush describes the training, terrain, and organizational history before lapsing into the second section's rather tedious narrative of the battle, which describes in excruciating detail the daily actions of each battalion. In the third and by far the most important and interesting section, he provides a unique view into the tactics and motivation of American fighting personnel, arguing that the regiment remained combat effective as long as a cadre of veterans existed to lead the replacements. Until Hürtgen Forest, this band averaged 35 percent of the total regimental strength. However, the battle slashed that figure to 3.5 percent, destroying the regiment's effectiveness.

Conversely, by November 1944, the German army found itself on the verge of collapse. The divisions facing the 22d Infantry consisted largely of old men, young boys, military and security detachments, and convalescents. Rush argues that German divisions grew increasingly anemic, remaining in combat without replacements until bled white. At that point, the division headquarters and support troops were pulled back to refit. However, the relieving division simply absorbed the surviving infantry. The German system provided a core of rear-area support troops to rebuild the division but few veterans to train the replacements. To counter the argument that the German army was a more cohesive force, Rush cites numerous examples of the enemy's cohesion collapsing. For example, during the Hürtgen battle, 22d Infantry lost fewer than 40 men and took over 700 prisoners.

Unfortunately, Rush sometimes stretches his analysis too far. For instance, he asserts a correlation between the number of messages the regimental commander sent to his subordinates and the number of casualties that day. His assertion is

dubious at best. A quick statistical analysis shows that very little, if any (less than 3 percent), correlation exists between the two. In fact, further analysis shows more correlation between time and messages. This would not mean that the progression of time caused the regimental commander to communicate with his subordinates; however, it might indicate that as casualties mounted and as the unit absorbed green troops, the commander increasingly had to micromanage subordinate units.

Notwithstanding these statistical problems, *Hell in Hürtgen Forest* makes a significant contribution to our understanding of the effectiveness of the American soldier. Like other reevaluations of the past decade, Rush's book accepts that the Army's replacement system had serious shortcomings but maintains that it was not as bad as historians like van Creveld would have us believe. At least by November 1944, it was better than the German system. Rush's work belongs on the shelf alongside Marshall's, van Creveld's, Doubler's, Mansoor's, and all the other studies of Allied and German fighting power.

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The Global Century: Globalization and National Security edited by Richard L. Kugler and Ellen L. Frost. National Defense University Press (<http://www.ndu.edu/inss/press/ndup2.html>), Fort Lesley J. McNair, Washington, D.C. 20319, 2001, 1,125 pages, \$59.00. Available on-line at <http://www.ndu.edu/inss/books/GlobalCentury/globalcent.html>.

With 1,125 pages and 49 chapters organized into five parts in two volumes (three inches thick and weighing in at five and a half pounds), this ambitious project can almost serve as an encyclopedia of American perspectives on globalization and US strategic interests. The collected essays are thorough, to be sure, and the contributors are established heavyweights in the field of security studies, with some new but qualified faces. However, a bias exists, which remains undetected until one reads the foreword and acknowledgments.

The US Navy undertook this project, and Jerry MacArthur Hultin, that service's undersecretary and author of the foreword, charges the analysts with examining how the current globalization trend will affect the United States and how the use

of naval power can respond to globalization. This service bias continues in part three, "Military Power: The Challenges Ahead," with most of its 10 chapters devoted to the naval perspective. This specific focus needs to be acknowledged up front. The volumes ignore airpower by omission even though it has become a more prominent feature in recent warfare. The Navy will not face the challenges of the global century by itself.

With so many chapters, the reader encounters many individual elucidations of what globalism is, as well as much overlap, and the editors could have reassigned some of the chapters to different parts. The study also lacks some kind of concluding or summarizing chapter. As it stands, the book merely ends with Canada, the last country addressed in part five, "Regional Trends: Promise or Peril?" Given the authoritative qualifications of the contributors, there is a lot of nonnaval information presented for a wider audience. *The Global Century* is well written and attractively packaged but too voluminous to serve as a university textbook; furthermore, the title is too misleading, the intended audience has not been clearly identified, and the volumes are too heavy for reading while waiting for your flight to depart.

Dr. Karl P. Magyar
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No Gun Ri: A Military History of the Korean War Incident by Robert L. Bateman. Stackpole Books (<http://www.stackpolebooks.com>), 5067 Ritter Road, Mechanicsburg, Pennsylvania 17055-6921, 2002, 288 pages, \$22.95.

In 1999 a trio of Associated Press (AP) investigative reporters collaborated on a series of articles that garnered them a Pulitzer prize. These articles purported to tell the previously unknown story of how US soldiers followed orders in gunning down hundreds of South Korean civilians on 26 July 1950 as they hid under and around a railroad bridge near the village of No Gun Ri. These startling revelations spurred the Army's inspector general to launch an investigation to determine the facts. These same reporters also produced a book entitled *The Bridge at No Gun Ri: A Hidden Nightmare from the Korean War* (2001). The only problem with the articles and the book is that the events they describe did not happen!

Robert L. Bateman presents a compelling and conclusive case about how one man's war story can

be spun into a national scandal. He shows that the four main sources for the AP stories were not even present at the events they related and that the incident was faked from start to finish. He notes how three of the sources probably assimilated the story from the main source, who not only didn't participate in the events, but also had been impersonating an officer since the 1980s. Furthermore, he had created a military record of heroism designed to place him in the company of legitimate combat heroes.

While fakery among veterans is a shameful and, unfortunately, an all-too-common occurrence, the author details how the AP reporters and editors took pains to hide the readily apparent truth because the made-up story fitted their preconceived antimilitary prejudices, helping them win the Pulitzer prize. Bateman uses his experience as a military officer, his academic discipline as a trained historian, and his presentation skills as a writer to lay out the entire story. He systematically dismantles the AP story and reassembles it to produce the truth about the military events at No Gun Ri, revealing how the investigative journalists manufactured the story even though they had the facts in their possession.

Anyone interested in military history should read this book not only to learn the facts, but also to become familiar with a primer to the genre. Bateman's intertwining of the disciplines of military history and investigative journalism results in a decent how-to book for anyone interested in knowing how a military history is crafted. In so doing, he presents a course in critical reading of inestimable value. Whether or not they are interested in this particular incident, people who consider themselves military historians should read *No Gun Ri*.

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Jane's Battles with the Luftwaffe: The Bomber Campaign against Germany, 1942-45 by Theo Boiten and Martin Bowman. HarperCollins (<http://www.harpercollins.com/hc>), 10 East 53d Street, New York, New York 10022, 240 pages, \$44.95.

In the skies over Western Europe from 1942 to 1945, men of the British Royal Air Force, US Army Air Forces, and German Luftwaffe fought the greatest air battles the world has ever seen. Never

before—or since—have so many airmen participated in the deadly struggle for air superiority. In *Jane's Battles with the Luftwaffe*, the authors have done a superlative job of bringing this heart-stopping action to the reader. Perhaps more importantly, they successfully deal with personal aspects of the air war and give the reader a sense of what it must have been like to fly and fight in the extreme cold of an unpressurized B-17 or B-24 or to fly an Me-109 through a formation of bombers with hundreds of machine guns intent on killing you.

Jane's and HarperCollins have brought together two outstanding authors to produce a book of timeless quality. Dutch historian Theo Boiten has written five books, most of them dealing with the bomber offensive, and Martin Bowman has authored over 60 books on US Air Force, US Navy, Royal Navy, and Royal Air Force operations. The compilation of their talents has produced a substantial and intriguing historical document.

Although lavishly illustrated with over 300 never-before-published photographs, many from the personal files of the men who flew these combat missions, *Jane's Battles with the Luftwaffe* is no mere coffee-table book. Although these amazing pictures do tell a tale, this book unlocks the door to the minds, attitudes, and fears of the men who fought and died in these great air battles. The authors do this by including hundreds of quotations from the German and American fighter pilots, bomber crews, and flak gunners. To understand or try to comprehend the loss of 60 bombers on a single mission is one thing. To "stand" in the fuselage of a B-17 as it is being pummeled by German 20 mm shells as your best friend's body is reduced to some unrecognizable goo is another. These personal stories—intense, powerful, and enlightening—are a must read, separating this book from many of its rivals.

The photographs and personal experiences, coupled with well-written and scrupulously researched narratives, make *Jane's Battles with the Luftwaffe* an outstanding book. It is very readable and full of information that any World War II aviation historian or enthusiast will want to read. Likewise, the authors' use of both primary and secondary sources results in a work that is both believable and consistent. Boiten and Bowman have added significantly to the study of the bomber offensive in Europe; their book will enhance any personal library.

Lt Col Robert Tate, USAFR
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War Wings: The United States and Chinese Military Aviation, 1929–1949 by Guangqiu Xu. Greenwood Publishing Group (<http://info.greenwood.com>), 88 Post Road West, Westport, Connecticut 06881-5007, 2001, 264 pages, \$64.95.

The transfer of lethal technology, the problem of governmental corruption, the dangers of national division, and the competition between US and European firms over the Chinese market may all sound like elements that complicate contemporary relations between the United States and the People's Republic of China (PRC). However, in this fascinating new book, we can see how they have been long-standing issues between the two powers. By reading this richly detailed account of US and Chinese relations that span the years of Nationalist China and the birth of the PRC, the reader will gain a unique perspective for understanding how America's relationship with China might evolve in the future.

The book is a solid account of China's historic preoccupation with national unity and that country's perception of how a new technology of the times—airpower—could help achieve this goal. The author begins in 1926 with the Nationalist Party's attempt to consolidate its power over local warlords, who remained fairly powerful in their provinces. As a largely rural country trying to shake off its feudal past, China lacked a modern transportation infrastructure, such as roads and railways, that the Nationalists could use to extend and consolidate their rule. Without an indigenous aviation industry, China had to look outside its borders for assistance and found it in the United States, among other countries. So begins a relationship that became both beneficial and troublesome for each but which remains a central focus for many members of the international community.

The most interesting quality of the book is the way it resonates with the reader's own knowledge of present-day China. The promise of airpower as a tool for national unification continues to occupy the imagination of the PRC's present leaders. The People's Liberation Army Air Force is seeking to rapidly modernize its force structure to conform to the senior leadership's belief that air operations across the Taiwan Straits would prove critical to any military victory.

Written chronologically, in clear and concise sentences, *War Wings* details the equipment and types of aircraft sold to China between 1929 and 1949 but does not descend into monotony. The

strength of the book, however, lies in its description of Chinese domestic politics and the role that individual Americans played in this 20-year period—witness the interesting account of Jimmy Doolittle and Claire Chennault assisting China in its campaign against Imperial Japan. Some of the tactics employed by these two men in China were later adopted by the United States during World War II. In many respects, China became a laboratory for their ideas about the effective employment of airpower.

Continuing through the book, the reader is struck by how the past conjures up images of the future. After the fall of China to the communists, Mao Tse-tung gained control of many of America's aircraft that had been part of Nationalist China's force structure. This raises an interesting question about American assistance to Taiwan: What happens to American military hardware sold to Taiwan over the decades if peaceful reunification between China and Taiwan occurs?

The resonance of this study with the future also highlights one of the book's most obvious oversights—the omission of a map of China during the time under consideration. *War Wings* is full of references to cities and provinces whose names have changed. Although the book includes a map of *present-day* China, it does not help the reader who may not know the current locations of old "Beiping" and "Canton." This fault, however, does not detract from the book's informativeness, relevance, and significance.

Paul Rexton Kan, PhD
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Reluctant Allies: German-Japanese Naval Relations in World War II by Hans-Joachim Krug et al. Naval Institute Press (<http://www.usni.org/press/press.html>), 2062 Generals Highway, Annapolis, Maryland 21401-6780, 2001, 456 pages, \$38.95.

After more than a half century, writers continue to produce new historical interpretations of World War II. Among such books, *Reluctant Allies* falls in the middle of the worth-reading scale. Part of its uniqueness is due to its authors: four men who approached the subject from German and Japanese perspectives but wrote in English to reach a wider audience. One of them, Capt Hans-Joachim Krug, served in German submarines in the Indian Ocean theater. Another, Rear Adm Yoichi Hiram, spent a

career in the Japan Maritime Self-Defense Force and is a noted military historian.

The alliance between Germany and Japan covers three periods, from its inception during the prewar years that began in 1934 to its defeat by Allied forces in 1945. The first period started with active steps taken by the Japanese navy to establish closer relations with the German navy around 1934–35 and featured Japan's interest in German military ordnance and technical innovations. The second period began in 1938, centering on partner perspectives based on an assumed armed conflict with Anglo-Saxon sea powers. The third phase commenced when the German and Japanese navies finally found themselves at war with both the Royal Navy and US Navy in the early 1940s.

The authors highlight the differing opinions of German and Japanese leaders and their mutual distrust regarding naval foreign policy, war planning, and domestic situations. A significant disparity also existed between Japan's big-ship-navy approach and Germany's smaller navy, which relied on submarine warfare.

The common ground that bound the two was the Indian Ocean. In spite of diverging views and great geographical distances between them, these reluctant allies came together to conduct naval operations that could have had disastrous consequences for the Allies—that is, if everything had worked and if luck had been on their side. After many blockade-running ships were sunk, Axis submarines were reduced to transporting small loads of critical cargo and passengers—too little, too late. Most of the subs never reached their destinations.

Reluctant Allies fills a void in the literature of World War II naval operations. For true scholars, its narrative and extensive German and Japanese source documentation have merit. But readers interested in air operations will not find much here. Nevertheless, it is useful to understand how two powers, reluctant though they were to join forces, both succeeded and failed in fighting together.

Dr. Frank P. Donnini
Newport News, Virginia

Rolling the Iron Dice: Historical Analogies and Decisions to Use Military Force in Regional Contingencies by Scot Macdonald. Greenwood Publishing Group (<http://info.greenwood.com>), 88 Post Road West, Westport, Connecticut 06881-5007, 2000, 247 pages, \$72.50.

Scot Macdonald, who lectures at the University of Southern California, specializes in analyzing the rationale behind the employment of military force in regional contingencies. This book is a culmination of years spent writing about and teaching this subject. Leaders often rely on historical analogies to formulate policy and reach decisions regarding the use of force. They also use history to persuade allies and their own government of the righteousness of their cause. Macdonald looks at four foreign interventions, starting with Korea and ending with the 1958 Anglo-American intervention in Lebanon and Jordan. Each of these cases offers a unique perspective on how history is used to justify or argue against military intervention.

The first part of the book provides short biographies of the decision makers involved in the different crises featured. They include Prime Ministers Anthony Eden and Clement Atlee of Britain as well as Americans John Foster Dulles and Dean Acheson. Readers will be surprised to know that a few of these people neither had a passionate interest in history nor derived any precedent from it. Some were hard-nosed lawyers swayed more by facts than historical analogy; many others saw themselves and their actions in a historical context that would be judged by future generations.

The second part begins with the Korean War, in which the events of World War II influenced the allies into making a decision to commit forces. Historical analogies included the appeasement of Hitler in Munich and the notion that the United Nations would not fail, as had the League of Nations before World War II. History played a pivotal role in American involvement in Korea, resulting in the commitment of US forces to the peninsula.

History also had a hand in dealing with the nationalization of Iranian oil by Mohammed Mossadegh in 1953. President Harry Truman wanted no part of foreign adventures in Iran despite British pressure to assist in the removal of Mossadegh. With the administration of President Dwight Eisenhower, British Intelligence and Foreign Office personnel conjured up the illusion of a Red scare, using recent analogies such as the loss of China to communism and the instability of Mossadegh to predict the encroachment of Iran's Tudeh (Communist) Party into Iran's government. Mossadegh, however, was a popularly elected prime minister and ardent nationalist. The coup to topple him succeeded and bought 25 years of a government friendly to Anglo-American interests under the Shah. However, the price for action was the backlash of the Iranian revolution of

1979, manifested in the Ayatollah Khomeini and the use of historical analogy to create an unyielding distrust of the West. It is interesting to note that the British argued for direct military action but were swayed by a more clandestine approach that used the Central Intelligence Agency and British MI-6.

The Suez crisis of 1956 saw president Gamal Abdel Nasser of Egypt nationalize and seize the Suez Canal, refusing to allow Israeli shipping to pass through. Nasser had been a thorn in the side of England and was the chief architect of dismantling the Central Treaty Organization, composed of members Pakistan, Iraq, Iran, and Jordan, and designed to encircle and contain the Soviets. Nasser's anticolonial and antimonarchy message was also heard on radio broadcasts that destabilized the Iraqi, Saudi, and Jordanian monarchies. Furthermore, he was involved in clandestine operations against the French in Algeria through his support of the National Liberation Front. The British compared Nasser to Mussolini and Hitler, even likening his book *Philosophy of Revolution* to Hitler's *Mein Kampf*. Anyone who took the time to read both works would have found the claim absurd since Nasser strove toward Arab self-determination and his rhetoric was a response to Arabs' feeling that foreign powers controlled their destiny. This galvanizing atmosphere led to the planning of Operation Musketeer, which called for an Israeli invasion of the Sinai up to the eastern side of the Suez Canal and military occupation of the canal by Anglo-French forces under the guise of a peacekeeping force. The problem was that the three governments left the United States out of their plans and did not consider the Cold War danger of Soviet intervention to assist a client state (Egypt). The invasion went ahead, but the Soviets protested, and Eisenhower issued ultimatums to France and Britain, resulting in a political victory for Nasser and a lesson on the abuses of historical analogies in formulating policy.

The book ends with Anglo-American intervention in Lebanon and Jordan in 1958. With the toppling of Iraq's monarchy that year, Baghdad was up for grabs, and Nasser inflamed the Iraqi military regime's socialist and anti-Western feelings. Also, Syria had concluded a union with Egypt, forming what became the United Arab Republic. The Jordanians and Lebanese felt it would be only a matter of time before a coup stimulated by Nasser would occur, so they asked for Western help. The most influential historical analogy used in this cri-

sis was the West's loss of China to communism after spending millions of dollars propping up the nationalist forces of Sun Yat-sen. However, Lebanese Christians represented a ruling minority among the Sunni and Shiite Muslims sympathetic to Egypt, whereas the Chinese civil war involved two parties, and Lebanon had several spheres vying for power. Nonetheless, on the strength of this analogy, Washington sent marines into Lebanon; and Britain, stinging from the Suez crisis, needed little prodding to commit British forces to protect Jordan's monarch.

Rolling the Iron Dice offers many lessons on the use of history to justify policy, and Macdonald urges decision makers to use caution when they compare crises to past events. Since people, time, and technology do not stand still, one should not place a blanket label on petty dictators or strongmen by labeling them Hitlers or Mussolinis. Doing so will prevent analysts from truly understanding their adversaries. In short, the author has done a commendable job, and I highly recommend his book to readers interested in strategy and policy.

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Making War, Thinking History: Munich, Vietnam, and Presidential Uses of Force from Korea to Kosovo by Jeffrey Record. Naval Institute Press (<http://www.usni.org/press/press.html>), 2062 Generals Highway, Annapolis, Maryland 21401-6780, 2002, 216 pages, \$28.95 (hardcover).

Jeffrey Record is well qualified to write on the use and misuse of analogy in presidential decisions about war. Currently, he is a professor in the Department of Strategy and International Security, Air War College, Maxwell AFB, Alabama. Among his more than a dozen publications are *Revising U.S. Military Strategy: Tailoring Means to Ends* (1984); *Hollow Victory: A Contrary View of the Gulf War* (1993); and *The Wrong War: Why We Lost in Vietnam* (1998). Record was assistant province advisor in the Mekong Delta during the Vietnam War; worked at the Brookings and Hudson Institutes as well as the Institute for Foreign Policy Analysis; and served as a staffer for Sen. Sam Nunn (D-Ga.), Sen. Lloyd Bentsen (D-Tex.), and the Senate Armed Services Committee.

In *Making War, Thinking History*, Record does something that hasn't been done before, and he does it well. The misuse of analogy in war-making

decisions has received limited study, starting with Ernest May's *"Lessons" of the Past: The Use and Misuse of History in American Foreign Policy* (1973). Other scholars have carried May's work forward, especially Yuen Foong Khong in his masterful *Analogies at War: Korea, Munich, Dien Bien Phu, and the Vietnam Decisions of 1965* (1992). Robert Jervis authored another groundbreaking work, *Perception and Misperception in International Politics* (1976), which tied the imaginable range of decisions to the decision maker's perceptions and misperceptions of previous events. Record provides a major update and applies the theory to the previously neglected decisions to not go to war.

Truman used the analogy of Munich in Korea but not in China (he let it go Red). Eisenhower used it in Lebanon but not in Vietnam. Munich remained an analogy of choice, even as the Munich-based decisions took life as analogies of their own. As each operation unfolds, the inventory of available analogies to use or misuse grows. But for the most part, the defining choice is still Munich, which defines the pitfalls of appeasement and the failure to stop aggression early on. Vietnam remains a popular analogy even though it is more difficult because no consensus exists on the war's lessons. One finds a strong fear of quagmires and a concern for clarity of purpose, sufficiency of force, and a clear exit strategy characterized by the Weinberger-Powell school—as well as a force-protection fetishism.

Peripherally, Saddam Hussein used analogies from Lebanon and Vietnam suggesting that America was militarily timid and afraid of force. So did Slobodan Milosevic. Mixed analogies from Munich and Vietnam led President George Bush to act properly in Operation Desert Storm but to leave Saddam as the unfinished business for succeeding US presidents.

Most presidents "have used force on behalf of nonvital interests, in the absence of public and congressional support, and not always as a last resort" (p. 135). But analogy is not the only factor in a given decision. Other factors include domestic politics, bad advice, or poor knowledge of history. No single consideration forces action—not even an apt analogy. President Lyndon Johnson ignored the lessons of Dien Bien Phu and China, opting for the Munich analogy as his guide down the slope to the Vietnam War.

Analogies become obsolete. Even if Munich and Vietnam are no longer reliable, they may well be dangerous. But the new analogy—the revolution in military affairs (RMA)—has little merit. Belief in

technology is the popular analogy from Operations Desert Storm (1991), Deliberate Force (1995), and Allied Force (1999)—as well as all of the operations that will follow this book. Beware! "If the United States could use force casually, without the accountability imposed by the risk of death and defeat, might it not become the arrogant global bully that its enemies today accuse it of being? And what of the warrior ethic? How does it survive warfare without risk?" (p. 154). More important, RMA doesn't stop asymmetrical responses, which will be on the rise as our power becomes even more overwhelming and we keep living with the Weinberger-Powell myth to which President George W. Bush signed up as a candidate.

Record uses analogy himself in comparing Weinberger-Powell's last-resort use of force to appeasement in terms of inflexibility and perhaps inevitability if the enemy understands all that goes before to be bluff and bluster and just a slide down the slope. At what point does one reach the last resort? This is a hard choice for decision makers, who sometimes guess wrong. Weinberger-Powell still incorporates the worst lesson of Vietnam—that body counts are always bad. According to Record, "If the Munich analogy encouraged early use of force, the Vietnam analogy's corollary of what I have elsewhere chosen to call 'force protection fetishism' encourages military timidity, even paralysis" (p. 142).

Making War, Thinking History is really good, even beyond the update. Record's long experience shows, and virtually every page has at least one sentence worthy of a full book. His skill at presentation is extremely sharp, making the book a joy to read. Remember that "if George Washington had insisted on the certainty of swift victory via overwhelming force, the Union Jack might still be flying in the capital city that today bears his name" (p. 133). But the bottom line is, "The power of historical analogies to warp presidential judgment should never be underestimated" (p. 88).

John H. Barnhill
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Black Hawk Down: A Story of Modern War by Mark Bowden. Penguin Group (<http://www.penguinputnam.com>), 375 Hudson Street, New York, New York 10014, 2000, 400 pages, \$13.95 (softcover).

Black Hawk Down, a historical document written in the same style as a memoir, deals accurately with a battle that occurred between US Task Force Ranger and Somali forces in Mogadishu, Somalia, on 3 October 1993. These events are also the subject of the movie *Black Hawk Down*, based on Bowden's book and released by Columbia Pictures in 2001. The book and movie both provide exceptional insight into the reasons why Delta Force, Air Force combat search and rescue (CSAR) assets, Navy SEALs, and Army Rangers—the finest ground operators in the world, fielding state-of-the-art equipment—experienced over 50 percent casualties in 18 hours of fighting against a third world enemy who had little, if any, formal military training and fought only with AK-47s and rocket-propelled grenades (RPG).

In the early 1990s, the United Nations (UN) decided to intervene militarily in Somalia to feed the people and begin the process of building a democratic nation, but its forces met resistance from the most powerful clan, the Islamic Habr Gidr, headed by warlord Mohammed Farrah Aidid. Several bloody incidents led UN and US leaders to conclude that Aidid was an obstacle, so they decided to bring in Task Force Ranger, a joint unit consisting of Delta Force, Ranger, SEAL, and Air Force CSAR personnel to deal with the problem. By this time, Aidid and his clan considered themselves at war with the United States.

At midafternoon on 3 October, this force of 160 men, 19 aircraft, and 12 vehicles set out from their base at Mogadishu airport to “snatch and grab” two leaders of the local Habr Gidr clan from a target location only three miles from the base. The Delta Force operators or “D-boys,” as the Rangers called them, would crash the party in the heart of clan territory and make the actual arrests. The Rangers would isolate the area from ground interference with air support provided by AH-6 Little Bird and Black Hawk helicopters. Four additional aircraft were to fly surveillance. Inserted by Black Hawks, the entire force planned to withdraw with the prisoners by ground convoy. Since this was a lightning strike, designed to take less than an hour, most of the operators left behind their canteens, their ceramic chest and back protectors for their flak vests, and their night-vision equipment.

Because intelligence had determined that the RPGs did not represent an air defense threat, the Black Hawks flew low over the city with shooters on board to support the ground operation. By this time, responding to several weeks of US helicopter presence, al Qaeda operatives had shown the Somalis modifications to the RPGs that would make

them more effective, such as adding curved tubes to guide the rocket exhaust in a safe direction.

As a result, an RPG soon destroyed a Black Hawk tail rotor, and the helicopter went down in the city. Several Ranger and Delta elements of the attack force immediately secured the area around the chopper. The main attack force tried to move by convoy from the target location to pick up the crew and return to base but became disoriented in the city streets and drove around in circles through heavy fire looking for the downed bird. As their losses mounted, they were forced to return to base, leaving about 100 Americans surrounded at the crash site.

Air Force special operations CSAR personnel, displaying tremendous courage, were inserted by air under fire into the area, after which reinforcing elements of the attack force arrived and began fortifying their positions. As night fell, they regretted their decision to leave behind the night-vision equipment. Repeated attempts by the Somalis to mass forces and overrun these American positions were neutralized by the US air cover's rockets and Gatling guns. In all, RPG hits put five Black Hawks out of commission during the battle; three made it back to base.

It was well past midnight before an armored column supported by elements of the 10th Mountain Division could be assembled and a rescue started for the trapped Americans. Operating in heavy fire, the column finally extracted the pinned-down forces and their captives, but 18 Americans lost their lives in the process. Somali losses numbered 500–1,000 killed, with total casualties probably running over 5,000.

President Bill Clinton decided to terminate the operation and pull Task Force Ranger out quickly. A few months later, all US forces withdrew from Somalia. The UN nation-building effort collapsed almost immediately after that, and the United States released all Somali captives. Aidid and al Qaeda hailed this as a great victory for Islam. Aidid was killed three years later, but his death made little difference to the political situation in Somalia. To this day, the country remains an extremely poor, politically bankrupt nation with substantial al Qaeda involvement.

The principal issues here lie not at the tactical level but at the strategic. In spite of the tremendous success of “effects based” warfare in Operation Desert Storm, people continue to misunderstand it and debate whether it has the advantage over “attrition based” warfare. Had we used effects-based strategies to move us towards our desired end state in Somalia, it is unlikely that Task Force Ranger would have found itself in such an extremely high-

risk endeavor that offered only minimal return. Clearly, removing Aidid or his lieutenants was not well linked to establishing democracy in Somalia. Rather, we would have recognized that nation building would be a long-term process, perhaps initiated by creating an interim government supported by a national police force defended by our forces operating in the background.

Both the book and movie do an extraordinary job of conveying the events that occurred in Somalia. As with most movies, trying to capture a complex battle with multiple characters in two hours is a major challenge. For that reason, the viewer should read the book first in order to understand some of the detailed interactions that the movie simply has no time to explain. But the movie more effectively conveys a sense of the carnage witnessed by our forces that day.

Everyone in the Air Force should either read *Black Hawk Down* or watch the movie version—preferably do both. Each attests to the spirit, professionalism, valor, skill, and nobility of the American fighting forces involved in this conflict. The Somali warlords intended this incident to become a modern-day version of Custer's last stand or the Alamo. But they were denied.

Col Jon Campbell, USAFR
Harvest, Alabama

Reaching for the Stars: A New History of Bomber Command in World War II by Mark Connelly. I. B. Tauris Publishers (<http://www.ibtauris.com>), I. B. Tauris and Co. Ltd., 6 Salem Road, London W2 4BU, 2000, 206 pages, \$35.00 (hardcover).

Mark Connelly's *Reaching for the Stars* is a well-written history of the necessity, development, and contributions of Sir Arthur Harris's Bomber Command of the Royal Air Force in World War II; it also addresses the wartime coverage of that command and the postwar controversy surrounding it. The author uses his thorough research to clarify the role of the long-range bomber in Britain's assault of German-occupied Europe.

The book begins with an account of the advent of the bomber and early doctrine for its strategic use. As German bombers blitzed London, Coventry, and the Midlands, the British people and government sought ways to carry the fight back to the home of their attackers. The long-range bomber proved to be the only weapon suitable for projecting power beyond Britain's traditional sea realm

and into the heart of Germany. Although the bomber received high praise from news outlets and popular film during the war, the book reveals how postwar coverage of the command sprouted resistance, dissension, and even shame in the minds of some people regarding the implementation of this strategic weapon's awesome power as it laid waste to Dresden in 1945.

Readers interested in the contributions of American forces during daylight raids or in the ways American and British bombers worked as a unit should look elsewhere. The author's coverage of US forces is limited to those situations of blame sharing for alleged atrocities in Dresden and other places. However, for readers interested in how Bomber Command made things go bump in the night in Germany's industrial heartland, Connelly's work is an outstanding choice. Easily read in a single weekend, the book provides a timely example of wartime media coverage and issues of proportionality and distinction, as addressed by the Law of Armed Conflict, among military, civilian, and industrial targets. I especially recommend *Reaching for the Stars* to students of World War II and airpower.

1st Lt Jay Hemphill, USAF
Edwards AFB, California

Victory on the Potomac: The Goldwater-Nichols Act Unifies the Pentagon by James R. Locher III. Texas A&M University Press (<http://www.tamu.edu/upress>), John H. Lindsey Building, Lewis Street, 4354 TAMU, College Station, Texas 77843, 2002, 544 pages, \$34.95 (hardcover).

The people who wear their nation's uniform hold a common view that civilians should stay out of the military's business. But what if internal organizational deformities prevent the military from conducting its business properly? Shouldn't civilians then intervene? After all, the Constitution does grant Congress the authority to make rules for the government and regulation of the armed forces. If the military is broken, does not Congress have an obligation to intervene—even against strong Pentagon objection?

This is exactly what Congress did when it passed the Goldwater-Nichols Department of Defense Reorganization Act of 1986 over the politically dead bodies of Secretary of Defense Caspar Weinberger

and much of the military's senior leadership. The Pentagon's performance in Vietnam and its subsequent bungled operations in Iran, Lebanon, and Grenada revealed the persistence of interservice rivalries that sapped American military effectiveness, even against the backdrop of dramatically heightened US defense spending in the 1980s.

Weinberger was part of the problem because he stubbornly refused to acknowledge that there was a problem. He believed that more money was the only thing the Pentagon needed, and he regarded calls for organizational reform as implicit criticism of his stewardship of the Defense Department. He eventually became his own worst enemy, driving congressional fence-sitters into the proreform ranks.

Ironically, the almost five-year campaign to strengthen the chairman of the Joint Chiefs of Staff (JCS) and the unified commanders at the expense of the service chiefs, and to institutionalize "jointness" within the Pentagon began in February 1982, when Gen David Jones, JCS chairman, appealed to the House Armed Services Committee to reform the JCS itself. The joint chiefs had become a committee system incapable of providing timely and useful military advice to civilian authorities or of maximizing operational effectiveness in the field.

Jones was not alone. By the early 1980s, a growing number of thoughtful military officers and Defense Department officials, including former secretaries of defense James Schlesinger and Harold Brown, had come not only to regard the system as broken but also to understand that it could not be fixed except by congressional intervention. Just as significantly, key *conservative* members of the House and Senate, most notably Barry Goldwater, Sam Nunn, and Bill Nichols, were reaching the same conclusion.

How this informal alliance of proreformers on both sides of the Potomac eventually prevailed over powerful antireform forces is the subject of James Locher's masterful narrative of the intricate history of Goldwater-Nichols. As the key staffer selected by Goldwater and Nunn to perform the research and craft the legislation for defense reorganization, Locher enjoyed an extraordinary vantage point from which to observe the interplay of politics and ideas that produced Goldwater-Nichols. *Victory on the Potomac* is not just a great read. It is a cornucopia of insights into the federal legislative process, civil-military relations, political coalition building, bureaucratic warfare, and the relationship of personality to political success. (For example, if the obstinate Weinberger went out of his way to alienate potential recruits in the fight

against reorganization, Barry "Mr. Conservative" Goldwater provided indispensable political cover for other Republicans to oppose the Reagan administration on the issue.) The book is equally a definitive case study of the most important and successful American defense legislation of the twentieth century.

Victory on the Potomac is probably the best informed book we are ever going to get on this critical chapter in the history of US military policy. As such, it is must reading for military professionals and civilian defense-policy experts alike.

Dr. Jeffrey Record
Maxwell AFB, Alabama

US Allies in a Changing World edited by Barry Rubin and Thomas A. Keaney. Frank Cass Publishers (<http://www.frankcass.com>), 5824 NE Hassalo Street, Portland, Oregon 97213-3644, 2001, 294 pages, \$54.50.

This book is the product of a conference dedicated to analyzing American alliances in the new century, hosted by Johns Hopkins University and the Began-Sadat Center for Strategic Studies of Bar-Ilan University in Israel in 1998. At that conference, a dozen academics specializing in national security, strategy, and international affairs delved deeply into a number of alliances crucial to the United States as it enters a new phase of defense strategy and policy.

The book contains several parts. Part one lays the groundwork for how the United States evolved from the Washingtonian ideal of shying away from foreign entanglements to forming the foundation of several key alliances against communism—these include the North Atlantic Treaty Organization, Southeast Asia Treaty Organization, and Central Treaty Organization. Thomas Keaney reminds us of 80 years of American history in which alliances became crucial to dealing with problems of global proportions. In World War I, the United States was a junior partner promoting collective security and fighting for independent control of its forces in Europe. In World War II, the United States eventually established itself as an equal among European and Russian Allies, emerging after 1945 as a dominant partner in several key alliances. This dominance, however, would be tested in the future, in light of Europe's desire for equality within

NATO, the economic challenges of maintaining forces, and disagreements over foreign policies.

Ted Hopf then offers a compelling argument regarding US maintenance of what he terms *authoritative alliances*. His thesis highlights the freedoms and sovereignty that nations give up when they enter into collective economic or security agreements. Thus, he forces readers to look upon the power of an alliance as a whole instead of focusing solely on the dominant partner (e.g., the United States). This perspective allows for a broader exploration of possibilities in the face of threats and challenges.

Part two explores the future of British and German alliances with the United States. Christopher Coker examines the historical aspects of the Anglo-American alliance, noting not only the two nations' firm commitment to each other but problems, such as the frightening technology gap between them. He also addresses the significant decrease in England's defense spending and the drawdown of British forces. On the positive side, Britain brings a wealth of experience in military policing, peacekeeping, and civil-military affairs by virtue of its colonial past. According to Karl Heinz-Kami, Germany sees the Bundeswehr evolving from its defensive role to one that includes both a crisis-reaction force and main defense force. German defense planners are seriously considering the concept of preventive defense, which favors limited and early military intervention before a crisis turns into a full-blown conflict.

Part three deals with Middle Eastern alliances, primarily Turkey, the Gulf States, and Israel. Kemal Kirisci cites Ankara's concern about its neighbors' arsenal of ballistic missiles and weapons of mass destruction, a fear that has driven Turkey into a cooperative agreement with Israel to fund and research antimissile defense systems. Turkey sees its alliance with the United States as crucial and understands the geo-strategic advantages it brings to the NATO alliance. Stressful situations include the rise of political Islam in the Turkish electoral process and disagreements over the plight of the Kurds.

Joseph Kostiner offers an illuminating synopsis of how the Gulf States wish to ally themselves with the United States. Arab nations have had a hard time jump-starting a collective security agreement, and Kostiner highlights the failures of the 1991 Damascus Declaration and the Gulf Cooperation Council. Moderate Arab states look to a future in which they would need US intervention in times of major crisis, with low-level contingencies handled by a collective security arrangement featuring

Egypt, Syria, and a moderate Iran led by President Mohammad Khatami and his followers.

Gerald Steinburg explores the current US-Israeli alliance, finding it anchored in two key points: antimissile defense and the question of implementing a formal defense treaty with Israel. Such a treaty would be based on the establishment of a Palestinian state and a declaration that Washington would not tolerate any further encroachment on Israel by either Palestine or other Arab neighbors.

The final part of the book delves into Asian alliances, looking in particular at the future of Japan, Taiwan, South Korea, and Australia. Tohkiyuki Shikata addresses issues of the Japanese alliance, including theories of preventive defense and attempts to balance Tokyo's constitutional limitations regarding offensive capabilities with a need to maintain security for the island. The United States will need to look into using its Japanese bases more effectively and utilizing offshore basing, while simultaneously developing Japan's capabilities for self-defense. Curiously, only Japan and the United States maintain squadrons of F-15 strike fighters and AWACS aircraft as well as *Aegis*-class cruisers.

Yong Sup-Han discusses how policies regarding South Korea have changed from containing North Korea to pursuing engagement with Pyongyang while maintaining a defensive strike posture. Similarly, Philip Yang delves into how US relations with Taiwan have changed from maintaining Taiwan's independence to making it part of a third China, whereby the island maintains its government, economy, and autonomy—like Hong Kong and Macau—yet is merged with mainland China.

US Allies in a Changing World is a thought-provoking book, highly recommended for readers interested in these key regions of the globe. Its lessons in the changing nature of US allies lead us to be sensitive to the aspirations and needs of those nations whose support America will continue to require as it pursues the current war on terrorism.

Lt Youssef H. Aboul-Enein, USN
Washington, D.C.

Fighting with the Screaming Eagles: With the 101st Airborne from Normandy to Bastogne by Robert M. Bowen, edited by Christopher J. Anderson. Stackpole Books (<http://www.stackpolebooks.com>), 5067 Ritter Road, Mechanicsburg, Pennsylvania 17055-6921, 2001, 240 pages, \$29.95.

Robert M. Bowen's *Fighting with the Screaming Eagles* provides a detailed history of the experiences of one man and his glider-infantry company in the Allied invasion of Western Europe in 1944–45. From training with the 101st Airborne at Fort Bragg, North Carolina, across the Atlantic to England, and through the D day invasion—and then from battlefield injury, to capture at the Battle of the Bulge, and ultimately to liberation from a POW camp—Bowen's narrative conveys the full range of emotions and experiences of an American fighting man in the European theater in World War II.

His account begins with in-processing at Fort George Meade, Maryland, and his transfer to Fort Bragg, North Carolina, and the 401st Glider Infantry of the 101st Airborne Division. Bowen provides rich details about his preinvasion experiences in England; through Operation Overlord; into combat in France, Holland, and Belgium; and, ultimately, his detention in Germany. Focusing on his own experiences as well as those of his unit, his book offers one of the very few accounts of glider-infantry units in Western Europe.

Bowen compiled his account just after the war, drawing on his memories and the collection of letters he had written home to his wife over the course of the campaign. The precision of his descriptions and his ability to tell a story make his experience come to life, proving once again that there is no substitute for the historian who has lived his or her subject.

The understated heroism of Bowen and his comrades shines through his humility and candor. The author's wit and ability to cultivate the images of his experiences in the minds of his readers make *Fighting with the Screaming Eagles* a valuable contribution to the growing body of works that cover the Allied invasion of Western Europe in World War II.

1st Lt Jay Hemphill, USAF
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The Kremlin's Nuclear Sword: The Rise and Fall of Russia's Strategic Nuclear Forces, 1945–2000

by Steven J. Zaloga. Smithsonian Institution Press (<http://www.sipress.si.edu>), 750 Ninth Street NW, Suite 4300, Washington, D.C. 20560-0950, 2002, 288 pages, \$45.00 (hardcover).

This historical overview charts the highlights and pitfalls of Soviet weapons development. Well

documented and utilizing new Russian source material, it casts light on Soviet and Russian secrets. During the Cold War, this book would have been a gold mine to Western intelligence agencies since system details and Soviet decision making regarding weapons procurement were shrouded in secrecy. Initially, Western readers will grapple with the code names and nomenclature of Soviet weapon systems—many do not even match the terms found in arms-control treaties sponsored by the Soviet Union. The practice of dual naming has led to some interesting crossovers. For example, the North Atlantic Treaty Organization (NATO) designated a nuclear-attack submarine *Akula*, and the Soviets then named their largest missile-carrying submarine class *Akula* (which the West designated *Typhoon*). Missile variations are even harder to follow since the Soviet Defense Ministry and missile designers all used different terminology to describe the same missile or variant. However, Zaloga's introduction, appendixes, and a Soviet/NATO cross-reference list serve as aids to the military-minded reader.

With the help of newly available sources, the book documents the threat perceptions that drove the Soviet Union to develop, build, and deploy nuclear forces, especially land-based intercontinental ballistic missiles (ICBM). The Soviet air force, wary of rockets and missiles in the 1950s, lost manpower and three air armies to the newly formed Strategic Rocket Forces when the Communist Party leadership decided that rockets were better than bombers. The navy, overcoming technological hurdles, finally got submarine missiles in the 1960s, and Zaloga chronicles the difficulties encountered during this process.

Like Pavel Podvig's *Russian Strategic Nuclear Forces* (2001), Zaloga's book covers Soviet developments in nuclear weaponry quite closely. Zaloga, however, has a few surprises and hints that more may come as additional Soviet-era archives become available. Particularly intriguing is his account of how the Soviet defense industry manipulated and influenced the Soviet defense minister and political leadership to obtain funding and production decisions. Continuing technical problems and deep xenophobic fears forced the Soviet Union to develop and field more nuclear systems than the West. Such motivations are especially telling in the case of missiles. The desire to reach parity and then achieve nuclear superiority over the West drove the Soviets to deploy even more weapons. Zaloga also discusses defensive weaponry, unfortunately in briefer form than his chapters on offen-

sive weapons. Nevertheless, he does explain how one of the great US-USSR arms-control controversies—that concerning the Krasnoyarsk ballistic missile warning radar—came about. Furthermore, because suspicious Soviet leaders viewed the US space shuttle as a weapon, they had it tracked and targeted by FON-1, an embryonic, ground-based antiballistic-missile system that affected the shuttle crew. The reader will find many more such vignettes that enhance the readability of the text.

The story of the SS-16 mobile ICBM as recounted in this book should serve as a source of some concern since intelligence assertions made in the early 1970s appear to be true—specifically, that the system was deployed undercover and kept from American national technical means to ensure that US intelligence agencies never learned of its existence. Zaloga also shows what effect the stagnation of the late 1980s had on the Soviet Union and how the Strategic Defense Initiative and other American weapon systems ultimately drove the USSR into ruin. The command and control systems implemented by the USSR over the years became more desperate, finally resulting in a semiautomatic system that could have launched a final, devastating strike had the Soviet leadership been killed in Moscow. Zaloga is one of the first writers to document how nuclear weapons were returned to Russia after the Soviet Union failed and four successor states with such weapons emerged. Russia's attempts to modernize its nuclear arsenal and the associated costs of doing so, in terms of both money and manpower, are covered in the last chapter. This modernization, which continues today, shows how the former superpower still wishes to cling to great-power status by nuclear means.

Although *The Kremlin's Nuclear Sword* is still short on some of the details embodied in the 55 years it covers, this overview certainly helps the reader grasp how the Soviet Union conducted its nuclear business. What sets this book apart is its readability. Structured chronologically and functionally around Soviet weapon systems, it provides a comprehensive, high-level account. Now future books will have to deal with technical and operational issues by weapon system.

Capt Gilles Van Nederveen, USAF, Retired
Alexandria, Virginia

The Forgotten Air Force: French Air Doctrine in the 1930s by Anthony Christopher Cain. Smithsonian Institution Press (<http://www.sipress.si.edu>), 750 Ninth Street NW, Suite 4300, Wash-

ington, D.C. 20560-0950, 2002, 248 pages, \$34.95 (hardcover).

The rapid collapse of France in 1940—the country fell in six weeks to German assault—was a tremendous shock to most of the world. A number of postmortems have tried to determine the precise reasons for France's defeat. Now, Anthony Christopher Cain, an Air Force lieutenant colonel recently appointed editor of *Air and Space Power Journal*, has examined the French air force and the role it played in the debacle. Cain does this by reviewing the Armée de l'Air in the interwar period, concluding that French airmen were buffeted by a succession of political upheavals and the machinations of a resentful and covetous army and navy. As a result, the airmen adopted a policy of "reactive defense"—that is, they acknowledged the defensive and war-weary mood of the French politicians and army, thereby consciously adopting a path that would fit air policy into these defensive modes. This proved unwise.

The French air force was the world's largest and most powerful when World War I ended in 1918. Although not a separate service, it nonetheless enjoyed a certain prestige for its excellent performance during the war. Things soon deteriorated, however. Demobilization hit the air arm particularly hard, partly because the army officers in charge gave preference in funding to ground forces and equipment. In addition, French politicians reflected the mood of the people, who were increasingly fearful of and pessimistic about a German resurgence. Defense policy, readily supported by the army, increasingly focused on a defensive stance in the east. The Maginot Line would stand as an impregnable and concrete trench when the Germans returned. Air theory, which in France stressed the offensive and revolutionary nature of strategic air attack (as it did in Britain, the United States, and Italy), was distinctly unwelcome in such a passive environment. Even when the air force became a separate service in 1933, airmen thought it wise to focus on supporting ground forces. Ironically, war would show that they did not handle that mission particularly well either.

Cain argues that Pierre Cot, air minister for much of the 1930s, realized the danger of such a stance and attempted to correct it through a vigorous effort at doctrine formulation, reorganization of the aircraft industry, more realistic war games and exercises, and a robust training establishment. Unfortunately, his efforts went for naught. As war approached, the army tightened its grip on the air

force, and by 1940 ground commanders again controlled all air assets. Cot's efforts at reforming the French aviation industry met with a similar fate. Even in the face of a looming German threat, companies could not be induced to streamline and modernize. When the German tidal wave hit in May 1940, the aircraft available were too few and too slow. Thus, France in 1940 serves as the classic example of how bad strategy and policy decisions can have catastrophic results.

In truth, the challenges faced by the French air force between the world wars were not unique. In both Britain and the United States, budget cuts took a severe toll on the air arms. In Britain, for example, the Royal Air Force (RAF) received on average a mere 15 percent of the defense budget, and in the United States, the Air Corps had an even smaller share. Similarly, the RAF found itself constantly under attack from the army and navy, which sought to disestablish the RAF as a separate service and take back the airplanes they had lost in 1918. In the United States, of course, the Army firmly controlled its Air Corps and quashed all talk of a separate service. In addition, Britain—and to a far lesser extent, the United States—had to meet the needs of imperial defense with a series of governments far more interested in disarmament than rearmament. Yet, the RAF and Air Corps managed to articulate a doctrine of strategic airpower that would see them through the war. What happened in France?

Cain does not tell us the French air force's share of the defense budget between the wars or

even its aircraft and personnel strength. Nor do we learn what role the Staff College and War College played in educating (as opposed to training) students for future war. We are nonetheless left with the clear impression that the French air force suffered from a remarkable lack of effective and forceful leaders during the interwar period. The book makes no mention of dominant commanders like Hugh Trenchard; rabble-rousers like Billy Mitchell, who put service above self; or even the type of driven and creative officers at the RAF Staff College and the Air Corps Tactical School, who formulated a doctrine of strategic bombing—despite what the other services and politicians said about that method of war. When French army generals made demands, air leaders folded. Cain concludes that the leaders of the French air force were not decadent, traitorous, or stupid. Perhaps not, but neither do they appear to have been selfless, visionary, or brilliant.

The Forgotten Air Force is a good book with some very important lessons. The French air force went from first to last in a remarkably short period of time. Leadership—more accurately, the lack of it—proved instrumental in this fatal spin. We should all be concerned with whether our Air Force is cultivating the types of leaders and thinkers who will ensure our readiness for future conflict.

Col Phillip S. Meilinger, USAF, Retired
McLean, Virginia



Touch and Go

In this section of "Net Assessment," you will find additional reviews of aviation-related books and CD-ROMs but in a considerably briefer format than our usual offerings. We certainly don't mean to imply that these items are less worthy of your attention. On the contrary, our intention is to give you as many reviews of notable books and electronic publications as possible in a limited amount of space. Unless otherwise indicated, the reviews have been written by an ASPJ staff member.

A Dream of Wings: Americans and the Airplane, 1875–1905 by Tom D. Crouch. W. W. Norton & Company (<http://www.wwnorton.com>), 500 Fifth Avenue, New York, New York 10110, 2002 (paperback reissue of 1989 edition), 352 pages, \$14.95.

The much anticipated centennial celebration of powered flight that will occur in 2003 has spurred a reissue of this classic work by Tom Crouch, senior curator of aeronautics at the National Air and Space Museum and dean of early American aviation historians. *A Dream of Wings* ex-

amines critically those epic years of trial and error when men schooled in the technological age "brought self-confidence, professional organization and experience" (p. 19) to the pursuit of controlled heavier-than-air flight. Crouch incorporates within an overarching chronological framework a review of the dogged efforts of such American aviation pioneers as Octave Chanute to make structural, power, and control theories into actual flying machines. Although the Wright brothers' test site near Dayton, Ohio, will gain renewed fame as the world celebrates a century of powered flight, when the festivities end, its renown will once again fade. But *A Dream of Wings* will ensure that the intrepid exploits of our aeronautical forefathers continue to bloom.

Maj William E. Fischer Jr., USAF
Wright-Patterson AFB, Ohio

The World Wide Military Command and Control System: Evolution and Effectiveness by David E. Pearson. Air University Press (<http://www.maxwell.af.mil/au/aul/aupress>), 131 West Shumacher Avenue, Maxwell AFB, Alabama 36112-6615, 2000, 414 pages, \$37.00.

In this book, David Pearson, now a professor at the University of Texas, demonstrates his perception and understanding of a complex reality. An expert in his field, the author describes the effectiveness of the architecture built around the complex, interconnected computer network known as the World Wide Military Command and Control System (WWMCCS), reviewing the progress of technology and its impact on this defense information system for the last few decades. Concentrating on computers and communications networks rather than sensors and command posts, Pearson outlines the organization, technology, and ideology behind WWMCCS. He clearly succeeds in conveying how computers and communication networks play a vital role in defending us from many types of attacks, including cyber warfare by hackers, who may or may not have terrorist intentions.

Dr. Louis Haeck
Montréal, Québec, Canada

Pierre Nadeau
Saint-Hubert, Québec, Canada

Attack of the Airacobras: Soviet Aces, American P-39s, and the Air War against Germany by Dmitriy Loza. Translated and edited by James F. Gebhardt. University Press of Kansas (<http://www.kansaspress.ku.edu>), 2501 West 15th Street, Lawrence, Kansas 66049-3905, 2001, 392 pages, \$34.95 (hardcover).

Few history buffs know that the United States supplied war materiel in quantity to the Soviet Union during World War II. Dmitriy Loza now brings to light the story of Bell P-39 Airacobras on the Russian front. The author points out that the Soviets, unlike the Western Allies, employed this aircraft as a fighter-interceptor. The Soviet air force used P-39s until the end of the war, and Loza carries the narrative through the campaigns in south Russia and the final push across Poland into Germany. The book reveals the Soviets' considerable organizational innovation and initiative, something that was long thought uncharacteristic of their military services. *Attack of the Airacobras* is most valuable as a unit-level glimpse into the air war on the eastern front. The enterprising history buff as well as the airpower enthusiast will find the story rewarding.

Dr. Matthew R. Schwonek
Maxwell AFB, Alabama

Flying Aces: Aviation Art of World War II by James H. Kitchens and Bernard C. Nalty. Sterling Publishing Co., Inc. (<http://www.sterlingpub.com/home/home.asp>), 387 Park Avenue South, New York, New York 10016, 2001, 144 pages, \$19.95.

Flying Aces is a spectacular coffee-table book that combines the beauty of aviation art and the history of aerial combat in the Second World War. Brief stories of some of the most legendary aces of that war are magnificently illustrated with paintings inspired by the heroic feats of those pilots as well as the efforts of aviators on different sides of the war in all theaters. Over 70 war scenes by noted artists provide parts of the war story that words cannot tell. A polished introduction by Bernard C. Nalty helps make this book both a very exciting read and an enjoyable viewing. Available in paperback, it is well worth the price.



Mission Debrief

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The Editor

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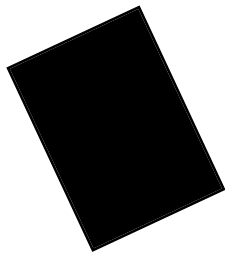


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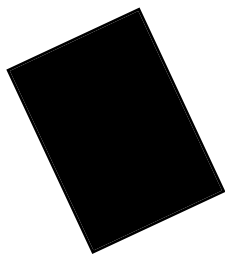


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